Good Practice
In Practice
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THE REVIEW PROCESS

Each of the contributions in this publication, with the exception of the Editors’ Introduction, has undergone a blind refereeing process by two referees. Where one of the editors is a co-author to a paper, that paper was handled editorially solely by the other editor.
Good university teaching not only has to be

didactically sound and conceptually up-to-date,
it also has to address the various conditions
that influence a student’s capacity to learn.
While the conditions under which students
studied were never stable and the same, the
past decade has seen cultural, social, techno-
logical and economic change which exposed
commencing students to a range of competing
demands on their time and attention. Study,
work and play have to be shuffled differently
than was the case ten years ago. Moreover, the
student cohorts are no longer homogenous.
Despite state-wide exams for school leavers,
the mix of units taken is highly variable, which
translates into a high variability of student’s
knowledge and abilities as they enter the un-
iversity system. But students are not only tradi-
tional face-to-face school leavers - increasing
cohorts are studying by distance education, or
by mixed modes. And, finally, an increasing
number of students come from international
locations, where requirements for university
entrance can be differently weighted. It is this
heterogenous mix of students that needs to be
catered for. It is imperative that we understand
the various pressures that come to bear if we
wish to adequately address the needs of stu-
dents as they experience tertiary study.

The papers collated in this volume, address
a range of these issues.

McKinnon and Danaia (p. 4) address the is-

sue of how science can be taught to education
students, who lack both content knowledge
and confidence in tackling seemingly complex
subject matter. The success of project-based
learning approaches, well received by the ma-

jority of students, could be demonstrated by
the improved student performance. Beyond
this, however. McKinnon and Danaia raise the
issue that the compulsory summative subject
evaluation feedback provided by students is
post facto. A correlation between negative eval-
uation and failing students is assumed. As nega-
tive subject evaluations reflect badly on

teaching staff in a performance-based funding
concept, the authors pose the question whether
such evaluations can be used as an intervention
method while the subject is still being taught.

The successful progression of students
from non-English speaking backgrounds into
tertiary learning is a challenge increasingly
faced by Australia’s universities. In the age of
quality-assured teaching, processes have to be
implemented that facilitate a transition that is beneficial to the student and teaching staff. Once such needs have been identified, processes have to set in place to service them—and service them swiftly. Wahr et al. (p. 24) describe the processes of subject development networks to achieve a rapid-response outcomes to a subject need. The roles of project management, change agents and particularly internal professional networks were all seen as critical to the successful implementation of innovative needs driven, teaching and learning programs.

Patil et al. (p. 32) discuss the transition to study and the high rates of academic failure and withdrawal experienced by students belonging to the lower castes of India. Here, socio-economic constraints are conditioned by, and overlain by, cultural constraints. Even though the caste system has been formally abolished for over two generations, it still pervades a person’s ability to equitably access the system, and then to successfully navigate the transition period to academic study. Constructs of power and status permeate inter-student relations and thus impact on the performance of the under-privileged. Although focussing on the situation in India, the paper has implications on how equity-driven access programs function in Australia and elsewhere.

The transition of students to their first year of study is the focus of papers by Farrell et al. (p. 41) and Lang and Robbie (p. 50). The latter describe the design and operation of a compulsory subject designed to overcome the problems students face when transition from a school system where study is regulated to a university system where study and attendance are more open. At a time when student cohorts rarely form learning communities with self-generated support mechanisms, but where university-externalities exert different pressures on individual students, a transition subject was deemed and proved to be a good solution. Rather than a generic study skills subject, however, the transition was subject specific. Intriguingly, the subject is a compulsory but zero credit unit that in current economic environment in Australia’s higher educations sector is no longer viable at the institutional level.

Farrell et al. (p. 41) describe the integration of an academic study skills subject into a first year core subject. While the student learning outcomes are commensurate with expectations, the subject also created benefits for the teaching staff through enforced reflection on the academic input by other colleagues.

Chan and Lee (p. 59) believe that technology can be successfully deployed to alleviate some of the pre-class anxiety students may experience as well as provide them with information in regards to assessment expectations and the like. The authors contend that the use of talk-back style voice clips, delivered via podcasting, is the solution. While ‘traditional’ approaches tries to stave off or at least offset the lack of informal, cohort-based learning communities through in-class group work and communal assignments in orientation/foundations subjects, Chan & Lee’s approach uncompromisingly favours the individual(istic) student in a fractionated cohort. Moreover, as the authors point out, podcasting is believed to offset student concerns about assignments ‘more flexibly and effectively than the traditional methods.’ In the light of study difficulties experienced by some NESB students, this may be a provocative and contentious issue.

The approach also requires techno-literacy by the users and the economic capacity for the acquisition of such technology. Universities traditionally offset this through the provision of technology for student use. As Spennemann et al have shown (p. 72), the nature of that required support changes over time. Previously, computer laboratories were seen as an essential means to allow students to access resources and to process their assignments. The plummeting prices of computer hardware, as well as the all-pervasiveness of the digital technology has shifted the focus. This trend is set to accelerate in the near future. The lessons from this are clear. Students need less technical and infrastructure support and more learning/academic skills support.

This matter is taken up by Smith and Burr (p. 83) who discuss the concept and functioning of the e-box, a digitally delivered support program targeted at distance education stu-
dents in their first semester of study. Broadened to include all students irrespective of mode of study, the e-box project demonstrates that affective issues of feelings of loneliness and lack of motivation among commencing students can be addressed together with the systemic and cognitive needs of students. As with all technology-based approaches, e-box can always only be one of many tools in the tool kit, albeit a powerful one.

The influence of modern spirituality and role on-campus colleges play has been raised by Anscombe (p. 92). This is an area worth further exploration especially the comparison of students living on their own or in shared flats/houses with those staying in halls of residence, and among the latter, to compare spiritually based halls with non-denominational ones.

The papers collated in this volume are those conference papers that were submitted for formal review process. Thus, by its nature, this publication is selective in its focus.

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PBL, COLLABORATION, PORTFOLIO AND CRITERION REFERENCED ASSESSMENT IN A SCIENCE AND TECHNOLOGY CURRICULUM SUBJECT FOR BEGINNING TEACHERS

David McKinnon & Lena Danaia
Charles Sturt University

The teaching of science and technology in primary schools is fraught with problems. Teachers perceive science as being difficult and they lack the content knowledge and confidence to teach it. This paper describes an approach in a compulsory subject of the Bachelor of Education (Primary) degree that tackles the integrated skills required by pre-service teachers to address problems identified in various national and international reports. A problem-based learning approach is adopted. Students demonstrate their content knowledge, collaborative skills and pedagogical content knowledge within a criterion referenced assessment framework. Their development as teachers of science and technology is presented in an integrated assessment portfolio record of their experiences. A quasi-experimental pre/post-test design is used to assess students’ developing content knowledge, scientific conceptions and cognitive reasoning. Three surveys were conducted by the CSU Evaluation Unit. Results show significant increases in content knowledge and complexity of cognitive reasoning, reductions in alternative scientific conceptions, and high levels of satisfaction with the approach. The discussion revolves around the student experience in the subject and usefulness of subject evaluation questionnaires to the teaching staff.


A national study conducted for the Department of Education, Science and Training (DEST) revealed that teachers estimated the average time they spent teaching science to be 59 minutes per week (Goodrum, Hackling & Rennie, 2000). The researchers acknowledge, however, that the self-reported data are not reliable and are most likely, overestimates. More than half of primary students surveyed reported that they never used computers or found information from the Internet. One third of students indicated that they never went on excursions. Half of the surveyed students indicated that they never visited zoos or museums and almost two thirds of them never had visiting speakers to talk to them about science. When practical activities were undertaken, the majority of students indicated that these were teacher directed. A large number of teachers reported that they were not required to report student learning outcomes in science to parents (Goodrum et al., 2000).

International reports such as Project 2061: Science for all Americans from the United States of America and Beyond 2000 from the United Kingdom identify many of the same issues confronting the effective teaching of science in primary schools. All reports highlight the need for science to be made relevant to the students’ lives; involve many, and different,
teaching and learning strategies; and, prepare them to be critical consumers of scientific and technological developments. These aims are not achieved by the teaching of discrete topics assessed by multiple-choice testing and reported to parents as summative marks. Rather, scientific literacy is highlighted as being a major aim of educational initiatives in these countries. The definition of scientific literacy in the DEST report from Australia is similar to others and revolves around a goal for science education “to produce a populace who are comfortable, competent and confident with scientific and technical matters and artefacts. Such an education should enable them to express an opinion on important social and ethical issues with which they will increasingly be confronted.” (Goodrum et al., 2000: p. 9).

Researchers in the field (e.g., Abell & Roth, 1992; Appleton, 1995, 2002, 2003; Harlen, 1997) and government reports (e.g., DEET, 1989; Goodrum et al., 2000) have highlighted some of the problems in science education at the primary school level. A general lack of confidence to teach primary science has, in the past, been attributed to lack of content knowledge and attempts to redress this have indicated that the connection between competence and confidence is far from clear (Appleton, 1995, Skamp, 1997). Appleton (1995, 2003) highlights the major issue that confidence to teach science should not be confused with competence.

Appleton and Kindt (2002) demonstrated that pre-service primary teachers who are presented with a suite of activities that work are more likely to develop the perception that they could teach the content with some confidence and be able to go on and devise their own activities. This suggests a strategy for primary school teachers to develop the science pedagogical content knowledge (PCK) necessary to become more effective in this key learning area. Here, PCK involves four central components: knowledge and beliefs about purpose; knowledge of students’ conceptions; curricular knowledge; and, knowledge of instructional strategies (Grossman, 1990). Science PCK applies to the teaching of science and is distinct from the PCK required to teach reading or writing or other curriculum subjects.

The purpose of this paper is fourfold. First, we briefly describe the context for attempting change within the science and technology curriculum studies subject for pre-service primary school teachers. Second, the problem-based learning approach employed is described that attempted to develop content knowledge, pedagogical content knowledge, and collaborative learning skills which were all assessed using a criterion referenced portfolio. The methods section describes how the data were collected. The results section reports the students’ content knowledge learning outcomes, complexity of cognitive reasoning, their alternative scientific conceptions and their formal evaluation of the subject. The paper concludes with a discussion of implications for practice and suggestions for further research especially in the evaluation of subjects by students.

THE CONTEXT FOR CHANGE

Previous iterations of the subject, Curriculum Studies I: Science and Technology K-6, employed a traditional lecture and tutorial format with students experiencing three contact hours per week for the semester. Instructors in the subject had experienced several problems with getting students to engage with the subject. These included:

- difficulty in getting students to read the set readings as evidenced by their inability to reflect on the content and implications for practice during tutorials and lectures;
- getting students motivated enough to engage in the practical activities and remain on-task as evidenced by their preference to talk about their social lives during tutorial activities;
- maintaining student engagement and getting them to question what they were doing, i.e., the pedagogical approaches they were supposed to be considering;
- lack of student preparedness for lectures as evidenced by their unwillingness to download and read the PowerPoint presentation posted three days prior to the lecture time or to read the relevant sections of the prescribed texts;
• getting students to express their understandings of what they were doing as evidenced by the deathly silences following instructor questions during tutorials and lectures;
• little or no student initiative as evidenced by instructors being asked to tell them what to do at every stage (almost learned helplessness) or simply waiting for instructor directions on how to proceed or wanting the instructor to explain everything; and, more mundanely,
• talking during lectures.

These problems/issues occurred in the context of a subject that attempted to cover the six curriculum content areas of the New South Wales Science and Technology K-6 syllabus and which only skimmed the surface of each while attempting to develop content knowledge, pedagogical content knowledge and positive dispositions to the teaching of science and technology. In short, the subject failed at all of these for most of the students on most occasions. An analysis of the subject indicated to us that all of the conditions for engendering surface approaches to learning were present (Gibbs, 1992). That is to say, a heavy workload and crowded curriculum, too many assessment items (two assignments worth 60% and an exam worth 40%), lack of choice and little time to reflect on what was being learned (if anything) disposed the students to behave as they did.

In an attempt to foster deeper learning approaches in the 2005 offering of the subject, we avoided the features that encourage surface learning. We included active, cooperative learning, offered students choice and flexibility and implemented an assessment strategy that monitored student performance through a single cumulative process that required the students to be reflective, flexible and open about the difficulties they encountered in covering the content and required participants to document, with evidence, all that was happening (Barnett, 1994; Entwistle, Entwistle & Tait, 1991).

THE CONTENT AND CONDUCT OF THE SEMESTER
For practical reasons, the instructors decided to focus on two curriculum content areas one of which is widely reported in the science education literature as one that is avoided or, if taught, taught badly and a second that contains few resources for teaching in departmental curriculum support documents. Thus, the topics to be covered were the Earth and its Surroundings and Environmental Science.

A “Problem Based Learning” (PBL) approach, more commonly employed in the field of engineering, was used in the 2005 subject offering rather than the more traditional format of lecture plus tutorial. It employs an iterative approach to understanding the problem, the personal learning required in order to solve the problem, solving the problem and reflecting on the outcomes (Hadgraft & Prpic, 2004). We hypothesised that such an approach might overcome many of the problems that had led to a measure of frustration from the instructors’ perspectives.

Setting up “the problem”
The “problem” was set up by administering the Astronomy Diagnostic Test (ADT) (CAER, 2000) as modified and extended by McKinnon & Danaia (2004). The “test” was administered on unsuspecting students in Week 2 to identify their prior knowledge (or lack of it) in the astronomy content of the Science and Technology K-6 syllabus. (Week 1 of the semester was used by a Mentor Training program for other purposes). The “test” also ascertained students’ alternative scientific conceptions as they related to certain astronomical phenomena and, in addition, allowed an assessment of their ability to explain the reasons for their answers. Students were horrified at the results. The pre-test results for females and males are shown in Table 1.

The maximum score for items which are mapped to the NSW Primary Science and Technology syllabus document is 14. The range of scores was 0 to 7 out of a maximum score of 14. Only 20 students scored 4 or more and only one student achieved a score of 7. These results indicate that the vast majority, if not all, of the students did not have the pre-requisite
content knowledge to teach the outcomes of The Earth and its Surroundings strand of the Primary Stage 2 and 3 curriculum (pupils aged 8-11 years). When given the results of the ADT, the students clearly understood that there was a problem: their lack of content knowledge. Many made the inspired leap in concluding that if they “did not know the content then how could they know how to teach it?”

Table 1: Astronomy Diagnostic Pre-test Results (Primary school syllabus items)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>σ</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.71</td>
<td>1.42</td>
<td>91</td>
</tr>
<tr>
<td>Male</td>
<td>3.13</td>
<td>1.89</td>
<td>23</td>
</tr>
<tr>
<td>Group Total</td>
<td>2.00</td>
<td>1.62</td>
<td>114</td>
</tr>
</tbody>
</table>

The tools supplied to the students
Students were next introduced to the “tools” that were to be employed during the subject: Problem Based Learning (PBL) approaches, Cooperative Learning strategies and a Portfolio Assessment approach involving criterion-referenced standards to document their learning processes and learning outcomes. A range of cooperative learning strategies were covered, through compulsory readings, to provide the groups with the skills that would make the “problem” manageable within the nine-week time frame within which the Earth and its Surroundings had to be completed. The balance of the semester was to be devoted to applying the skills they had acquired in the first nine weeks to dealing with the environmental problem loosely framed as “Water quality in the Murray-Darling Basin.”

In the first formal tutorial after students received their results from the ADT, they were given the opportunity to form groups (size range 3-6) in which they were to work during the semester. They were asked to record their thoughts and feelings about their performance in the ADT privately in their logbook before sharing their results and reflections with their group members. In recording their thoughts about the act of sharing the ADT results, students described their relief at finding their friends and peers were as ignorant as they were. In their discussions, they also articulated that they were probably just as ignorant in the other five content strands of the Science and Technology K-6 Syllabus and expressed grave concerns for their ability to be competent teachers of science. Many did recognise, however, that they had to learn the content before attempting to teach it.

Content knowledge support
A compendium of 31 Projects, pre-prepared by the instructors, was provided to the groups. The Projects were all related to the Earth and its Surroundings and contained materials that were associated with all of the six Key Learning Areas of the primary curriculum (Science and Technology, Mathematics, English, Human Society in its Environment, Creative and Practical Arts and Personal Development, Health and Physical Education).

From these, the groups could choose to do as many, or as few, of the projects they felt necessary in order to address their content knowledge deficits (the problem). In deciding which projects to cover, in true PBL fashion to make the problem “manageable”, the groups pooled their collective ignorance and mapped what they did not know against the requirements of the syllabus. Thus, the students constructed a curriculum for their group that would be enacted over a period of seven weeks.

In developing this personalised group curriculum, students, without realising it, were employing some of the cooperative learning strategies they would be required to use throughout the semester. They came to realise that other cooperative learning strategies could be used to reduce the magnitude of the problem still further. These included: Jigsaw II where one student became the expert on a topic and taught it to the others in the group; group investigation where each member adopted specific roles for particular purposes that changed from week to week; and, think-pair-share where students identified what they individually already knew and then, in pairs, pooled this knowledge before going off to extend it and subsequently returning to share and work
through it as a group. In sum, students quickly recognised that the collaborative learning strategies were the means by which the overall task of content knowledge acquisition could be made manageable.

**Portfolio Assessment and the Marking Rubric**

The single assessment item by which student performance was to be judged in this subject was a portfolio involving criterion-referenced standards to document their learning processes and learning outcomes. The criterion-referenced framework contained 60 outcomes covering Problem Based Learning (18 items), Cooperative Learning (13 items), Academic and Knowledge components (8 items) and Portfolio components (21 items) and was supplied to students in their Subject Outlines at the beginning of the semester. This “Marking Rubric” is supplied as an appendix to this paper.

Each outcome was assessed with respect to an ordinal scale indicating the level of performance as follows:

5 Excellent, Superb, Extremely Well Done, Wow!
4 Very Good, Very Well Done
3 Well Done, some gaps, can be improved a little
2 Many gaps, can be improved a lot
1 Barely mentioned, needs to be addressed in detail
0 Not Present.

**Gateway Tasks**

Students were required to submit components of the Portfolio on four occasions during the semester. The occasions were referred to as “Gateway Tasks” and were designed both to provide the students with formative feedback and to ensure that they did not leave the entire portfolio construction until the last moment. The minimum standard that was acceptable for a pass in the subject was a mean score of “3” on the rating scale described above.

The first Gateway Task involved students formally describing their personal reactions to the result they had obtained in the ADT, their reactions to their group members' results and reflections about the reactions. A second component of the first task involved a set of eight research papers related to the teaching of astronomy in primary schools being distributed to the groups with directions being given that each student had to choose a paper that had to be summarised and the main concepts reported to the group the following week. Each student also had to find an additional research paper covering a similar topic to the one supplied and the contents reported in the same way as the paper that had been provided. Students used a combination of cooperative learning techniques to do this. The techniques included Jigsaw, Jigsaw II, Think-Pair-Share and Roundtable. At the next tutorial, each student reported their findings of these two papers to the group. Collectively, the group had to present to the class the two most important issues to emerge from the research papers that had direct relevance to the teaching of science in the primary school. They were also required to record their personal reactions to the presentations of the members of their group. Thus, they experienced the effective “divide and conquer” approach of collaborative learning predicated upon the key concepts of positive interdependence, individual accountability and personal responsibility.

The second Gateway Task required students to map the curriculum outcomes and indicators from each of the six Key Learning Areas of the primary syllabuses to the projects that the group had chosen to undertake. The students adopted a similar divide-and-conquer strategy to this task. In their groups, individuals assumed responsibility for a sub-set of their group’s projects. Most students communicated their curriculum maps to the members of their group using email while some met face-to-face to exchange their information. The second component of Gateway Task 2 was to write, individually, a rationale for their curriculum and later to share this with their peers and subsequently, collaboratively develop a rationale for their group curriculum.

The third Gateway Task required the group to do the projects they had chosen by employing cooperative learning strategies. Thus, individuals adopted differing roles and had to
document their perspectives both as teachers and as learners. In adopting these roles, students developed both content and pedagogical content knowledge and became quite adroit at identifying the learning issues both for their peers and for the pupils they would teach in the future. They also had to construct a personal critical reflection on what they had done and learned in relation to the knowledge, skills, attitudes, pedagogy and assessment/evaluation components of the primary curriculum in general, and the science and technology curriculum in particular, and to share these reflections with their peers.

Gateway Task 4 involved students working in their groups to address the ill-defined problem of “Water Quality especially as it relates to the Murray-Darling Catchment.” They used the PBL and the cooperative skills and strategies that they had developed while covering the astronomy component. In this case, however, none of the learning issues were to be addressed through practical activities. In essence, the students were developing a personalised curriculum for themselves that they would need to follow if they were to teach the topic to their pupils.

The Gateway Tasks were then to be collated, organised and presented in the Portfolio together with any additional materials that individuals felt needed to be included to address the evidentiary nature of the assessment criteria.

**METHOD**

This section describes the participants involved in the subject, the way in which the Astronomy Diagnostic Test was treated and the use of the formal surveys of the subject administered by the University Evaluation unit.

**Participants**

Participants in this study were 114 students enrolled in the Bachelor of Education (Primary), Bachelor of Primary Education Studies, and the Double Degree in Primary Education and School Counselling programs at a rural Australian university. These students were undertaking the compulsory curriculum subject, Science and Technology I.

Of the 114 students, the two enrolled in the BPES degree went on a practicum experience at the end of week six and returned at the beginning of week 11 of the semester. Of the 25 double degree students, 19 completed the first nine weeks of the semester before going on their practicum experience with the remaining six completing the 13 weeks of the semester. The entire cohort of 87 Bachelor of Education (Primary) students completed the entire 13 weeks of the semester.

**Astronomy Content Knowledge**

During the whole-group lecture in week 2 of the semester, students completed the Astronomy Diagnostic Test (CAER, 2000). This instrument has been developed by the Collaboration for Astronomy Education Research in the United States of America. Researchers at Charles Sturt University have modified the instrument by adding an additional four items that require students to draw a picture of four astronomical phenomena and to explain what their pictures mean. The original 21 multiple-choice items of the ADT were modified by inviting students to explain their reasons for choosing a particular multiple-choice option thus avoiding the major danger of an “educated guess” prompted by the stem of the question and the alternatives. Students were asked not to venture guesses on the multiple-choice items and to leave them blank if they did not know the answer.

**Scoring of the ADT**

Four variables were assigned to each item in the ADT. The first variable indicated whether the student had answered that question correctly. The next two variables identified the alternative scientific conceptions that were evident in the students’ written reasons for either explaining their diagram in the first four questions or explaining why they had chosen a particular multiple-choice option in the remaining 21 items. The final variable described the complexity of the students’ written response using the Structure of the Observed Learning Outcome (SOLO) taxonomy (Biggs & Collis, 1982).
In an earlier research project conducted by the authors, a total of 59 alternative scientific conceptions related to astronomical phenomena had been identified and collated into a manual describing them. This same manual was employed to ensure a high degree of reliability in the coding of students’ responses.

The SOLO taxonomy describes a hierarchy of learning outcomes according to the complexity of the students’ written responses. If a student did not provide an answer, a “0” was assigned. If the student did provide an answer but indicated that it was a guess, a “6” was assigned. A response that does not appear to answer the question is described as pre-conceptual and is coded as a “1”. The remaining codes were assigned in order of increasing complexity of answer as follows. A “2” was assigned if there was only one “piece” of information in the response. An answer of this type is described as uni-structural. A “3” was assigned if there was more than one “piece” of information provided in the written response. An answer of this type is described as multi-structural. A “4” was assigned if the pieces of information in the multi-structural type response had been related together. An answer of this type is described as relational. A “5” was assigned if a relational response was detected but the student had gone beyond the question to develop an “extended-abstract” response. A response of this type typically goes well beyond what is asked in the question but the argument presented by the student clearly indicates how the additional information relates to the question. No extended abstract responses were detected on either the pre-intervention or the post-intervention ADTs.

The 14 items of the ADT that relate directly to the content of the Science and Technology K-6 syllabus are used to construct a total test score of content knowledge. The items all relate to: day and night; phases of the Moon; the orbits of the Earth and Moon about the Sun; the seasons; the movement of the Sun in the sky; the structure of the solar system; and, the colours of stars. A mean SOLO score was also computed for these 14 items for each student.

Subject evaluations
Subject evaluations were administered at the end of the semester for each of the courses described above. Three surveys, constructed by the Evaluation Unit, were administered covering the offering of the internal subject, the teaching of the subject and the tutoring methods employed. Additional questions related to the unique components employed (PBL, cooperative learning, gateway tasks and the portfolio assessment task) in the subject were asked. Students provided free-form responses to these items. The questionnaires were forwarded to the Evaluation Unit for processing. Free-form responses were coded thematically and are yet to be analysed.

When the student surveys were returned after processing by the Evaluation Unit, all data were entered into the Statistical Package for the Social Sciences (SPSS v 11.5) to allow more sophisticated statistical analyses to be conducted.

RESULTS
This section presents the results of the various components described in the Method section. First, the results of the ADT are presented in three sections: the knowledge component, the SOLO as it relates to the complexity of students’ conceptions evident in these written responses. Second, more powerful repeated-meaures statistical analyses are employed to determine the learning effects from the Pre-ADT to Post-ADT occasion. The results are presented in the same order as for the pre-intervention occasion. Third, an analysis of the formal evaluations is presented. Fourth, a brief analysis of the assessment outcomes derived from the marking rubric are presented.

Pre-intervention results
Table 1 above shows the pre-test mean scores for females and males for the 14 items related to the content of the primary school Science and Technology K-6 syllabus. The outcomes of this test, as suggested above, clearly indicate the parlous nature of the students’ content knowledge about the simple astronomical phe-
nomina that they will be expected to teach in Years 3 to 6 (Stages 2 and 3). There is a significant difference in the mean scores of females’ and males’ content knowledge ($F = 15.70, \text{df} = (1,112), p < 0.0001$).

Table 2: Mean SOLO score, standard deviations and counts for females and males

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>$\sigma$</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.12</td>
<td>0.50</td>
<td>91</td>
</tr>
<tr>
<td>Male</td>
<td>1.49</td>
<td>0.48</td>
<td>23</td>
</tr>
<tr>
<td>Group Total</td>
<td>1.20</td>
<td>0.52</td>
<td>114</td>
</tr>
</tbody>
</table>

Table 2 presents the mean score of the students’ SOLO responses on the pre-intervention occasion. The table shows that, on average, the students’ reasons for their drawing or multiple-choice answers are at a pre-conceptual level indicated by the mean score close to “1” for both the females and the males. The difference between the mean female and male SOLO responses is significant ($F = 9.51, \text{(df}=1,112), p < 0.002$) with males offering, on average, a more complex reason.

Table 3: Alternative scientific conceptions related to the causes of Day and Night

| Day & Night: Earth orbits Sun to make night/day. Earth orbits Sun daily. | 13 | 11.4 |
| Day & Night: caused by the Sun going around the Earth. | 11 | 9.6 |
| Day & Night: is equivalent to the seasons. | 4 | 3.5 |
| Day & Night: Moon blocks sunlight at night. Moon orbits the Earth daily. | 1 | 0.9 |
| Total | 29 |

The alternative scientific conceptions evident on the pre-intervention occasion are presented in a set of multiple-response tables. This is because two variables were assigned to classifying students’ alternative scientific conceptions. The tables present both the count and the proportion of students who offer each of the alternative scientific conceptions listed. It is possible that the percentages in the right-hand column can add to more than 100% because students offered one or more alternative conceptions.

Table 3 shows the range of alternative scientific conceptions that some of the students hold about the causes of day and night. A surprising 11.4% of students think that the Earth goes around the Sun daily with a further 9.6% thinking that the Sun goes around the Earth daily.

Table 4: Alternative scientific conceptions related to the movement of the sun across the sky

| Movement of Sun: The Sun is directly overhead at noon every day. | 66 | 57.9 |
| Movement of Sun: The Sun always rises in the east and sets in the west. | 59 | 51.8 |
| Movement of Sun: Sun is only directly overhead on one or two days per year | 3 | 2.6 |
| Movement of Sun: confusion with northern hemisphere | 1 | 0.9 |
| Total | 129 |

Table 4 shows the range of alternative scientific conceptions that students have about the apparent movement of the Sun across the sky. A total of 57.9% of students think that the Sun is directly above their heads every day at noon and 51.8% think that it always rises directly in the east and sets directly in the west. One student’s response shows that perhaps they have only read texts that describe the movement of the Sun from a northern hemisphere perspective.

Table 5: Alternative scientific conceptions related to the orbits of the Earth and Moon about the Sun

| Orbit: Earth rotates at centre of system Sun goes round the Earth. | 4 | 3.5 |
| Orbit: Sun & Moon go around Earth in same orbital path. | 4 | 3.5 |
| Orbit: Earth orbits the Sun by day and the Moon by night. | 3 | 2.6 |
| Orbit: Moon and the Earth orbit the Sun together in the same orbital path | 3 | 2.6 |
| Orbit: Moon orbits the Sun. Earth not mentioned. | 1 | 0.9 |
| Orbit: The Moon goes around the Earth in a single day. | 1 | 0.9 |
| Total | 16 |
The results in Table 5 show that for a small number of students there is a degree of confusion about how the Moon and the Earth orbit in relation to the Sun. For some of these students, the results of the Copernican revolution have not yet filtered through.

Table 6: Alternative scientific conceptions related to the phases of the Moon and eclipses

<table>
<thead>
<tr>
<th>Phases: of Moon caused by shadow from the Earth.</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phases: Eclipse of Sun happens at full Moon BIG ENOUGH to cover the Sun</td>
<td>53</td>
<td>46.5</td>
</tr>
<tr>
<td>Phases: Total eclipses (Sun) can happen at any phase of Moon</td>
<td>33</td>
<td>28.9</td>
</tr>
<tr>
<td>Phases: caused by amounts of sunlight shining on Moon.</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Phases: caused by cloud blocking the light reaching the Moon.</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Phases: caused by distance from Earth/Sun</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Phases: caused by Sun covering Moon.</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Phases: caused by Sun orbiting Moon.</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
</tbody>
</table>

Table 6 presents the results for students’ alternative scientific conceptions related to the causes of the phases of the Moon. The most common conception is that the Earth’s shadow is responsible for the different shapes. A further 8.1% of students offer varying reasons for the phases of the Moon. A total of 28.9% of students believe that a total eclipse of the Sun can only happen at a full Moon because then, and only then, is it big enough to completely cover the Sun while a further 8.8% believe that a total solar eclipse can happen at any phase.

Table 7: Alternative scientific conceptions related to the causes of the seasons

<table>
<thead>
<tr>
<th>Seasons are caused by the Earth’s distance from the Sun.</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasons: Sun on one side Earth hot for 6 months other side colder.</td>
<td>108</td>
<td>94.7</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

Table 7 shows that a massive 94.7% of the second and third year teacher education students think that the seasons are caused by the distance of the Earth from the Sun. One surprising alternative conception seemed to indicate that the Sun had a cooler side that caused winter and a warmer side that caused summer.

Post-intervention results

Table 8 shows the mean scores, standard deviations and Ns for females and males who supplied data on the pre- and post-intervention occasions for the 14 items related to the content of the primary school Science and Technology K-6 syllabus. The post-intervention outcomes of ADT clearly indicate that the students have made significant progress towards improving their content knowledge about the simple astronomical phenomena that they will be expected to teach in Years 3 to 6 (Stages 2 and 3).

Table 8: Mean scores, standard deviations and Ns for females and males for the 14 items

<table>
<thead>
<tr>
<th>Gender: Mean</th>
<th>σ</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>2.03</td>
<td>1.65</td>
</tr>
<tr>
<td>male</td>
<td>3.30</td>
<td>2.08</td>
</tr>
<tr>
<td>Group Total</td>
<td>2.29</td>
<td>1.81</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender: Mean</th>
<th>σ</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>7.12</td>
<td>3.03</td>
</tr>
<tr>
<td>male</td>
<td>8.00</td>
<td>3.01</td>
</tr>
<tr>
<td>Group Total</td>
<td>7.28</td>
<td>3.03</td>
</tr>
</tbody>
</table>

The differences were tested using an ANOVA with repeated measures on the occasion of testing and the gender of the respondents as the independent variable. There is a significant main effect due to the occasion of testing (F=182.92, (df=1, 93), p < 0.00001) with an effect size of 0.663 (eta squared). Both females and males increased their scores significantly although there remains a significant between- groups main effect due to gender (F=5.64, (df=1, 93), p = 0.02). The difference
between females and males on the post-intervention occasion is, however, less than on the pre-intervention occasion as indicated by Figure 1 which shows the closing of the difference between the mean scores of the two groups.

Table 9 shows the mean scores, standard deviations and Ns for females and males who supplied data on the pre- and post-intervention occasions for the mean SOLO content of the reasons given for answer to the 14 items. The post-intervention outcomes of the SOLO analysis of the ADT clearly indicate that the students have made significant progress towards being able to explain the reasons for their answers at a higher level.

The differences were tested using an ANOVA with repeated measures on the occasion of testing and the gender of the respondents as the independent variable. There is a significant main effect due to the occasion of testing \((F=39.525, \text{df}=1, 93), p < 0.00001\) with an effect size of 0.3. Both females and males increased their scores significantly with the females offering more complex reasons than the males on the post-intervention occasion though the difference due to gender is now no longer significant \((F=1.454, \text{df}=1, 93), p = ns\).

The difference between females and males on the post-intervention occasion is reversed with the females outscoring the males as indicated by Figure 2 which shows the crossover in the mean scores of the two groups.

The alternative scientific conceptions evident on the post-intervention occasion are presented in a set of multiple-response tables. The tables present both the count and the proportion of students who offer each of the alternative scientific conceptions listed.

Table 10 presents the results of the analysis for students’ alternative scientific conceptions on the causes of day and night. Comparison with Table 3 above shows that there has been a reduction in the incidence of alternative con-

---

### Table 9: Mean scores, standard deviations and Ns for females and males for the SOLO responses

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>σ</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>1.12</td>
<td>0.50</td>
<td>91</td>
</tr>
<tr>
<td>male</td>
<td>1.49</td>
<td>0.48</td>
<td>23</td>
</tr>
<tr>
<td>Group Total</td>
<td>1.20</td>
<td>0.52</td>
<td>114</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>σ</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>2.02</td>
<td>0.64</td>
<td>77</td>
</tr>
<tr>
<td>male</td>
<td>1.81</td>
<td>0.66</td>
<td>18</td>
</tr>
<tr>
<td>Group Total</td>
<td>1.98</td>
<td>0.65</td>
<td>95</td>
</tr>
</tbody>
</table>

---

![Figure 1: Graph of mean knowledge scores on the pre- and post-intervention occasions for females and males](image1.png)

![Figure 2: Graph of mean SOLO scores on the pre- and post-intervention occasions for females and males](image2.png)
ceptions with a count of 13 from 13.8% of students retaining an alternative conception compared with 25.4% of students on the pre-intervention occasion.

The results in Table 12 show that a small number of students still retain a degree of confusion about how the Moon and the Earth orbit in relation to the Sun. Comparison with Table 5 shows that there is a qualitative difference in the alternative conceptions that the students express. Only two remain exactly the same with “Sun & Moon go around Earth in same orbital path” and “Moon orbits the Sun. Earth not mentioned.” It would appear that some students have incompletely integrated the movement of the Moon about the Earth and the Earth about the Sun. They appear to have focussed on only one aspect of the system and confused the movement of the Sun around the Earth to cause day and night rather than answering the question about the orbits of these objects.

Table 12: Post-intervention alternative scientific conceptions related to the orbits of the Earth and Moon about the Sun

<table>
<thead>
<tr>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbit: The Sun goes round Earth. Moon not mentioned.</td>
<td>6</td>
</tr>
<tr>
<td>Orbit: The Sun goes around the Earth in less than a year.</td>
<td>1</td>
</tr>
<tr>
<td>Orbit: Sun &amp; Moon go around Earth in same orbital path.</td>
<td>1</td>
</tr>
<tr>
<td>Orbit: Moon orbits the Sun. Earth not mentioned.</td>
<td>1</td>
</tr>
<tr>
<td>Orbit: Moon and the Earth orbit the Sun together</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 13 presents the alternative conceptions expressed by students for the causes of the phases of the Moon and solar eclipses. Comparison with Table 6 above shows that there have been major reductions in all alternative conceptions. For example, the post-intervention incidence of the phases being caused by “shadow from the Earth” has dropped from 46.5% of students to 31.6%. The reason for a total eclipse of the Sun happening only at full Moon “because it is big enough to cover it” has fallen from 28.9% to 20%.

The results in Table 12 show that a small number of students still retain a degree of confusion about how the Moon and the Earth orbit in relation to the Sun. Comparison with Table 5 shows that there is a qualitative difference in the alternative conceptions that the students express. Only two remain exactly the same with “Sun & Moon go around Earth in same orbital path” and “Moon orbits the Sun. Earth not mentioned.” It would appear that some students have incompletely integrated the movement of the Moon about the Earth and the Earth about the Sun. They appear to have focussed on only one aspect of the system and confused the movement of the Sun around the Earth to cause day and night rather than answering the question about the orbits of these objects.

Table 13: Post-intervention alternative scientific conceptions related to the causes of Day and Night

<table>
<thead>
<tr>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day/night: caused by the Sun going around the Earth.</td>
<td>5</td>
</tr>
<tr>
<td>Day/night: Earth orbits Sun makes night/day. Earth orbits Sun daily.</td>
<td>4</td>
</tr>
<tr>
<td>Day/night: Moon blocks sunlight at night. Moon orbits the Earth daily.</td>
<td>2</td>
</tr>
<tr>
<td>Day/night: Earth orbits the Sun by day and the Moon by night.</td>
<td>1</td>
</tr>
<tr>
<td>Day/night: Earth rotates at centre of system, Sun goes round the Earth.</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 11: Post-intervention alternative scientific conceptions related to the movement of the Sun across the sky

<table>
<thead>
<tr>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement of Sun: The Sun always rises in the east and sets in the west.</td>
<td>31</td>
</tr>
<tr>
<td>Movement of Sun: confusion with northern hemisphere</td>
<td>13</td>
</tr>
<tr>
<td>Movement of Sun: Sun is only directly overhead on one or two days per year</td>
<td>10</td>
</tr>
<tr>
<td>Movement of Sun: The Sun is directly overhead at noon every day.</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
</tr>
</tbody>
</table>

Comparison of the results presented in Table 11 for the post-intervention occasion with Table 4 for the pre-intervention occasion shows that there has been a halving of the alternative conceptions related to the movement of the Sun across the sky with a drop from 129 to 55 detections. There has been a major drop in the incidence of students thinking that the “Sun is directly overhead at noon every day” from 57.9% of students to 1.1%.

Table 10: Post-intervention alternative scientific conceptions related to the causes of Day and Night

<table>
<thead>
<tr>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day/night: caused by the Sun going around the Earth.</td>
<td>5</td>
</tr>
<tr>
<td>Day/night: Earth orbits Sun makes night/day. Earth orbits Sun daily.</td>
<td>4</td>
</tr>
<tr>
<td>Day/night: Moon blocks sunlight at night. Moon orbits the Earth daily.</td>
<td>2</td>
</tr>
<tr>
<td>Day/night: Earth orbits the Sun by day and the Moon by night.</td>
<td>1</td>
</tr>
<tr>
<td>Day/night: Earth rotates at centre of system, Sun goes round the Earth.</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 13: Post-intervention alternative scientific conceptions related to the phases of the Moon and eclipses

<table>
<thead>
<tr>
<th>Phases of Moon caused by shadow from the Earth.</th>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phases: Eclipse of Sun happen at full Moon BIG ENOUGH to cover the Sun</td>
<td>30</td>
<td>31.6</td>
</tr>
<tr>
<td>Phases: The Moon goes around the Earth in a single day.</td>
<td>19</td>
<td>20.0</td>
</tr>
<tr>
<td>Phases: Total eclipses (Sun) can happen at any phase of Moon</td>
<td>12</td>
<td>12.6</td>
</tr>
<tr>
<td>Phases: Caused by distance from Earth/Sun</td>
<td>6</td>
<td>6.3</td>
</tr>
<tr>
<td>Phases: Light reflected from Earth lighting the bit of Moon we see.</td>
<td>5</td>
<td>5.3</td>
</tr>
<tr>
<td>Phases: Shadow of Earth on Moon causes phases.</td>
<td>3</td>
<td>3.2</td>
</tr>
<tr>
<td>Total</td>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>

Table 14 shows that now 41.1% of students believe that distance from the Sun causes the seasons compared with 94.7% on the pre-intervention occasion. This is a further example of incomplete integration within the students’ mental model. It was evident from analysing the written responses that many students thought that because the tilt of the Earth’s axis pointed them towards the Sun in summer that they were “closer” and hence “warmer” compared with winter when the tilt pointed them “away.” This has lead to confusion with their previously “wrong” mental model of the Earth’s distance from the Sun causing the seasons.

Table 14: Post-intervention alternative scientific conceptions related to the causes of the seasons

<table>
<thead>
<tr>
<th>Seasons: are caused by the Earth’s distance from the Sun.</th>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>39</td>
<td>41.1</td>
</tr>
</tbody>
</table>

One question asked students to list in order of distance from the Earth, the Moon, Sun, Pluto and stars. Table 15 presents the results of two further alternative conceptions that were detected. One was evident in 11.6% of responses where there is confusion between the size of the object in the sky and its distance. The Sun “looks” bigger than the Moon so it is closer. The second alternative conception related to the same question equates faintness with distance, e.g., “Pluto is very faint therefore it is further away than the stars.”

Table 15: Other Post-intervention alternative scientific conceptions detected

<table>
<thead>
<tr>
<th>Confuses distance of objects with size in sky, big=close</th>
<th>Count</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confuses brightness/faintness with distance, faint=far</td>
<td>11</td>
<td>11.6</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4.2</td>
</tr>
</tbody>
</table>

The apparent reduction in the detection of expressed alternative conceptions on the post-intervention occasion compared with the pre-intervention occasion was tested with an ANOVA with repeated measures on the occasion of testing. Here the number of expressed alternative conceptions by each student on both occasions was calculated to produce two dependent variables. Students who did not offer a reason(s) for their answer were not included in the analysis. On the pre-intervention occasion, 54% of the possible written reasons for their answer were left blank while on the post intervention occasion this had fallen to 30%. That is, students appeared to be more disposed on the post-intervention occasion to offer a reason for their answer.

The results showed that there was a highly significant reduction in the mean number of expressed alternative conceptions on the post-intervention occasion with the mean number for females falling from 3.9 to 2.4 and for males from 3.5 to 1.7 ($F=24.330$, $df=1, 93$, $p < 0.00001$). The effect size was a modest 0.307. Figure 3 presents these reductions graphically. Perhaps if students had offered reasons for their answers then more could be classified as “alternative”. Nonetheless, the reduction in expressed alternative conceptions is highly significant.
SUBJECT EVALUATIONS AND GRADES
In this section, the 2005 cohort evaluations of the subject are presented together with the grade distribution. The student evaluations were administered during the final lecture for the subject. Three instruments were used: the subject evaluation, an evaluation of teaching, and an evaluation of tutoring. A subset of the data is presented here to illustrate the visual correlation between the subject grades awarded and the evaluations received from students. It is not possible to compute a correlation coefficient between the grades awarded and the students’ evaluations of the subject because of the anonymity of response to the evaluation instruments.

It is, however, possible to compute a correlation coefficient (Pearson) between reliable factors within the Subject Evaluation instrument that emerged as a result of an Exploratory Factor Analysis computed on the 19 items. Five factors emerged in the analysis accounting for 67% of the variance. Two of these factors are quite different from each other and serve to illustrate an issue that will be taken up briefly in the discussion. These two factors were: an instrumental factor related to the objectives, content coordination and assessment within the subject (4 items) and a teaching factor related to how the subject was taught and the availability/approachability of the lecturer and tutor (7 items). The internal consistency (Cronbach’s alpha) of the two scales were 0.8328 and 0.8455 respectively.

Figure 4 presents the distribution of marks awarded for the students' efforts in the subject together with the normal distribution superimposed as a curve. The bi-modal nature is evident with approximately 20 students falling in the lower part of the distribution and who were deemed to have failed the subject. Figure 5 presents the distribution of scale scores for the Factor related to the instrumental aspects of the subject involving objectives, content and assessment. A bi-modal distribution, though not quite as evident as in Figure 4, is nonetheless present, with a number of students awarding a scale score of 17 (uncertain or disagreement responses on the 4 items) or less.
out of a total possible total of 28 for this instrumental aspect of the subject.

A correlation coefficient was computed for the two scales whose distributions are presented in Figures 5 and 6 above. The Pearson correlation coefficient is 0.642 (p < 0.000001). That is to say, when students responded to both the instrumental scale and to the teaching scale, they did so in very similar ways. Those students who rated the teaching positively also rated the objectives, content and assessment system positively. More importantly, when they rated one factor negatively, they rated the other equally as negatively. In short, this small group of students were alienated by the subject content, and its teaching.

Though a relationship between the marks obtained by a student in the subject cannot be traced to a student's ratings of the subject, there is evidence to suggest that such a relationship exists as evidenced by the highly significant correlation above and the bi-modal nature of the four distributions presented.

**DISCUSSION**

This paper has described an intervention involving Problem Based Learning approaches in an area of science education that is normally taught badly in primary schools. Data were collected from a cohort of students that tapped their astronomical knowledge, alternative scientific conceptions, ability to explain phenomena and their reactions to the subject through the formal evaluations conducted by the University’s Evaluation Unit. The discussion that follows addresses the topic of academic outcomes briefly and focuses on the student experience within the subject in a slightly more detailed way though both are important in terms of the performance-based funding initiatives being undertaken at the institutional level. The relationships amongst student performance in, and evaluation of, the subject and their experience at university will require further research.

In New South Wales, all primary teachers are expected to teach the six Key Learning Areas of the curriculum. The teaching of the Key Learning Area of Science and Technology has been identified in a number of research reports as being of concern. The results presented above show that pre-service teacher education students possessed little astronomi-
cal knowledge and held significant alternative scientific conceptions prior to undertaking the science and technology curriculum subject about certain astronomical phenomena. The post-intervention data show that they learned a great deal about astronomy in the problem-based learning environment with high task expectations that employed an assessment system based on an extensive set of criteria, which scaffolded the portfolio they were required to submit for marking. Students’ knowledge increased significantly with a learning effect size of 0.667. In addition, they developed a significantly increased ability to explain the astronomical phenomena in question that was accompanied by a significant reduction in their alternative scientific conceptions. From a subject content perspective, these results are very impressive and tend to speak for themselves.

Students’ experiences within the subject were formally evaluated using the instruments developed by the university’s Evaluation Unit. Students’ evaluation of the subject and its teaching could not be tracked back to their performance in the subject because of the anonymity of response. Analysis of the evaluations reveals a bi-modal distribution of responses to the subject and its teaching that mirrors the bi-modal distribution of final marks awarded to students for their efforts in the subject. It was found, however, that when a student reacted negatively to one scale factor in the Subject Evaluation instrument, they reacted in an equally negative way to a second scale factor unrelated to the first. The correlation between these instrumental and teaching factors was highly significant.

It is to the issue of students’ evaluations in this period of Performance-Based Funding to schools for teaching performance that we now turn. More importantly, the interaction between students’ experiences in the subject and their evaluations of it has consequences both for the lecturer and for the academic organisational unit. “For Schools, the target for teaching performance is that 50% of permanent academic staff meet the University’s criteria for continuing professional development in teaching in 2005. If this target is met, then the 7.5% funding available in relation to teaching will be made available to the School in 2006” (Performance Based Funding, 2005: p 1).

To meet the criteria for “continuing professional development in teaching”, an academic staff member must either have received an award for teaching excellence sometime in the past three years or undertaken two of 10 approved activities described in the Performance Based Funding document (2005). Of these 10 approved activities, the majority of academic staff is likely to undertake a Subject Review with a reflection paper of 500 words (Conversation with Educational Designer, 2005). The Subject Review requires the academic to use “University student evaluation data” as well as “other evidence” to compose their reflection paper (Performance Based Funding, 2005: p 1).

The subject described in this paper employed new approaches to the teaching of a compulsory science and technology curriculum studies subject. The results obtained showed highly significant changes in academic outcomes that we as lecturers were interested in achieving. The latter part of the Results section highlighted the visual correlation between student performance and students’ evaluation of the subject. A small number of students delivered very negative evaluations of the subject using scales extracted by exploratory factor analysis from the formal evaluations, and who were likely to be the students who did not achieve a passing grade in the subject.

This raises the concern that the “student evaluation data” obtained summatively is of little use to the lecturer and of even less benefit to the low performing students, and more, it has cost them money, through the HECS fee, for failing the subject. In addition, their experiences within the subject are likely to leave them with a negative attitude towards the curriculum area. This is an undesirable situation in terms of the problems identified in national and international research reports discussed briefly earlier in this paper. Further, the negative responses of the few students have significantly negative impacts on the mean item scores of the formal evaluation instruments presented by the Evaluation Unit as a report to the lecturer and which have implications for both the in-
There is little utility in the summative evaluation information on how the lecturer can implement changes on the next iteration of the subject to address issues identified by the evaluation data. This is, in part, because there will be a new cohort of students involved who will have their own peculiar dispositions and reactions to the new offering of the subject. In short, the Subject Evaluation data are of little formative use while the subject is being delivered. In essence, the question that is raised is one of how to identify the students who will deliver negative evaluations because of their experiences within the subject, and who are likely to fail, before they develop overwhelmingly negative attitudes towards, and later actually fail, the subject.

Thus, the authors are more concerned with being able to make adjustments to the subject while it is running, identifying the students who are struggling during the subject delivery and implementing interventions with them to redress the situation before summative evaluations are undertaken both of, and by, them. This will likely have the combined benefits of making the students’ experience more positive as well as less expensive.

The student experience at university is a product of many factors and includes their experience within each of the subjects they are studying as well as the other features that the Student Experience Questionnaire (SEQ) is designed to tap. Negative experiences within subjects may well influence performance. Formative evaluations are now possible as evidenced by the online administration of the SEQ. The decision to make such evaluation data “anonymous” raises issues of utility that need to be addressed by the University. Who are the students who are reacting negatively to the delivery of the subject? Why are they reacting in this way? What interventions can be designed for them? Can the interventions overcome the disposition to failure for these students? Should these students be in the subject at all? These questions may, in part, be addressed by requiring students to provide identifying information to a third party, e.g., CELT or the information systems databases, so that they are adequately protected while they are studying the subject yet the information they provide can be useful to the lecturer in a formative sense.

The authors are now trialing an approach where informal “one-minute Harvard Papers” are completed by the students at the end of each two-hour tutorial. Students are asked to reflect, and write a few words, on what they had found good and bad about the session, what they had learned, what they feel they need to learn and to give five words describing what their reactions were to what had been covered. They are invited to identify themselves on the paper and to discuss issues with the lecturer/tutor when they feel it necessary. Scans of these papers are quite revealing. The vast majority of students are positive about the content and their experiences within the subject. Some, however, do not “get it”. These students are the ones who require interventions to be constructed to help them understand. With greater understanding perhaps, their experiences within the subject will become more positive.

In this period of performance based funding of teaching activity, the subject evaluations will assume an even more important role in the judgments that managers make of academic staff. Attention should also be directed at the potential benefits to students who can provide feedback to their instructors while the subject is running so that their university experiences in general, and their learning experiences in particular, become more meaningful, positive and worthwhile.

BIBLIOGRAPHY


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Appendix – Marking Rubric

Marking Rubric EMS200 K-6 Science and Technology, Autumn 2005

Name: __________________________________________________

Student Number: ______________________________

Contact number: ______________________________

Email Address: ______________________________

Tutorial Group: 1  2  3  4  5  6 (Circle)

1. This sheet MUST accompany each of the Gateway Tasks 1-3 AND accompany the submission of your final Portfolio.
2. The ticks against each criterion indicate to you how well you have addressed each one.
3. Not all criteria apply to all Gateway Tasks.
4. In essence, the rating scale against each criterion can be regarded as developmental. That is, if you score a 1 (not clearly evident) against the criterion on Portfolio Aspects Evidence of student participating in selecting contents of group curriculum, on submission of the Gateway Task 1, it is possible to increase this score to a 2, or greater, by addressing it in more detail in subsequent Gateway Tasks or on submission of the completed Portfolio. This can be done either by re-addressing the Gateway Task 1 or developing what you need to do in later Gateway Tasks to address the criterion properly.

Marking Scale:
5 – Excellent, Superb, Extremely Well Done, Wow
4 – Very Good, Very Well Done
3 – Well Done, some gaps, can be improved a little
2 – Many gaps, can be improved a lot
1 – Barely mentioned, needs to be addressed in greater detail
0 – Not Present OR Not Applicable in this Gateway Task

I certify that unless otherwise acknowledged, the contents of the Gateway Tasks and the completed Portfolio are all my own work.

Student Signature: __________________________________________

<table>
<thead>
<tr>
<th>TASK</th>
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<tbody>
<tr>
<td>Gateway Task 1</td>
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<td>Gateway Task 2</td>
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<td>Gateway Task 3</td>
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<tr>
<td>Final Portfolio</td>
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<td>Final Mark</td>
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Signature of Subject Tutor: ______________________________
Marking Rubric + Components

Portfolio Components

1. Evidence of student participating in selecting contents of group curriculum.
2. Contains Criteria for selection of contents.
6. Contains Evidence of Enlarging the view of what is learned.
7. Contains Evidence of Fostering learning about learning.
8. Contains Evidence of Demonstrating progress toward identified outcomes.
10. Contains Evidence of Providing a way for students to value themselves as learners.
11. Contains Evidence of Offering opportunities for peer-supported growth.
12. Contains samples of work that stretch over a period of time.
13. Contains particular subject matter across the 6 KLAs
14. Contains evidence that a learning process is occurring.
15. Contains reflections upon experiences, thinking processes used, and the habits of mind employed at given points in time and across the time periods.
16. Contains Evidence of risk taking
17. Contains Evidence of creative solutions.
18. Contains Evidence of learning to make judgments about their own performances.
19. Contains Evidence of students' monitoring of their own comprehension.
20. Contains Evidence of students' monitoring of their own metacognitive reflection.
21. Contains Evidence of students' monitoring of their own productive habits of mind.

Cooperative Learning Components

1. Contains evidence of using face-to-face promotive interaction.
2. Contains evidence of using Positive Interdependence
3. Contains evidence of using Individual Accountability/ Personal Responsibility
4. Contains evidence of using Interpersonal and Collaborative Skills
5. Contains evidence of using Reflection/Group Processing of Interaction

Commonly Used Techniques:

6. Contains evidence of using and evaluating Think-Pair-Share strategy
7. Contains evidence of using and evaluating Three-Step Interview strategy
8. Contains evidence of using and evaluating Roundtable strategy
9. Contains evidence of using and evaluating Numbered Heads Together strategy
10. Contains evidence of using and evaluating Pairs Check strategy
11. Contains evidence of using and evaluating Send a Problem strategy

**Team Learning Techniques**
12. Contains evidence of using Jigsaw II strategy
13. Contains evidence of using Role Cards strategy

**Academic Components**
5 4 3 2 1 0
1. Evidence of wide reading of scholarly literature.
2. Evidence of correct referencing techniques.
3. Evidence of correct use language conventions.
4. Evidence of critical reflections of S & T that inform change and are adaptable to different learning contexts.

**Knowledge Components**
5 4 3 2 1 0
1. Evidence of having acquired knowledge of scientific content.
2. Evidence of having acquired knowledge about, and how to use, the K-6 Science & Technology syllabus.
3. Evidence of being able to conduct scientific experiments.
4. Evidence of being able to draw scientific conclusions from experiments conducted.

**Problem Based Learning Components**
5 4 3 2 1 0
1. Has effectively used a Logbook.

**Key Steps in PBL**
2. Contains evidence of attempting to Understand the problem
3. Contains evidence of Addressing the problem
4. Contains evidence of Modeling the problem
5. Contains evidence of Generating solutions
6. Contains evidence of Iteration in the initial stages of PBL.
7. Contains evidence of attempting to Solve the problem
8. Contains evidence of Identifying learning issues and assigning to group members.
9. Contains evidence of collecting new information and evaluating it
10. Contains evidence of sharing new information with group
11. Contains evidence of Applying learned information to solving the problem (L)
12. Contains evidence of Assigning learning issues to group members (L)
14. Contains evidence of Generating alternative solutions (R)
15. Contains evidence of Evaluating solutions
16. Contains evidence of using brainstorming
17. Contains evidence of using de Bono’s six hats approaches
18. Contains extensive evidence of engaging in Critical Reflection
GREAT IDEA! BUT HOW DO WE DO IT?
Mobilising internal networks to get innovative projects off the ground

Fiona Wahr, Elizabeth McAspurn, Roger Hadgraft & Kathleen Gray
RMIT University

The importance of internal organisational networks can be demonstrated through the use of a case study of a project to improve student experience and success through the introduction of an English for academic purposes course. In complex organisations, such as universities, using these networks to inform and negotiate the inevitable academic hurdles is essential to successfully progress novel and/or innovative student experience projects. Strategies for developing and maintaining internal networks that can come together for a rapid response in getting innovative projects off the ground are explored and factors that impact on creativity in teaching and learning are also examined.


Student progress and retention are considered measures of student academic success. They are also two of the eight measures currently used by the Australian Government to monitor the performance outcomes of Australian universities (DEST, 2005). Supported student transition is recognised as a key factor influencing student progress and retention (Carey, 2005; Moxley, Najor-Durack, & Dumbridgue, 2001) and hence, improvements to student transition are integral to student progress and retention.

The Science, Engineering and Technology (SET) Portfolio at RMIT University, Melbourne, Australia has nominated improved student transition as one of its three teaching and learning priorities for 2005. A number of relevant activities have been established with this aim, that is, to improve student experience and success, in addition to and subsequently to improve performance outcome.

The ten schools within SET currently provide standard transition activities including orientation to facilities and services, IT induction and training, social events and access to learning support. In 2005, each school has nominated a project to address a specific student transition need. These have included evaluation of orientation programs, an early intervention program for students ‘at risk’ and improving student articulation between TAFE and higher education programs. A part-time teaching and learning project officer has been dedicated to collectively support these projects.

A transition priority for the School of Civil and Chemical Engineering (SoCCE) is the successful progression of non-English speaking background (NESB) students, both local and international.

A recent internal RMIT report (2005a) has identified the key reason for specific cohorts of students to cancel from their programs. International onshore NESB students are more

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likely to report “academic difficulties” and domestic NESB students are “more likely to say the program was ‘not what they expected’” (RMIT, 2005a, p.1). This is consistent with the anecdotal findings of SoCCE staff who have previously found these students lack the English language and learning skills necessary to successfully engage in their program of study. (Note: RMIT terminology denotes a sequence of units of study leading to an award as a program and the individual units of study as courses.)

To address this priority, SoCCE has identified a project to develop and offer an English for Academic Purposes (EAP) credit-bearing course, contextualised to teach and/or consolidate the English language and learning skills specifically required to successfully engage in the core courses undertaken by first year students.

In this paper, we firstly provide a background for the importance of innovation in teaching and learning to respond to student needs and suggest approaches for doing this. Secondly, we outline the actions, hurdles, negotiations and resolutions experienced by the project team using the case study of taking the idea for the EAP course and actioning it to the approval stage within an eight-week window of time. Finally, we examine the role of internal networks in the success or otherwise of the project and how these can be mobilised for rapid and effective responses to innovative teaching and learning ideas.

**EVIDENCE BASED CONTINUOUS IMPROVEMENT AND ACTION RESEARCH**

Our commitment to continuous improvement encourages and provides the impetus to better understand the student experience and to find innovative solutions to students’ learning needs. This professional commitment is reinforced at the organisational level by internal and external management drivers in the collection and reporting of performance measures and improvements (AuQA, 2005; DEST, 2005).

Further than just monitoring, Carey (2005) says in relation to student progression and completion rates, the data must be analysed and used to create new approaches and innovations to teaching and learning; “[I]t matters whether administrators and faculty monitor student progress, taking advantage of new data systems to tease out patterns of student success. Successful schools use that information not only to help individual students but also to make needed changes in policies and practice” (Carey, 2005, p.2).

Scott (2001) supports the need to link improvements to relevant data and further, refers to the constancy of the need for change in response to changing data, as the relationship between “continuous quality improvement and innovation” and “effective change management” (Scott, 2001, p.2). The resulting application of these combined processes, amongst other factors, produces “evidence-based action priorities” including research into what others are doing in the field, recognises that there is some inherent uncertainty in the change process, and takes an “action oriented” approach which includes ongoing monitoring, evaluation and further improvement, and the creation of learning from this work. Scott (2001) refers to the methodology as a workplace action research approach.

Similarly, Cherry’s model of action research is a “continuous cycle of planning, action and review of the action” (Cherry, 1999, p.1). Like Scott’s model it results in improvement and learning; providing “an opportunity for a different kind of knowledge-making: the creation of knowledge by taking what is already known and applying it in conditions that are different” (Cherry, 1999, p.23). The project team in taking existing knowledge and understanding of the transition needs of NESB students and applying them to the development of the new EAP program used an action research approach.

Scott’s (2001) work links innovation and change together, which suggests both non-standard approaches and/or standard approaches to new situations; hence, his reference to the uncertainty associated with change. Cherry (1999) recognises this also, “the action work on offer is by no means assured and is never a matter of simply following the program, rolling out the plan or joining up the dots.” (Cherry, 1999, p.17). Additionally, both
acknowledge there are factors outside of the control of the action researcher.

In a university setting, acting on an innovative idea for change requires planning, seeking approval and implementation which can use significant resources, and requires a comprehensive understanding of how the organisation works and possibly long lead times. Budget and policy considerations and organisational politics can all create a series of unforeseen hurdles for the action researcher.

Each hurdle needs to be deconstructed into its elements and these elements must be negotiated, in order for the project to progress. Thus, a range of skills and areas of expertise is required, leading to the need for an action team to undertake action research (Scott, 2001). This team should be made up of people “already active in the area and who are willing to work collaboratively to develop their common innovation further” (Scott, 2001, p.2). He stresses the need for the team to be trained in an action research approach.

Gladwell (2002) in relation to change management argues there is a point in the change process “when everything can change” (Gladwell, 2002, p.8). This is the tipping point. Once the tipping point has been reached, the existing conditions make implementation of the change self-sustainable. Hence, the key task of the change manager or action researcher/team is to drive the change process to the tipping point.

The necessary conditions to achieve the tipping point are set by three elements; appropriately skilled people to drive the change, the nature of the change itself and the appropriate environment into which to attempt the change (Gladwell, 2002). The appropriate skills for the change managers are the ability to make and maintain strong and relevant yet varied professional networks, the specialist knowledge to recognise linkages between aspects of the change and the ability to be persuasive (Gladwell, 2002).

In relation to teams Belbin (2004) has found in addition to a range of attributes such as leadership (also in Kotter, 2001, 1995), creativity and intelligence there needs to be “a good match between the attributes of members and their responsibilities in the team [and] an adjustment to the realization of imbalance” (Belbin, 2004, p.90) within the team. For a small, yet responsive, team this can mean recognising expertise outside of the group will be needed. Hence, the network of each team member becomes an attribute in itself and must be exploited to make up for gaps in team skills and/or knowledge.

Whilst referring to corporate alliances, Kanter (1994) also stresses that successful collaborations rely on the strength of the partners and their commitment to positive outcomes. Like Belbin (2004), Kanter (1994) also referred to the range of skills brought by the different members of the group, saying “neither can accomplish alone what both can together” (Kanter, 1994, p.100).

If a team understands its skill gaps and has complemented these with established and effective networks, it can set out with an action research approach and be flexible enough to undertake innovative change projects.

CASE STUDY

The opportunity

In the School of Civil and Chemical Engineering School, up to 40% of students identify as either local or international non-English speaking background (RMIT, 2005b). Statistically, SoCCE student records show student progress and retention rates for NESB students studying engineering programs were poorer than the overall average. SoCCE staff anecdotally reported NESB students’ English skills as particularly lacking in the areas of written and oral communication and analytical skills and studying in a second language. Difficulty also occurs in team-based project work where confidence in communication in English is important.

Having the required International English Language Testing System (IELTS) entrance requirement does not guarantee that international students from non-English speaking backgrounds (NESB) achieve early success in their studies, due to gaps in English language and study skills. Equally, local NESB students are recognised as having special needs in these
areas. For instance, in regard to learning Krause et al. (2005) found that NESB students:
• “have difficulty comprehending the material, with 30 per cent agreeing that this is the case
• have more difficulty adjusting to the style of university teaching, and
• are more uncomfortable in class discussions.” (Krause et al., 2005, p.75)

A number of SET Schools have strategies in place to support students in study, professional and/or communication skill development, which can include some support in English language enhancement. However, most of these do not formally address the needs of students who lack the English language skills necessary to engage successfully with program requirements.

Additionally, students can voluntarily access the RMIT Learning Skills Unit (LSU) where they can receive English language skills support and study skills support, including through online materials, one-to-one and small group teaching or drop-in centre support. LSU staff have also successfully team taught with context-based lecturers in core courses, focussing on the needs of NESB students.

The idea
The initial idea was to make a new English for Academic Purposes (EAP) course available to NESB engineering students. The course would be owned and offered by SoCCE, and be driven by the language and learning needs of its students. The course would complement students’ existing studies by providing language development skills and approaches to learning as a NESB student using their other studies as the learning context, in this case, focusing on the English requirements of the engineering programs.

EAP courses are particularly valuable in terms of building student awareness of, and abilities in, the discourses (ways of talking, reading and writing) used in the higher education field generally, and where contextualised, specific discipline areas. These courses are different to general English as a Second Language (ESL) courses in that they focus on the ‘context-reduced’ language which is often abstract and more difficult to learn by ‘osmosis’ (Cummins, 1982; Jordan, 1997).

Much research points to the usefulness of EAP courses, particularly those that are content-based, that is, those built around a general discipline area. Kasper (1997) for instance reports improved language and content performance and higher scores on measures of reading proficiency among students who have completed content-based EAP courses. However, they do more than address language issues; they address a range of issues in learning in an unfamiliar learning culture. Ballard (1996) states that language problems often mask ‘the much deeper problems of adjusting to a new intellectual culture, and new way of thinking and of processing knowledge to meet the expectations inherent in the Anglo education system” (Ballard, 1996, p.150).

Much research points to the usefulness of EAP courses, particularly those that are content-based (those built around a general discipline area). Kasper (1997) for instance reports improved language and content performance and higher scores on measures of reading proficiency among students who have completed content-based EAP courses.

Using the networks

The action research team
Within SoCCE, the original need to support NESB students was recognised and responded to by the SoCCE Director (Teaching and Learning); a co-author with teaching and learning and engineering expertise.

At the same time the SET Portfolio was encouraging targeted action in relation to improving student transition, by requiring each School to identify a project to address the transitional needs of a particular student cohort. This brought the involvement of the Manager, Strategic Teaching and Learning Projects; a co-author with educational development, teaching and learning and academic policy and administration expertise, who works in the SET Portfolio office.

Brainstorming based on some initial research suggested a range of possible solutions. An EAP course was one appropriate solution,
but it seemed an ambitious option. Its form and how it might be offered, and by and to whom were initially unclear.

In the previous year, the University’s Teaching and Learning Committee had made a top-down recommendation that an EAP should be developed in each portfolio of the university. However, the proposal had languished without a champion. It was recalled and revived in this case only once a clear need emerged from focussed staff exploration of data and practices around supporting student transition in Schools which recognised the benefit of embedded support for culturally and linguistically diverse students.

The initial discussions highlighted the need of an expert to comment on the English language and learning skills aspects and options within the project. A colleague, a co-author, from the Learning Skills Unit (LSU), a provider of services to students from across the University to support their learning, who had previously supported NESB students was contacted and agreed to become involved. She also had close knowledge of EAP courses offered elsewhere in the University.

The course could be service taught by RMIT’s Learning Skills Unit, whose staff have substantial experience in teaching academic literacy and supporting NESB students in developing the English language and study skills required for higher education study.

The formation of the project team with the added resource of each members’ own networks and commitment to positive outcomes created the tipping point for the project. Despite the small size of the team, the commitment and networks of each member created the necessary change environment to progress the project.

The networks
This section briefly describes the process used by team members to progress the project. It includes references to the broad expertise accessed by the team through their networks.

With a narrow window of time, consultation from across the Portfolio was needed to determine which other Schools were interested in collaborating on such a course. Collaboration would involve staff input to contextualise the course to the needs of students from a range of programs, resourcing and administration.

The consultation was organised and facilitated by the Manager, Strategic Teaching and Learning Projects using Portfolio contacts. Five of the ten Schools were represented at a meeting where participants provided indications of interest and raised suggestions and issues with the project team. A possible scenario for the EAP course had been provided to School representatives to give some framework for the discussion. Input and comment from the other engineering schools was gathered using existing relationship amongst the respective Teaching and Learning Directors of these schools.

To be offered, the course needed to be cost neutral or return a profit to SoCCE. Financial projections were needed. The University’s finance department provided an income and expenses costing based on a model which applied a range of assumptions prepared by the team. The assumptions included minimum and maximum class sizes, teacher skill level and mode of delivery.

This costing was subsequently not used as the model could not account for the specifics of this case. Using the same set of assumptions, a second costing was prepared by the Manager, Strategic Teaching and Learning Projects and validated by the Portfolio’s Finance Manager. Further expert advice was sought from those with experience in teaching an existing EAP course, in another discipline area. School based content experts, who would advise on how to contextualise the course to their disciplines, academic policy experts on what was allowable within the University’s policy framework and the approval process, were also involved. This led to determinations on the following details about the course:

• The course content would be individually contextualised to supporting the English and study skills needed by students in their other courses, to ensure that students find it beneficial, highly relevant and engaging.

• As each RMIT undergraduate program requires students to include two or three stu-
dent electives, whereby students may enrol in any course offered by the University (some conditions do apply), the EAP course could be offered as an elective.

- The timetabling concern that students may need to take an above load enrolment would be mitigated by the fact that they were receiving learning skills support that they might otherwise have to be resourced outside of their courses. Additionally, students would benefit by lightening their load later in their program. The EAP course could be seen as visiting a private tutor for assistance, not as another course with a large burden of content to be absorbed.

- The pass only grade status of the course will make it unattractive to over-qualified students.

Finally, the course once finalised, needed ownership. This was left to the Director, Teaching and Learning in SoCCE to seek the endorsement from the School and to subsequently present the course for Portfolio approval.

The course has now been approved and with further implementation work by the project team it will be offered in 2006.

**Why we need to be responsive and why there is often a lag?**

Student centred practitioners often use an action learning approach to meet the learning needs of their students. They will regularly “take the pulse” of the student experience by collecting feedback to determine what and how students learn in their classes, courses and program (Chickering & Gamson, 1987). They then come up with continuous improvement and innovation strategies, to make the student experience more effective to achieve the learning objectives of the program. Such strategies may be modifications of existing practices, applications of practices from elsewhere, or genuine innovations, and selection of one over the other will depend on a range of factors, including needs of the various cohorts of student, degrees of risk attached to various options, the background and creativity of the practitioner themselves, and the resources and support available.

There is often a significant lag between the conceptions of teaching and learning innovations and their implementation, as they often require either policy or budgetary responses or a shift in the culture from traditional modes of operating in the organization which can impact on uptake. Knight and Trowler (2000) put this down to a reduction in the “time, energy and mental space available to improve teaching and learning practices” (Knight & Trowler, 2000, p.71) available to staff for teaching and learning improvements.

In this case study, the project group has been able to respond to a complex problem in a short time. The task was complex because it required a non-standard response, that is, setting up of a course from another discipline (English language) within an engineering school for a particular cohort of students. There was no existing precedent within the school for this proposal. It had to be conceived from the ‘first principles’ of change and project management (Ciocoppe, 1997; Kotter, 1995) and innovation was needed (Senge, 1990). Despite the complexity involved, the time taken to design the course and have it approved was approximately eight weeks.

Of greatest importance is that if the project had not been picked up by the team members and acted upon as described, this project would not have been attempted this year, and subsequently, the needs of the student cohort could not have been addressed in this innovative way.

**The importance of internal networks**

Knight and Trowler (2000) found that due to the current inherent pressures on academic staff “[R]educed self-esteem and self-confidence reduce the capacity to take risks and innovate” (Knight & Trowler, 2000, p.72 in teaching and learning. The use of networks can assist staff to feel better supported in relation to this work.

This project had a core team of three, each with different areas of expertise which was substantially complemented by the team member's own networks. The additional expertise provided by the combined networks of the
team members was critical to the success of the project. Using networks, such as the consultations, not only confirmed that NESB students required targeted strategies to achieve academic success, but provided invaluable feedback which assisted the project group to see the deeper issues to offering the course, including issues relating to assessment and grading, mode of delivery, timetabling and the role of existing support for NESB students.

Using an action research approach, the project team consulted within its professional networks from which options for the project were identified and analysed. This subsequently led to the final form of the EAP course.

Establishing and maintaining internal networks – valuing skills and abilities

Building networks relies on the range of professional and social avenues available to the individual (Gladwell, 2002) but also it is about being able to engage them to contribute. This requires taking the time to build mutual respect and recognition (Kanter, 1994). For the authors this occurs through participation in strategically useful working groups and committees.

Networks can involve engaging socially and can be strengthened by such, but do not have to be to be effective. Knight and Trowler (2000) note that academic staff do not find the opportunity to discuss teaching and learning because of limited opportunities to socialise. Such opportunities must be created to allow networks to grow and consolidate. The qualities of collaboration (Kanter, 1994) can be applied here to really strengthen networks.

Effective governance and management systems

Strong governance and management systems, primarily policies, which are rigorous yet flexible, map out frameworks in which staff are encouraged to innovate. These systems require boundaries and parameters that are clearly understood and outcome focused and risk managing, rather than risk averse. These provide a form of leadership for the project and in this case, leadership was provided by the SET Portfolio’s decision to target efforts to improve transition and provide the assistance to do so.

CONCLUSION

The use of a range of networks was essential to the success of this project. The critical mass created by the combined networks and subsequent access to skills and knowledge was able to negotiate the policy hurdles which can exist for innovation. Thus, despite the brief timeframe, the project team was able to successfully achieve the approval of an innovative new course for NESB engineering students to enhance the student experience and student success.

BIBLIOGRAPHY

Great Idea! But how do we do it?


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TRANSITION IN ENGINEERING EDUCATION:
An International perspective on ‘at risk’ students

Arun S. Patil & Henk Eijkman
Monash University

Kiran V. Madhale
Walchand College of Engineering

This paper highlights the plight of minority group students such as those from what was commonly known as the ‘Untouchable’ class in their transition in undergraduate engineering courses at one college in Maharashtra State of India. The paper takes a comparative approach to the issue of transition and equity in higher education and begins to map out a participative action research project to address the unacceptably high rates of academic failure and withdrawals.


Higher education as a western Euro-American global phenomenon remains inherently unequal in outcomes if not in opportunity for minority group students. Despite the adoption of a wide range of access programs and the success of relatively few members of socially disadvantaged groups, statistics such as in Australia, demonstrate that very little if any substantial improvement has been made regarding such groups as a whole. The situation in India in relation to what is known as the ‘Backward’ class (e.g. scheduled castes and tribes) and poor members of the ‘Open’ class (e.g. the Maratha and Brahmins) is no different. In response to severe disadvantages in relation to entry into higher education, Indian governments have, by law, reserved large percentage of places for students from the social groups that comprise the ‘Backward’ class. However, reflecting somewhat similar experiences in western nations, moves to enshrine equality of opportunity have not resulted in significant improvements in equality of outcomes. Accordingly, the academic failure and withdrawal rates for students from these ‘Backward’ class groups remain unacceptably high. For these disadvantaged social groups, higher education provides entry into professional work and thereby the only way out of poverty.

This paper describes the beginning of a Participative Action Research project aimed at addressing the substantial failure and dropout rates especially during the first three years of an undergraduate engineering program in which 50% of all places are reserved for the ‘Backward’ categories. Initially using academic failure and withdrawal data from the undergraduate engineering courses at Walchand College of engineering at Sangli in Maharashtra State of India we aim to implement a Participative Action Research program to investigate causal
factors and implement curricular practices aimed at increasing the successful participation and engagement of these students.

BACKGROUND
Although for westerners India tends to conjure exotic visions of Brahmins, gurus, Bollywood, cricket and beggars, such is a very limiting picture of reality. For instance, India has always been at the forefront in higher education in almost every discipline, especially mathematics, science and technology. Higher Education in India has evolved in divergent and distinct streams with each stream monitored by an apex body, indirectly controlled by the Ministry of Human Resource Development. Funding for universities is mostly the responsibility of individual state governments. However, there are 12 important universities called Central Universities, which are maintained by the Union Government and because of relatively large funding, they have an economic edge over the others. The engineering colleges and business schools in the country are monitored and accredited by the All India Council for Technical Education (AICTE).

ENGINEERING EDUCATION SYSTEM IN INDIA, AND MAHARASHTRA STATE
India has large number of technical graduates with 1,346 approved degree-level engineering institutions with the intake of 439,689 students as well as 1,244 approved diploma-level engineering institutes with an intake of 265,416 students as of March 2005 (AICTE, 2005). These institutes are located all over the country and approved by a statutory council named the AICTE, which has been established in order to properly plan and coordinate technical education in the country.

The State of Maharashtra, which is one of the more economically and industrially advanced states, contributes to this educational achievement by supplying over half of all engineering graduates in India annually. Since the establishment of a School of Engineering in 1854 at Pune, higher technical education in Maharashtra state has grown exponentially. For instance, at present (2005), there are 150 undergraduate engineering institutions with an intake of 43,836 students and 310 diploma level institutions with a student intake of 51518 (DTE, 2005). In the State of Maharashtra, engineering and technology education is provided at three different levels, namely:

- Diploma-level courses;
- Undergraduate courses; and
- Postgraduate courses.

CLASS AND CASTES IN INDIA
In India, like other nations, there are culturally specific ways of separating social groups with a view to privileging or disprivileged their access to political and socio-economic power. In fact, India has the longest tradition in strictly separating social groups based on a strict and rigidly prescribed hierarchical caste system. Although formally abolished by law, elements of this very complex and rigid caste system still largely pervades the socio-economic realities of life in India. This all-pervasive caste system, also called ‘Jati’, was originally based upon four principal classes or ‘varnas’, hierarchically arranged according to their status in society.

Importantly, each caste was internally divided into various classes and sub-classes, and members of each caste and its classes were tied to specific professions and trades. Thus, the ‘Brahmin’ caste constituted the highest status professions of priests and teachers. Next was the ‘Kshatriya’ caste comprising rulers and soldiers. These were followed by the ‘Vaishya’, a caste made up of merchants and traders. The ‘Sudra’ caste, being on the lowest rung of the status ladder, contains mostly labourers and artisans. Most important however are the classes and subclasses within this lowest caste. In fact, the lowest classes and tribes in the Sudra caste are of such low status that they are, for all intents and purposes, outside the system – hence their title of ‘Untouchables’ – though now popularly known as ‘Dalits’ (Thekaekara & Gaag, 2005).

Therefore, although there are many subgroupings within each of these four caste categories, the caste system in modern India, can be broadly divided primarily into two general categories, the ‘open’ or higher class and the ‘Backward’ or lower class, as depicted in Table 1.
Table 1: Class and caste outline.

<table>
<thead>
<tr>
<th>Class</th>
<th>Castes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN</td>
<td>Brahmins, Kshatriya, Vaishya</td>
</tr>
<tr>
<td>BACKWARD</td>
<td>Sudra, Dalits/Untouchables</td>
</tr>
</tbody>
</table>

The caste system is an immensely complex socio-historical phenomenon, and a detailed discussion is well and truly beyond the scope of this paper. However, for our purposes, we will define each class and briefly describe their constituent castes and tribes mainly in relation to their position regarding access to, and academic achievement in, engineering education.

The ‘open’ class consists of several other sub-castes however the ‘Brahmins’ are at the top of the hierarchy. It has been found that over the centuries the ‘open’ or higher class people attained immense power, upholding the law as well as dispensing it. Whilst these generally tend to include the more socio-economically developed castes, it needs to be pointed out that even here one finds many poverty-stricken communities. The ‘Backward’ class, as shown in Table 1 consists of a number of castes and tribes whose role it is to act as a service sector for the ‘Open Class’. These tend to be among the poorest of the poor, such as labourers, itinerant artisans, leatherworkers, etc. though again, while they may be socially marginalised, some may also be reasonably well off. Most of the degrading jobs are even today done by the lower castes and tribes of the ‘Backward’ class, which includes the ‘Untouchables’ or ‘Dalits’.

**Backward Castes, Reservation Policy and Enrolment Requirements**

Even before, but especially since, Independence, the caste system has been formally repudiated, and politically abolished, such as in the ‘Pune Pact’, signed in 1932. Yet discrimination in its various forms still continues especially in relation to some social practices, which has included access to higher education. In response the State governments, under various Reservation Policies, have allocated percentages of places in higher education to the ‘Backward’ classes. In the Maharashtra State for instance, which is the focus for our project, 50% seats are reserved for the backward class students of various categories for the admission in all types of engineering colleges. Table 2 gives the outline of reservation policy designed and implemented by the State government for the admission at the first year engineering and technology courses (Government of Maharashtra, 2005).

Table 2: Percentage of reserved seats for ‘Backward’ or ‘Reserved’ classes.

<table>
<thead>
<tr>
<th>Category/class</th>
<th>Percentage of seats reserved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduled Castes and Scheduled Caste converts to Buddhism (SC)</td>
<td>13</td>
</tr>
<tr>
<td>Scheduled Tribes (ST)</td>
<td>7</td>
</tr>
<tr>
<td>Nomadic Tribes (NT) [also includes NT1, NT2, NT3, VJ, DT]</td>
<td>11</td>
</tr>
<tr>
<td>Other Backward Classes (OBC)</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
</tr>
</tbody>
</table>

At this point it is important to note that whilst the caste system has been formally repudiated, the very existence of the Reservation Policy affirms the presence of the very structure it wants to abolish. For us as academic practitioners/researchers, our focus therefore is on curricular justice for students from poverty-stricken social groups. This includes ‘Backward’ classes but extends to social groups within the ‘open’ classes that also suffer socio-economic deprivation. We do not want to get locked into a social structure which we too reject.

The undergraduate engineering courses in the State are of four years’ duration after 12 years (10+2) of higher secondary education. The eligibility criteria require that the candidate must have passed Higher Secondary School Certificate (HSC) examination with a minimum score of 50% (while candidates from ‘Backward’ classes require a minimum score of 45%) in aggregate in the following subjects: Physics, Chemistry, Mathematics and English. The enrolment procedure for students from the Maharashtra State for the first year undergraduate
engineering courses was strictly based on their results in the state level Higher Secondary Certificate Examination (HSC). From the academic year 2005/6, the State Government of Maharashtra will implement a Combined Common Entrance Test (CET) for undergraduate engineering and technology courses. This means that eligibility for the admission is now governed by the academic results achieved in both the HSC examination (in the subjects of English, Physics, Chemistry and Mathematics) as well as the ranking obtained by the candidate in the Combined Entrance Test (CET) conducted in May 2005.

At the same time, the statutory reservations for candidates belonging to ‘Backward’ class categories as per the Maharashtra state government rules are also applicable (DTE, 2005). This means that even though ‘Backward’ class candidates must achieve the minimum score, their score (45%) is less then the required score for ‘open’ class students (which is 50%). This means that ‘Backward’ class students can enter Engineering programs because a certain number of places are reserved for them and moreover they can access those places with a lower academic score than their ‘Open Class’ counterparts. This is clearly evident in the enrolment patterns at Walchand College of engineering in Sangli, Maharashtra State.

**ABOUT WALCHAND COLLEGE**

The Walchand College of engineering at Sangli provides us with a most appropriate case study. Established in 1947, the college is not only one of the oldest established in the South-West of Maharashtra state, but also located in a rural/industrial area and therefore attracts large numbers of students from all communities; including the ‘Backward’ and other low socio-economic groups belonging to the ‘open’ classes. The college, because of its long history, has a well-established and extensive infrastructure which has enabled it to gain a high reputation for its academic excellence. The college offers the diploma, undergraduate and postgraduate engineering courses in various engineering disciplines. Currently Walchand College has a total first year intake of around 700 students that includes diploma, under- and post-graduate students. This size and social mix of students enables us to observe differences in performance of students from the various castes.

The four year undergraduate Bachelor of Engineering (BE) degree program is conducted in six disciplines. These disciplines (with the maximum intake for the first year) are given as below:

- Civil Engineering (60);
- Computer Science and Engineering (90);
- Electrical Engineering (60);
- Electronics Engineering (60);
- Information Technology (60);
- Mechanical Engineering (60) (Walchand College of Engineering, 2005).

The total maximum intake of the College for the four year undergraduate engineering program is 390 students in all six disciplines. This includes all category students eligible for the enrolment as per the State Government of Maharashtra’s admission rules. Section 3 of the admission rules gives all the details regarding the reservations provided for the seats of Maharashtra State quota. The reservation of seats for the students from ‘Backward’ class categories for each discipline is given in Table 3.

**ACCESS AND THE ‘BACKWARD’ CLASS STUDENT EXPERIENCE**

While ‘Backward’ Class students have guaranteed access to university places, like Australia, access for equity group students does not translate automatically into equity in outcomes, namely successful educational engagement as measured by course completion rates (Eijkman 2003a, 2003b). Thus, despite having been given access they generally experience much higher rates of educational disengagement than their ‘Open’ class counterparts. Statistics covering the year 2002/3 intake from Walchand College of Engineering, Sangli, as partially indicated in Table 4 below, shows considerably high failure and withdrawal rates across all ‘Backward’ class students throughout the first three years of the courses offered. At this point in time we are awaiting statistics of failure and withdrawal rates for students from the ‘open’ classes. Anecdotal evidence suggests that the academic achievement of the latter is significantly higher.
The data given in Tables 3 and 4 above describe the actual enrolment of ‘reserved’ category students for the first year (in 2002/3) against the allotted quota and number of students from this ‘reserved’ category eligible to enter into the fourth year of the course (in 2005/6). The data as per Table 4, which compares student strengths between the first year and the fourth year, indicates that the failure and withdrawal rates are consistently – and unacceptably - high for all ‘Backward’ class students.

From the statistical data collected, a number of findings have been made; these are listed as follows:

- Out of 142 ‘reserved’ category students enrolled for the first year engineering courses (2002/3) at the College, only 63 will be eligible to admit in the fourth year of the program (2005/6) that means, the overall failure/withdrawal rate is considerably high (44.36%). The academic results of these students are still awaiting and therefore this percentage will be higher if all 63 students will not be able to clear their academic results.
- It has been observed that there is a high rate (75%) of failure/withdrawal in the Scheduled Tribe (ST) category students.
- The failure/withdrawal rate is lowest (25.49%) in the Other Backward Class (OBC) category students.

<table>
<thead>
<tr>
<th>Discipline/Branch</th>
<th>Max intake</th>
<th>Reserved places as per government policy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Scheduled caste (SC)</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>Electronics Engineering</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>Computer Science &amp; Engineering</td>
<td>90</td>
<td>11</td>
</tr>
<tr>
<td>Information Technology</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>390</td>
<td>51</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discipline/branch</th>
<th>Admitted for the first year (FE) of the course (2002/3)</th>
<th>Failure/withdrawals at the fourth year (BE) of the course (2005/6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SC</td>
<td>ST</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Electronics Engineering</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Computer Science &amp; Engineering</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Information Technology</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>50</td>
<td>4</td>
</tr>
</tbody>
</table>

- The failure/withdrawal rate will be higher if the academic results of these students at the current year will be lower. Also, the overall failure/withdrawal rate of all ‘Backward’ class
students is predicted very high at the end of the course, i.e. After the fourth year (BE) academic results.

**CLOSING THE ENGAGEMENT AND ACHIEVEMENT GAP**

Given that the gap between ‘Open’ class students and the fundamentally [white], middle-class, and urban discourse and literacy practices of academia is generally easily bridged due to greater degree of similarities in discourse and literacy practices, ‘Open’ class students tend to be ‘insiders’ to that discourse and its literacy practices, as evidenced by their much greater academic success rates (Eijkman 2003b). However, the discursive practices of ‘Backward’ class students is generally not anywhere near as closely aligned to the discursive practices of academia. They are what Jim Gee (1999) calls ‘latecomers’ to the academic discourse and its literacy practices. Based on an influential body of largely western research (e.g. see Scollon & Scollon, 1981; Gee, 1999; New London Group, 2000; Lynch & O’Riordan, 1998; Lankshear et al., 1997; Jones, 1991; Heath, 1983; Delpit, 1995; Zamel, 1998; Zamel & Spack, 1998) we argue that not only are ‘Backward’ class students ‘latecomers’ to the world of academia and its discursive practices, but that their own primary discourse is disprivileged in the world of education (Connell, 1993, 1994). It is therefore both this lack of familiarity with the academic discourse and the simultaneous disprivileged of their discourse in the classroom that, all other things being equal, is responsible for their high failure and withdrawal rates, as clearly evident in Table 4 above.

Subsequently the greatest challenge for ‘Backward’ class students is to make a successful transition from being ‘latecomers’ to becoming ‘insiders’ to the discourse of academia and its literacy practices. The issue for engineering educators, to focus on our project, is therefore to support this transition at the level of the everyday curricular or educational practices (we take a broad definitional approach to ‘curriculum’ to include content, teaching and assessment practices). The aim of our proposed research project is therefore to (1) analyse the applicability of our hypothesis, namely that a major factor in problematic outcomes for ‘Backward’ class students is the gap between their disprivileged primary discourse and that of academia, and (2) to explore various pathways that engineering educators can take to enable ‘Backward’ class students to achieve parity of success by improving the educational engagement of those least advantaged.

**Table 5: Failure/withdrawal rates (in %) of ‘reserved’ class students for all disciplines.**

<table>
<thead>
<tr>
<th>Category/class</th>
<th>Admitted for the first year (FE) (2002/3)</th>
<th>Drop outs at the fourth year (BE) (2005/6)</th>
<th>% failure/withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduled Caste (SC)</td>
<td>50</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>Scheduled Tribe (ST)</td>
<td>4</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>Nomadic Tribe (NT)</td>
<td>37</td>
<td>24</td>
<td>64.9</td>
</tr>
<tr>
<td>Other Backward Class (OBC)</td>
<td>51</td>
<td>13</td>
<td>25.5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>142</strong></td>
<td><strong>63</strong></td>
<td><strong>44.4</strong></td>
</tr>
</tbody>
</table>

The experience of ‘Backward’ class students at Walchand College confirms that equality of opportunity does not automatically translate into equality of outcomes. Linked to the policy of reserved places, their experiences of academic failure also indicates that ‘access’, traditionally generally perceived as a key ‘gatekeeping’ mechanism for inclusion and exclusion, no longer performs that traditional role – at least not for students from ‘Backward’ classes. It is now the curricular practices as experienced daily in the classroom that has become the pivotal gatekeeping mechanism to maintain the academic achievement rates for ‘Open’ class students and thereby ensure their privileged place in the ‘professional’ labour market (Connell, 1994; Gee & Lankshear, 1997; Eijkman 2003b). As Table 5 indicates, these students can get in, but few of them last the distance.

As pointed to earlier, one factor in these high academic failure and underachievement rates is the problematic educational history of
'Backward' class students, as evidenced in their lower HSC scores – with which they can enter into engineering courses. While the HSC score for the four key subjects required for entry into engineering is a minimum of 50% for ‘Open’ class students, ‘Backward’ class students require only a 45% pass mark (DTE, 2005).

The policy of reserved places, though laudable in intent, has not yet succeeded in improving ‘Backward’ class access to the highly paid professions. Although undoubtedly effective for some, there is as yet no evidence of a significant statistical shift in that direction for any of the social groups that make up the ‘Backward’ classes. Moreover, it inadvertently tends to continue a focus on the very caste system rejected by government policies. The reservation of higher education places for the ‘Backward’ classes ignores those social groups in the ‘Open’ classes, which while not as badly discriminated against as say the ‘Dalits’ (previously and popularly known as the ‘Untouchables’) nevertheless may suffer similar socio-economic deprivation. The latter point is also of significance for our research and intended Participative Action Research Project, for if we were to focus exclusively on the ‘Backward’ class students, we would ourselves implicitly perpetuate the very system that we too reject.

Furthermore, it will be tempting for Indian educators in higher education, such as at Walchand College of engineering, to opt for the favoured – but equally unsuccessful – approach taken by most western universities, and adopt a range of access, bridging or enabling programs. While a full discussion is out of scope here, suffice to say that in Australia for instance 15 years of an ‘access’ focused equity policy, has not resulted in a statistically significant improvement in the position of our most marginalised equity groups. (For extensive data and discussion cf. Eijkman, 2003a, 2003b).

At the concrete but surface level, we can attribute academic failure or underachievement to factors pertaining to the students themselves. For example, anecdotal evidence suggests that they have lower HSC scores, their socio-economic conditions deprive them of educational resources (some as basic as lack of electricity and no lights to read by), many come from family backgrounds characterised by illiteracy, and an absence of appropriate role models, guidance, and support. While these inhibiting conditions certainly exist and play a significant role, this focus is myopic in that it concentrates on the deficiencies of these social groups, which, whether intended or not amounts to a victim-blaming approach and means that we fail to focus on the other half of the equation: the curricular/pedagogical practices employed in these educational institutions themselves (Eijkman 2003a, 2003b). Our project intends to focus firmly on both.

A Participative Action Research Project

Given this scenario, our intended case study project to promote social justice in engineering education will embody the following principles for our point of departure:

First, while fully cognisant of and responsive to the plight of the ‘Backward’ classes (and especially the ‘Dalits’), our focus will be on achieving social justice for all marginalised and disadvantaged social groups, regardless of caste.

Second, while we are aware of the value of specifically targeted access programs, such as enabling, bridging and access courses, we are also cognisant of their failure to deliver benefits to marginalised social groups as a whole. We reject a dualistic either/or position on this issue by arguing for a dialectic ‘both/and’ approach which blends the development and implementation of socio-culturally appropriate access programs with a focus on making current curricular practices that, currently and demonstrably, tend to inhibit rather than promote active academic engagement by students from disadvantaged social groups, more socio-culturally inclusive (Eijkman 2003a, 2003b, Gee 1999, Lankshear et al. 1997, Bourdieu & Passeron, 1977).

Third, the theoretical model that informs (and is also subject to the outcomes of) our Participative Action Research project is that of a social constructionist approach to critical literacies. Our main argument is that academic achievement of students from marginalised...
social groups is inhibited through what amounts to the discursive privileging of the western, white, middle/upper class urban discourse which forms the bedrock of academic discourse and its literacies practices in western, Euro-American influenced higher education institutions. Again, while we believe in giving marginalised social groups access to academic discourse as a highly valued discourse of power, we also believe that higher education institutions must rethink their wholesale disprivileged of the discourses, lifeworlds, and practices of marginalised social groups. A key reason for the failure of access programs is that they are blind to the exercise of power to privilege and disprivilege certain discourses within mainstream higher education to protect middle/upper class access to professional work within the labour market. If equity was important in the past, even more so now that we, and our marginalised Indian students find ourselves in the highly competitive era of globalised fast capitalism in which only one fifth will find themselves in highly paid and sought after knowledge creation work (Reich, 1992, Gee et al. 1996).

Fourth, we are committed to a Participative Action Research approach as it is not only focused on building change on robust, evidence-driven research, but also because of its proven emancipatory potential. Its in-built focus on social inclusion is for us an essential prerequisite as this is to be an outcomes-driven project in which all participants are key and equal stakeholders.

The methodology for this project needs itself to match the project’s aim to empower the participants in the educational experience to better understand the dynamics of disprivileged in order to effect change. Participative Action Research (PAR), as a form of social research is our preferred methodology for the following reasons. First, PAR as a critically self-reflective spiral of systematic planning, acting, observation, reflection and replanning etc. constitutes a sound evidence-driven approach to improving an educational practice because understanding and practice are integrated in praxis; that is through its dialectic focus on research and action. PAR therefore constitutes a systematic and responsive learning process that informs, and is informed by, practice. Second, and most importantly, it is predicated on authentic participation and empowerment as those involved — as educators and students - work towards the improvement of their own practice to achieve curricular justice by including the perspective of the least advantaged (Connel, 1993). Third, and in line with point two, PAR is fundamentally collaborative as those involved in the practice to be changed participate and work together as a self-critical community in all phases of the research and change process. Fourth, PAR will enable both engineering educators and their students to theorise about their curricular/educational experiences and practices, thereby deepening their understanding of the dynamics of discursive privileging and disprivileged. Fifth, PAR enables all participants to put their ideas and assumptions to the test and give reasoned justification for improvements by gathering compelling evidence through critical reflection on practice.

In terms of the roles of each of the authors of this paper, each author is a principal researcher but making different contributions. Arun Patil, as PhD student at Monash and former engineering educator in India, brings to the project his engineering/science expertise, especially in relation to accreditation and quality assurance in engineering education. Dr. Henk Eijkman, as educational consultant, provides the theoretical framework that underpins the project and also the methodological expertise in Participative Action Research. Kiran Madhale, as lecturer in physics at Walchand College, will act as the local expert and liaison person to coordinate the on-site field work.

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SCAFFOLDING THE SCAFFOLDERS: 
An integrated approach supporting first semester students in 
Engineering and Industrial Design

Helen Farrell, Clare Power & Celeste Salter
University of Western Sydney

At the University of Western Sydney a successful collaborative project has been developed for first year students in the School of Engineering and Industrial Design undertaking a common, core introductory unit for engineering and industrial design students, Engineering and Industrial Design Practice (EIDP). The project involved the integration of academic literacy skills within the content of a unit of study. The project included the development of a resource book which incorporated materials from lectures, tutorials and laboratory sessions with the requirements for the three assignments. The participating academic staff are a cross functional team from engineering, industrial design and the Learning Skills Unit. The student experience of attending university has changed dramatically over the last twenty to thirty years and the costs associated with university study now means that many university students have to juggle study, work and family commitments and this can result in disengagement with university life both academically and socially. The integrated nature of this project contributes partly to the academic, social and professional growth of first year students undertaking this core unit of study. The academics involved in this unit also saw an opportunity to support the School's goal of improving retention rates.


In this paper the development and embedding of specific academic literacy skills into a first year core Engineering and Industrial Design unit (EIDP) at the University at Western Sydney is discussed. To date the process has occurred over two stages, where initially these skills were implemented in an Industrial Design unit, and due to the success of the initiative these skills were further developed in the EIDP unit in 2005. The project is analysed in terms of its integrated nature as it involved a cross functional team from the School of Engineering and Industrial Design and the Learning Skills Unit (LSU). This collaborative approach led to the development of a comprehensive embedded academic literacy book, lectures given by LSU staff within the unit and a compulsory peer mentoring program located in the unit.

BACKGROUND
For a number of years the Learning Skills Unit has regularly conducted academic literacy workshops for both the Engineering and Industrial Design departments in all years of undergraduate study. These usually consisted of 2 hour workshops which were typically held at the beginning of each academic year. The Industrial Design (ID) Course has a fourth year component in which students are required to...
write a long research paper to support their project. The internal examiners reported that the academic literacy skills of a number of students were not well developed despite the annual academic literacy workshops. This situation was investigated by the teaching staff in ID during 2003. Staff met on several occasions to discuss possible approaches to strengthen the academic literacy skills of the whole cohort of ID students. During these meetings, it became clear that some literacy skills were expected of students but were not actually taught, while other skills were taught and re-taught over successive semesters. It was then decided by the teaching staff to 'map' the literacy skills needed to successfully complete the fourth year project, then to work down through the preceding three years of the course allocating particular literacy skills to particular semesters. Across all years a holistic approach was taken to ensure that the four areas of listening, oral communication, critical reading skills and various genres of writing occurred in each semester of every year. Literacy skills for first year included identifying main ideas in texts; the ability to paraphrase a text correctly; the ability to write well constructed paragraphs, essays and reports, as well as basic IT skills. Additionally, a critical literacy focus has been adopted across all four years.

One outcome of the discussions was the development of an academic literacy resource booklet produced in 2004 for a core ID Unit. This was funded through an equity project grant and hard copies of the resource materials were provided to each student. This resource scaffolded the first assignment; an annotated bibliography that the students were required to submit in week 6 of the semester. Tutors were given a short training session as an introduction to the resource and then the tutors sat in on each two-hour tutorial that the LSU staff conducted around the expectations of the first assignment. During the semester, the tutors were to refer students to the resource when appropriate. The outcome of this initiative in terms of improved literacy levels was encouraging. Also, feedback from students who used the resource suggested that they found it very useful not just for their first assignments but as a resource for their other units of study.

Those involved in the planning and teaching of the 2004 equity project realised the potential to expand the resource for the student intake in 2005. A new core combined first year compulsory unit was being developed for both Engineering and ID students. This new unit, EIDP, provided an ideal opportunity to embed the resource and thus to closely integrate the teaching program with the assignments. In this new core unit, the students had on average 4.5 contact hours per week: a one hour lecture, a two hour lab session, and a two hour tutorial on alternate weeks. On the weeks that students did not have a tutorial session, a one hour peer mentoring session was scheduled.

**Methodology**

The 2005 resource book focuses on the literacy skills which had been 'mapped' for first year first semester students. In addition to highlighting the requirements of each assignment the book provides worked examples with commentary on the first assignment, an annotated bibliography, and supporting references were provided to students on WebCT. One of the tutorial classes specifically focussed on students working through the concepts required to write an annotated bibliography, with opportunities for discussion and reflection. The resource book also provides realistic practice exercises, related to the skills discussed in each module, that the students can then use as guides to inform their academic writing practices. The modules cover a range of study skills including note taking, reading effectively, research methods, critical thinking, referencing and notes for oral presentations. For the successful completion of each assignment it was necessary for students to demonstrate some competency in using these skills.

Integration of academic literacy skills occurred across all teaching sessions. The lab sessions revised/introduced students to WebCT, Excel and Word as well as specialised IT programs. Tutorials focussed on mind mapping, journal writing, writing lab reports and research reports, exploring effective group work strategies, oral presentations and critical thinking.
and writing exercises. Many of the academic skills included in the resource book were discussed in lectures, lab and tutorial sessions in order to reinforce the integrated nature of the unit. The first three weeks of the resource book were made available on WebCT for students to ensure that they had access to the materials early in the session while they were adjusting to the needs of their study and obtaining course materials. In contrast to the previous year this second stage was not equity funded so students were asked to purchase a copy of the resource book.

It is acknowledged that beginning University is often demanding academically and socially and therefore potentially a very stressful time for commencing students which can result in their disengagement from the experience (Slee, 2003; Kantanis, 2003; Elliott, 2003; McInnis, 2001; McInnis, James and Hartley, 2000). This project was seen as ‘value adding’ to the student experience since EIDP allowed for a carefully planned incremental assignment load which eased students into the academic demands of university life. Assignments 1 and 2, an annotated bibliography and a case study analysis (each awarded 15% of the mark allocation) equipped students to write their later assignments. These later assignments required substantial critiquing and attracted 50% of the marks allocated. The assignments were spaced fortnightly from week 6 through to week 14 encouraging students to work steadily as they adapted to university life and its demands.

As a component of EIDP, peer mentoring was introduced from week 2 of semester to maximise students’ cognitive, social and cultural integration. Peer mentoring involves the facilitation of a group of first year students by a more senior student, usually from the same discipline. The first few sessions had an acculturation focus and encouraged mentors and mentees to get to know each other and explored issues related to settling into University life and ‘getting to know the ropes’. Later sessions focussed on study strategies and provided a forum for activities such as practicing oral presentations and discussing assessment tasks. Five x 1 hour sessions were timetabled into the unit and attendance was specified as compulsory to encourage students to attend. This was because it had been the experience in previous years of running peer mentoring in the School, that many students would not avail themselves of this opportunity and as a result would miss out on the valuable experience it could bring them in adjusting to university life.

To evaluate the effectiveness of the initiatives implemented in EIDP, students were surveyed through an extensive survey on WebCT and asked for feedback on the usefulness of the resources provided, opinions about peer mentoring and the teaching resources provided. The results of the students’ feedback relating to the resource book and evaluation of the academic literacy skills embedded into the unit, is discussed later in this paper. Feedback on the other aspects of the unit is to be reported in other papers.

**DISCUSSION OF EIDP**

**Integration and scaffolding**

The value of embedding academic literacy skills within the curriculum as a collaborative process is well documented (Street, 2004; Percy & Skillen, 2003). This approach ensures the contextualising of students’ experiences and provides a meaningful opportunity for skills development within their disciplinary framework. Where a shared purpose and mutual enthusiasm exists between collaborative partners the process of integrating academic skills tends to produce effective and engaging outcomes (James, Skillen, Percy, Tootell & Irvine, 2004; Brackley & Palmer, 2002). As initial academic assignments are an opportunity for integration of students into their learning community, especially where there are supportive interactions between academics and students (Krause, 2001), the incorporation of scaffolding strategies across a course enhances students learning experiences (Wilson, Devereux, Macken-Horark & Trimmingham-Jack, 2004). Supporting the student transition to university learning can also have a marked effect on retention rates and promotes an ethical approach to curriculum development. Meyers, Whelan, Nulty and Ryan (2004) demonstrate that through implementing a structured and supported curricu-
lum students not only improved their learning in the unit, but also had more initiative in developing their independent learning. This approach is also supported by Tinto (2004).

**Value adding to the student experience**
The rationale for the integrated approach of EIDP is to bring together two important aspects of learning: that knowledge acquisition is both a personal construct of the learner, and a social activity whereby the learner participates in the socio-culture of the learning community (Lave & Wenger, 1991). The personal construction of knowledge requires the learner to develop ‘personal autonomy’ (Caffarella, 1993, cited in Tennant, 1997, p.8). Caffarella explains this process in part as ‘a self initiated process of learning [which] stresses the ability of individuals to plan and manage their own learning’ (p. 8). This practice is in line with an educational value of UWS which is to expect students to be independent learners. Ensuring that students develop independent learning skills is a goal of those involved in this project, but due to high attrition rates and poor academic performance from a worryingly significant number of students it was considered advisable to ‘wean’ student onto academic independence as many students are not naturally self directed learners (Brookfield, 1993).

**Team learning activities and team facilitation**
The second aspect of learning which the project focussed on developing was the construction, sharing and distribution of knowledge ‘during the course of social interaction’ (Mowatt & Siann, 1998, p. 97). It is common practice in the field of Engineering and Industrial Design that individuals will work as members of teams, and this was a driver for focussing on teamwork in EIDP. The rationale for teamwork in the resource book is stated as ‘a key characteristic of being a professional engineer or industrial designer. Project teams are a way of life in the workforce… and the ability to participate effectively in a team is seen as a core attribute of employees’ (p.55). The resource book also explains that ‘teamwork increases depth of understanding of materials by interacting with others’ viewpoints, enhances critical analysis skills, allows for more material to be covered [and] allows students to see the variety of methods other students use to problem solve’ (p.55). By providing students with some ground rules, shared understandings and expectations for effective teamwork, team members were then able to negotiate with their team if they perceived that the team was not functioning well.

The role of teamwork is valued as a powerful learning tool and students were asked to critically appraise the strengths and weaknesses of their team as part of their final assessment task which comprised a team project and team presentation. Students met in their own time in their teams to organise these tasks. A significant component of the team’s presentation and assessment criteria was to reflect on the processes the team engaged in which were helpful to meeting the goals of the team. For instance, students provided feedback on how they overcame meeting difficulties and solutions included using MSN Messenger, WebCT discussion tool and mobile phones. Many students also reported that as a result of their experiences, they realised that it is better to meet face to face until they know each other and have some shared understandings of the direction to be taken in their team work.

**Peer mentoring**
That teamwork is valued as a learning tool is reinforced through the Peer Mentor program being an integral part of EIDP. The programmed sessions within this unit have some structure where the mentor firstly checks whether the mentees have any issues/concerns. Discussion of these issues to the satisfaction of the group takes precedence over any other topics which may have been planned for the session. The second stage of the session involves considering the timetabled topic as per the unit outline (including time management, understanding the layout and content of the unit outline) and then moving on to any pre-planned requests that the mentees may have decided on at the conclusion of the previous meeting (for instance, the group may have decided to deconstruct a particularly difficult reading).
Students who have participated in peer mentoring at UWS report the development of better study skills; independent management of difficult subjects; feeling socially connected to the university and feeling emotionally supported (Armstrong, 2004; Carmichael, 2003). It has been demonstrated that students who have participated in the peer mentoring program in the School of Engineering and Industrial Design have gained better grades and were much less likely to withdraw before completion of their degree (Carmichael 2001; Shrestha, 1999).

In 2003, 499 first year students attended mentoring sessions across UWS. The unit with the largest number of participants, located in the School of Engineering and Industrial Design, had particular success with its mentoring program. The mentored group comprised 263 students of whom 84% were awarded a pass or higher result, while in the unmentored group (98 students) only 50% of students were awarded a pass or higher result (Carmichael, Handa & Power, 2005).

The informal and social aspects of the mentoring it is hoped will increase feelings of belonging to the university community and thus impact positively on retention rates (Jardine, 2005). It is acknowledged that friendship is important particularly during adolescence (Seifert & Hoffnung, 2000). At a time of uncertainty such as commencing university, encouraging friendship and the social and emotional support which is a vital part of friendship maximises opportunities for developing good coping mechanisms (Seifert & Hoffnung, 2000). At such a vulnerable time, peers can contribute important information about an individual’s ‘self concept’ (Seifert & Hoffnung, 2000, p.511) and thereby promote self confidence. Negative emotions can have a deleterious impact on student learning, however it is often in peer mentoring sessions that mentors ‘who have experienced the ups and downs of student life, can empathise with students issues’ (Stewart & Rawrhiiti, 2004, p.41) and together the mentees devise helpful strategies to resolve these issues. One complex and ongoing concern that needs to be addressed is the claim by students that there is little social life at university, yet for a number of reasons they seem unable to commit to contributing to the development of university social life. Thus the social aspect of peer mentoring was potentially an experience of social connectedness.

**Online learning & IT support**

Online learning and adjunct materials support students as agents of their own learning. IT and online learning skills are required for many units within Engineering and Industrial Design courses, but to date the acquisition of these skills had been presumed or left to students to learn ad hoc. Consequently it was considered pedagogically important to include instruction in IT skills since UWS has a proportion of students who come to university with little IT experience. An increasingly important part of the academic culture at UWS is the use of WebCT as a platform for interactive learning activities, disseminating information and for online discussion. This particular tool is often a new learning experience for students yet students have little time to spend in becoming functional in the use of this tool before they are required to use it as part of the requirements of their unit. EIDP provides learning support and instruction in its use. Many students reported that formal instruction in regularly used computer software programs and Web based materials was unnecessary. While attendance at these sessions may have been extraneous for some students, it provided an opportunity for others to gain vital skills in a timely manner and ensured a basic, common level of IT and online skills. The integration of these skills follows best practice that all expectations be explained and that students be provided with formal instruction sessions to ensure they become effective online learners. There is some evidence that online communication enriches class interactions allowing ‘more time for participants to engage in reflection, peer discussion and supportive interaction’ (McLoughlin, 2002, p.22).

Gaining familiarity with WebCT was especially important since all assessment tasks were submitted through WebCT. As well, all lecture notes and adjunct materials pertinent to lectures, tutorials or lab sessions could be retrieved by students from WebCT and could be
accessed from anywhere and at any time through the World Wide Web. From Week 10 onwards, attendance at lectures declined to below 50% of the cohort and consequently WebCT became a valuable tool for communicating important messages and content to students. WebCT is used at UWS both in the management of large class sizes and as an interactive learning resource for students. These two functions of WebCT will be explored further in a paper at a later date.

SUCCESS OF THE PROJECT

Embedding academic skills within EIDP

Perhaps one of the more significant aspects of this collaboration is the locating of academic skills within the discipline rather than offering adjunct, generic skills workshops which the students then need to transfer to their specific context. This decision to embed and contextualise the skills was based on a recognition that each discipline has its particular ‘communicative competencies’ which can be described as an awareness that ‘what constitutes a discipline and its ways of thinking and knowing are actually embedded in that discipline’s writing processes, its norms and conventions’ (Street, 2004, p.16). Through immersion in the content of the subject, and regular discussion with SEID academics, LSU staff were able to produce a resource book that reinforced and modelled the communicative competencies of the discipline. It has been suggested that the difficulties students encounter can often be due to differences between what academics expect and how students interpret the expectations (Street, 2004). The collaborative approach, which enabled the melding of the knowledge of the discipline with the fresh insight and expertise of the LSU staff, was a means of addressing the gap between staff expectations and students’ interpretations of expectations.

The student evaluations of the resource book have provided insights for its further development. Table 1 summarises the students responses from the on-line survey conducted in the penultimate week of the teaching session, where feedback from the students on the usefulness of the resource book was sought. The survey was voluntary and attracted a 64% response rate. Sixty seven percent said that the resource book was helpful/very helpful in preparing the annotated bibliography which was the first assignment. However, only 47% reported the resource book as helpful/very helpful for preparing the second assignment. The lower satisfaction rates reflects the fact that the students had no explicit models of the genre and little scaffolding for the case study assignment. The scaffolding provided a module modelling effective note taking techniques and a reminder to carefully consider the marking criteria.

<table>
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<th>Table 1. Summary of Student Feedback on Resource Book Usefulness (n=247)</th>
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<td>Aspect of Resource Book</td>
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<td>Analysing the Task</td>
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<td>Research</td>
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<td>Reading Effectively</td>
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<td>Note Making</td>
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<td>Paraphrasing and Avoiding Plagiarism</td>
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<td>Referencing</td>
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<td>Academic Writing</td>
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<td>Writing and Annotated Bibliography</td>
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<td>Oral Presentations</td>
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<td>Critical thinking</td>
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<td>Did you find the Resource Book materials provided on WebCT for Weeks 1, 2, and 3?</td>
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Students reported that the resource provided support in relation to the academic conventions associated with assignment writing. For example, students reported the usefulness of the resource in relation to acquiring referencing skills (67%); and paraphrasing and avoiding plagiarism (69%). In relation to acquisition of referencing skills, what students reported and what their practices suggested were at variance. The panel marking the group report, which was the final assignment, noticed many students did not comply with the conventions of the preferred referencing style.

Collegial relationships and other benefits for staff
The paramount outcome was the satisfaction of teaching an integrated well-planned unit. The success of the project was partially the result of long-term working relationships, based on trust, and which demonstrated mutual respect for each other's professional input. Encouragement was provided by supportive heads of program, especially in ID, who valued the contribution of the cross-functional team in the improvement of student performance.

For the LSU, the benefits of the project are many and include the professional satisfaction of working in a multidisciplinary team during the planning, resource development, teaching and finally the allocation of final grades. The marking panel consisted of the cross-functional team and tutors. Sharing the marking load strengthened collegiality and more importantly provided insight into what students have learned during the semester and allowed identification of areas which need follow up during the next semester. Overall, this EIDP project required ongoing intensive administrative coordination and oversight of the unit. Since it was a new unit of study, tutors and lecturers had to be supported through the changed components. In some small ways the team was able to support the coordinator who was also a member of the cross-functional team.

Benefits for students
Student evaluation of the resource book indicated that the majority of students felt that the resource book helped them to understand the expectations of lecturers and that 62% thought it was likely to be a useful resource for future units within their courses. In relation to the student viewpoint, EIDP allows LSU staff to be seen as a part of the academic community. LSU staff became familiar with the EIDP students who were more likely to perceive them ‘in a non remedial’ role (Jardine, 2005, p.6). As a consequence, students may be more likely to access LSU learning support programs in a timely manner. For those students who came to individual appointments, there was ‘reduced stigma’ associated with the visit (Jardine, 2005).

Overall, the cross-functional teamwork approach, fostered a dynamic and effective process which allowed for development of a more comprehensive and appropriate educational product (Power, Bohemia, Farrell & Yevenes, 2005).

CONCLUSION
As we reflect on the success of this introductory unit, several aspects of the program need addressing in subsequent semesters. First is the necessity to train tutors who will be involved in taking tutorial groups. We had intended to train the tutors but the short time frame between their employment and the beginning of semester did not allow sufficient time to run training sessions. Training seems to give tutors a sense of involvement and ownership of the resource book and a better sense of how components of the Unit interrelate. Training allows tutors to become familiar with the resource book and as a result tutors are more likely to promote its use and refer to it in class. We would also model the second assignment. Restricting modelling to one assignment meant we ‘cut the students loose’ while they were still in the process of becoming academically acclimatised to the academic literacy demands of the School. We consider it important to provide online academic support on WebCT especially in relation to appropriately incorporating evidence into academic texts. This material would be presented in various ways to demonstrate and give practice in the conventions of referencing. The impact of the peer mentoring program in 2005 has yet to be fully analysed. However, it will continue to be implemented as
part of the unit and we will evaluate the efficacy of the program in relation to student engagement and retention.

Another consideration is that the demands made on students in relation to teamwork may not be realistic in terms of the significant geographic and employment constraints most students face. Many students travel very long hours often by (unreliable) public transport to get to the Campus. In addition to long travel times, most students work inordinately long hours to support themselves financially, for instance twenty to thirty hours per week of paid work while enrolled as full time students is not unusual. In addition to their 20 hours + face to face course instruction time, to ask students to find time to complete a team project out of class time is very demanding. Students often find the experience frustrating and unfulfilling and report that in many cases the learning objectives for team projects can be only minimally achieved. An alternative would be to allocate some lab time and/or some tutorial or mentoring time to ensure quality time is given to the teamwork project. The burden of teamwork would be lifted and all students could be expected to attend and participate to maximise educational and social benefits of this form of learning. This would also facilitate the reflection of successful teamwork strategies for students away from the logistical aspects (that were in some cases overwhelming) and allow them space and time to delve into the creative interactions possible that can be part of innovative design. The allocation of class time to teamwork would also facilitate the development of peer networks and provide stability for students during their transition to university life.

The integration of all the components within EIDP was an experience of academic and social connectedness for students. As such, EIDP provides a model for other units within the School. The value of this unit of study is that it integrates thinking, listening, and talking through new ideas (both online and face to face) with writing about new ideas. Students are encouraged to integrate what they have learned in one situation with the content of another component of the unit. The EIDP unit of study prepares students for a second semester unit Engineering and Design Concepts which requires students to write reports, be involved in productive teamwork and to be analytical and reflective thinkers.

As a foundation and core unit, EIDP aimed to induct students into the ‘ways of doing’ within the School of Engineering and Industrial Design at UWS. The overall success of the project was not only that it enhanced the student experience (Stewart & Rawrhiti, 2004) but as part of the reformulation of expectations of the whole student body within the School, it asked staff to change and adjust in order to add quality to the teaching and learning experience at UWS.

**Bibliography**


Scaffolding the scaffolders: An integrated approach supporting first semester students


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A COMPULSORY IT TRANSITION SUBJECT EXPERIENCE: zero credit points leads to zero future

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Swinburne University of Technology

In 2002 the Faculty of Information Communication Technologies (FICT) at Swinburne University of Technology made a commitment to student transition to higher education by mandating that incoming undergraduates complete a transition subject (HIT0103 IT Transition) as part of their degree. This paper describes how this zero credit point transition subject has evolved over four years. It commenced as a one-semester length compulsory subject in one of the faculty's degree courses, and extended to all first year degrees by 2005. As a result of systematic evaluations, and the burden to the faculty of self-funding, a one-week intensive program will replace HIT0103 in 2006. Some of the main curriculum components from HIT0103 will be embedded in core subjects, in particular a continuing focus on the group work process, presentation skills and reflective writing. The authors discuss HIT0103's implementation through the design, development, review and evaluation phases drawing on the reactions of students to this compulsory pass requirement of a zero credit point subject in their undergraduate degree course.

Academics in the Faculty of Information Communication Technologies (FICT) were consistently troubled by the fact that high achieving secondary school students often did not translate into high achieving first-year university students. Research into student transition to higher education indicated that if students have a smooth start to their course there are increased chances of a lower drop-out rate and better academic results. The advantage of belonging to a cohesive group with provision of a support network leads to increased student success (Gardner, 2001; Tinto, 1998). HIT0103 IT Transition was introduced in 2002 in response to this concern.

The primary objective of HIT0103 IT Transition was to produce higher achieving students. It was also obvious that a program providing weekly tutelage on transition topics would not only help the cohort of international students adjust to the learning environment in Australia, and students articulating from TAFE, but also benefit the academic outcomes of students from the more teacher-led education environment of secondary schools.

The Faculty already had an existing academic orientation program for students during Orientation Week. This one day non-compulsory program delivered a general academic and administrative introduction as well as a hands-on laboratory session to introduce students to the learning management system (Blackboard) used to deliver much of the course materials. HIT0103 IT Transition was designed to complement these orientation activities by addressing learning and communication skills, group work processes and written reflection, rather than specific IT skills. It also pro-

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vided an important vehicle for students to create early links with others in the same degree course through small tutorial sessions led by both an academic staff member and, as the subject developed, a peer tutor.

**Placing Subject in Context**

The university campus of early 21st century is a constantly changing environment. The student cohort can vary between predominately young school leavers, international students or more mature part-time workers. There is a strong international presence; various ethnic groups mix freely, and have their own clubs and their own food outlets in the student food hall. The demographic profile of students attending tertiary institutions has changed considerably over the last forty years (Astin, 1998; Kuh, 2001; Marchese, 1998; McInnis, 2001; Pascarelli & Terenzini, 1998; Tinto, 1998). Instead of young full-time students living on campus, many students are now older, often enrolled part-time and commuting to campus. The career aspirations and overall dedication of students to their studies have also altered focus, in some cases to the detriment of the pursuit of a generalist higher education and more in favour of maximising potential earning capacity in the employment market. Research into the learning experiences of students in universities resulted in the “Seven principles of good practice in undergraduate education” (Chickering & Ehrmann, 1996). The principles involved establishing good communication links with academic staff and peers; the use of active learning techniques by involving students in the learning process; prompt feedback on assessment; adequate time on task; the communication of high expectations and appreciation of diverse talents (Chickering & Ehrmann, 1996 p.2-8). However, these principles were the outcome of research on a cohort of students that were “a homogenous group of middle-class on-campus residents” (Pascarella & Terenzini, 1998, p.162) and perhaps no longer have currency in today’s university. In 1996 the seven principles were revised to include the part technology can play in their implementation.

Kuh (2001) investigated what makes a good institution, using the National Survey of Student Engagement (NSSE) as a tool for seeking national benchmarks. This survey did not assess learning outcomes but instead the extent of the use of good educational practices. Based on the seven principles of good learning, Kuh focused on five benchmarks, and used a credible variety of survey techniques at a wide selection of institutions in the USA to gather data. The five benchmarks are: the level of academic challenge students experienced; the amount of active and collaborative learning undertaken in courses; the level of student interactions with academic staff; the number of enriching educational experiences; the perception of a supportive campus environment. The results of this US survey showed that substantial proportions of students are experiencing active and collaborative learning (90% of students reported working with other students on projects which may or may not have included collaborative learning). However, poor student interactions with academic staff were reported as well as 56% of respondents spending only 15 hours a week in preparation for their courses, half the recommended amount of time. While this survey relied on self-reporting, steps were taken to ensure that the tool elicited truthful and recent responses. These included clearly worded questions referring to recent activities that did not intrude on private matters. An acceptable response distribution for most items was evident on analysis adding further credibility to the tool (Kuh, 2001). The survey results indicate that students are spending less time on campus and less time engaged in learning than that expected by academics. The results of the Kuh survey contribute to the belief that students are becoming increasingly less engaged with tertiary learning in the sense that they are spending less time in preparation and reporting limited interactions with academic staff.

Marchese (1998) was convinced that students were becoming more materialistic in their educational expectations, as was Astin (1998). In 1966 Astin asked students to rank the importance of particular values; “developing a meaningful philosophy of life” ranked number one by more than 80% of students surveyed, and “being very well of financially” ranked in
sixth place. In 1996 the position of these two statements had reversed, 74% of students ranked the economic value first, and the value of a meaningful life philosophy sixth (Astin, 1998 p.11). In “Your First College Year” survey a similar question on developing a meaningful philosophy of life was asked and more than half the students (52%) responded that this was important or very important to them (Sax, 2002 p.31). Sax also reports that close to 70% of first year students experience concerns about financing their education in the first year of college, and nearly 20% experience serious financial difficulty. This need to finance education through working off campus, or supporting loans could contribute to a preoccupation with financial matters, and could well account for the increase of importance of economic stability in the lives of students (Sax, 2001p.26).

Marchese’s attack on the decreasing values of today’s college student could be founded in economic realities of paying day-to-day living expenses and bills.

Recent research supports the decreasing levels of engagement of students; the convergence of career aspirations between males and females; a greater use of technology by both academic staff and students and a change in the philosophical outlook of students. Students have always tried to negotiate their level of involvement, however this trend is increasing due in part to the reactive rather than proactive way universities have been dealing with student demands (McInnis, 2001p.14). Technology is increasingly being used to change the delivery mode of courses, the interaction between students and academic staff, and students and peers. The use of electronic mail, asynchronous discussion boards, electronic submission of assignments and delivery of lectures via the internet increases the immediacy and reach of educational institutions while also contributes to the decreasing amount of time students need to spend on campus if they so choose (Chickering & Ehrmann, 1996).

Tinto challenges universities to acknowledge the changes in their cohort and use the curriculum to negotiate the level of involvement they demand from students (Tinto, 1998). In commenting on the community colleges in the USA, institutions offering two-year programs, he suggests that co-registration and block scheduling need to be introduced so that a homogenous learning community could meet two or three times a week for four to six hours each time (Tinto, 1998 p.170). McInnis suggests that a number of different approaches need to be taken by universities to deal with the decreasing engagement of students. Using the curriculum as an organising device, not to the extent of increasing the myriad of choices students are currently faced with, but to create a more cohesive and integrated learning environment (McInnis, 2001p.10). Students are no longer a homogenous group. There is a need for several different solutions to cater for the different cohorts of mature part-time students, young local part-time and full-time students, and the international student cohort. Marchese states that universities now need to recognise that there is a problem and they are a part of the problem (Marchese, 1998). He suggests that they need to understand the problem; develop more imaginative teaching methods; work more closely with secondary institutions, help students “recapture the joy and power of deep learning”; and keep thinking of ways to bring “value-added roles” to students (Marchese, 1998). This would encourage students to want to become more engaged with their institutions.

The challenge for universities to take a leadership role in managing the expectations of their changing student cohort, while maintaining their integrity informed the development of the HIT0103 course reported on in the following sections. This was enabled through curricular change, timetable change and the use of technology to support the seven principles of good learning. This subject was created to encourage a level of engagement in first-semester students from varying backgrounds that was not necessarily provided in any of the core curriculum subjects in their courses.

INTRODUCING HIT0103 IT TRANSITION

The first iteration of HIT0103 was introduced to Bachelor of Computer Science and Software Engineering students (CSSE) in 2002. This degree course was considered the most technical
of all offered by the Faculty, and it was thought that these students would most benefit from a smooth start to their course. Students attended a weekly lecture and tutorial, and submitted weekly reflective journals on their transition experiences.

Curriculum planning involved faculty academics, an academic educational development advisor from Learning and Teaching Support (LTS) and expert support staff from the Language and Learning department. Initial weekly topics were designed from responses to an e-mail asking first year lecturers and tutors what skills they felt their students needed most. In the majority of cases these were generic skills such as time-management, written communication, and presentation skills. The use of the Blackboard system also allowed the introduction of electronic submission of the reflective journals and online discussion spaces for group collaborations and project presentation preparation. Problem solving tasks and critical thinking exercises further extended the academic learning capabilities of students. Tutorials on plagiarism and how it could be interpreted differently in various subjects complemented a library skills session and referencing standards.

The assessment requirements of the subject were clearly outlined to the students in the first lecture and consisted of individual weekly journals to allow for reflection, written communication practice and regular feedback; an individual presentation to the class on a subject of the student’s choice to improve and enhance presentation skills and finally a group work activity that involved research into a subject relevant to first year transition presented to the whole group in a lecture situation. There was also an 80% attendance requirement.

The group activities were an enforced way of accelerating a feeling of cohesion and belonging as well as a vehicle for instilling group work methodologies early in the course. None of the exercises and activities that were undertaken in the tutorial sessions was carried out individually, for example the plagiarism activity involved discussion with three other students, the problem-solving tasks involved working in pairs and so on. The final journal submission at the end of semester was submitted in hard copy to display enhanced word processing features of table of contents, pagination, referencing, title page and executive summary. While there were no scheduled computer skills sessions, apart from a session in the Library Training Room that re-enforced citations skills, journal feedback throughout the semester encouraged students to correctly format their submissions.

**Curriculum development, evaluation and refinement**

Over the first four iterations of HIT0103 IT Transition, when reading the student feedback and final reflective journal entries, it was obvious that the journal aspect of the subject was considered the most tedious to students, and the group work experience the most enjoyable and beneficial to them. One student, who had obviously had a negative group-work experience, commented that this had taught him not to choose to work with for the rest of his course, an invaluable piece of knowledge in his opinion. Taking student feedback into consideration, the assessment load of the subject was reduced over the various semesters, and the timing of presentations and submission adjusted to allow for maximum benefit while having minimal impact on other assessment and exam preparation. In 2005 the subject was compressed into ten weeks, to ensure that preparation of the final journal did not overlap with exam preparation time. The provisional weekly outline of the subject, at its most refined (current) stage, can be seen in Table 1.

The journal has proved a most valuable tool not only for the students to reflect on their current learning experiences, practice and enhance their written communication skills, identify areas for improvement but also as a mechanism for feedback and evaluation of the subject. Students expressed positive, negative and mixed experiences on a variety of themes. The following selected verbatim responses are representative of the range of positive, mixed and negative comments collected from the final reflective journals submitted at the end of semester one 2004.
Table 1: Subject Outline Semester 1, 2005

<table>
<thead>
<tr>
<th>Week beginning</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 21st Feb</td>
<td>Introduction to course. Making the most of your course. What is reflective writing (journal)</td>
<td>Individual groups in timetabled rooms</td>
<td>No tutorials in the first week</td>
</tr>
<tr>
<td>2 28th Feb</td>
<td>Goal setting for the rest of the semester/year/course</td>
<td>Introductions</td>
<td>Maximise learning to suit your learning styles.</td>
</tr>
<tr>
<td>3 7th March</td>
<td>Introduction to group work activity How to work in groups successfully.</td>
<td>Choose groups. Group evaluation strategies. Choice of group work topics.</td>
<td>Reflection and evaluation (BB paragraph)</td>
</tr>
<tr>
<td>4 14th March</td>
<td>Ethical Dilemmas</td>
<td>Database searching, research, citations.</td>
<td></td>
</tr>
<tr>
<td>5 21st March/ 28th March</td>
<td>No lectures in these weeks, attend tutorial classes only</td>
<td>Problem solving strategies (algorithm writing)</td>
<td>Reflection and evaluation (BB paragraph)</td>
</tr>
<tr>
<td>6 4th April</td>
<td>Critical thinking strategies and exercises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 11th April</td>
<td>Individual presentations / group presentation preparation</td>
<td>Reflection and evaluation (BB paragraph)</td>
<td></td>
</tr>
<tr>
<td>8 18th April</td>
<td>Individual presentations / group presentation preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 25th April</td>
<td>Examinations at university. What to expect and what to do IN the exam. Where to get help. DO NOT MISS THIS SESSION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 2nd May</td>
<td>Group Presentations</td>
<td>See Blackboard for attendance and presentation instructions</td>
<td></td>
</tr>
<tr>
<td>CONSULTATION WEEK (No Scheduled Classes)</td>
<td>See Blackboard site for content and submission requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 16th May</td>
<td>Group Presentations</td>
<td>See Blackboard for attendance and presentation instructions</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>No further attendance required.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments were varied and covered subject management and organisation; subject content and delivery method; group work and presentations; assessment and reflective journals; and commitment to the subject. The range suggested that most topics were considered relevant and useful and achieved their objectives.

Attending this “Transition” subject has helped me realise what university is all about and how it functions and I am grateful to be doing this subject. The ongoing journals have given me a chance to stop and reflect on my life and also where I intend on going and what I intend of doing in my later years. (Ex-secondary school student)

Students commented on their transition experience from secondary school or TAFE to university education and their need to become more responsible in their approach to learning.
At uni no one offers you help, they wait for you to ask, which is one of the major differences between TAFE, secondary school and uni. Although TAFE they excepted (sic) you to ask, but with a course, which follows a set path, that never deviates it is hard to come unstuck. What I mean by all of this is that at uni you have more responsibility towards your learning, you choose your timetable, you choose your electives and you choose to go to lectures. (Ex TAFE student)

The group presentation activity resulted in a positive outcome for most students with several commenting that it was an advantage being able to meet other students and assisted in developing presentation, research and referencing skills. Although some students commented that they “hated doing group work and presentations” and that they had done these “many times before” generally comments suggested that were they happy that they had been made to do it.

The reflective journal has been used to assist in the thinking process enabling students to enjoy the learning for learning’s sake rather than concentrating on end results. Students were initially very vocal about completing a journal. They were concerned about the amount of time they needed to set aside to do it and that journal writing was not perceived as useful. Throughout the course of the semester attitudes changed and final reflections in the journals identified the contributions journal writing had made to their learning.

The thing that I liked about the subject were the journals because they were not that difficult to complete but they allowed you to reflect on how you are studying and were you could improve. (Ex-secondary school student)

The value for many of the international students was evident in the progressive development of their writing during the journal process; their understanding of Australian university life; and information about Swinburne’s resources and services available for students gained through listening to some of the group presentations and researching and citing references for their own group presentations. Their ability to clarify their needs was important. The small group tutorials, the involvement of a peer tutor and the availability of an online discussion group further assisted and supported international students in their learning.

Finally I am saying that this Transition subject was very useful to me not only as a first year student, but also as being an international, non English speaking student. I am feeling more confident about using resources and services in the university and more confident about being a tertiary student, because of the guidance that we got from this IT Transition subject. (International student)

As is to be expected, commitment to the subject varied within the student cohort. Many changed their minds as the semester progressed as they gradually saw the benefits of the subject. Many saw the subject as a means of finding more about university life, its services and resources, but as the semester progressed students gradually understood the relationship between the journal writing process, group work and presentations as a means of assisting their learning and study skills in other subjects. Another of the aims of the Transition subject was to encourage students to enjoy the process of learning rather than always focussing on the final results. As such the content has been based around the qualities and skills that students will need during their course such as time management, group work, problem solving and plagiarism.

Game (2003) in her book “The First Year Experience; start, stay and succeed at uni.” lists expectations, anonymity, bureaucracy and procrastination as major factors affecting a first year students experience at university, whether they are exit VCE, TAFE/other university or international. While the book offers some tips and advice for students it also confirmed the validity of the HIT0103 IT Transition because it addressed these issues through the curriculum offered. The structure of HIT0103 IT Transition allowed for first year transition issues to be handled sensitively during the tutorial sessions as well as through informal
discussions and formal presentations with the tutor and student mentors. It is also interesting to note that many of the issues raised and discussed as part of HIT0103 IT Transition were shared and published in editions of Swinburne Student Union newspaper “The Swine”. Front page headlines in 2004 included “Avoiding Plagiarism and Cheating”, “The Great Group Work Scam”; and “First Year Hanging in There”.

PEER TUTORING AND MODELLING
In 2004, for the first time, second-year students were employed in first semester as peer tutors for each of the tutorial groups and assigned to an academic staff member for each of the tutorials. This decision was made to add validity and credibility to the advice given, and to allow these students to train as tutors through direct modelling. In semester two, as a result of this intensive and individual tutelage, they were re-employed as tutors in their own right, with the sole responsibility of running the tutorials. Each of the peer tutors were also obliged to take the compulsory sessional tutor training provided by the Faculty, and had completed the subjects themselves in the previous year. The peer tutors were not necessarily the best achieving students, but had a commitment to ensuring that incoming students had a smooth transition experience. One of these second-year students in particular had been a vocal critic of the program when he was forced to attend the classes initially, but grew to see its benefit over the course of the program to the extent that he is now one of its strongest supporters.

Informal discussions with academic tutors (lecturers and program directors) identified that their relationship with the peer tutor varied between individuals. Some academics met regularly with their peer tutor face to face for collaboration on tutorial activities; some used the Blackboard system discussion forums to facilitate communication. Some academics guided their student mentor towards a more responsible role, and others were keen to keep control and did not relinquish many responsibilities. The differences in perceived expectations and roles of academics and in turn their expectations of the role of the peer tutor affected communication and sense of accomplishment for some. The following quotes were taken from an end of semester on-line anonymous survey of the peer tutors.

- at times it seemed almost pointless being there with the amount of involvement the tutor was willing to involve me in
- I would like to have had more involvement
- Might have been good if we as mentors had more of a go at teaching for part of a session, as it’s a bit of a step going from mentoring, helping out a bit, to running the classes a lot more

The academics in the same survey, expressed that the best thing about their role was “seeing students grow in confidence”, “interaction with students”, and “seeing them develop during the transition process”. Some responses from academics however, indicated a lack of commitment to the program which reinforced perceptions of some student mentors.

The peer tutor experience was generally felt to be most rewarding and allowed a number of students to gain confidence in their tutoring abilities by modelling on an academic in a shared responsibility role. Some of the initial peer tutors have gone on to tutor in other subjects within the faculty.

Across the faculty some academics viewed the subject as the sole responsibility of the convenor demonstrating a lack of commitment to the objectives of the program. Throughout each evolution of the program, while the subject convenor had tried to involve as many academics as possible, this did not always eventuate. The success of the program required a shared involvement and responsibility across the faculty and across all levels of courses offered.

ZERO CREDIT POINTS MEANS ZERO FUTURE
In today’s university environment, a zero credit point subject has a zero future. The proposed changes for 2006 allow for up to 12 hours of orientation, transition and learning skill development for incoming students (6 hours in Orientation Week and 6 hours in week 1 of semester), but will not incur an on-going cost to the faculty of an academic being responsible
for this program throughout the semester. While students will be given set timetables in Orientation Week, promoting the 6 hours of additional transition activities in week 1 of semester, attendance will be totally optional. The transition sessions in week 1 will make use of already scheduled but previously unused timetabled laboratory and tutorial sessions in core subjects (traditionally laboratories and tutorials have not started until week 2 of semester). It is proposed that lecturers and tutors will deliver pre-designed transition activities instead of course work in these sessions, facilitating the transition to higher education of new students. The involvement of wider faculty in this new program spreads the responsibility for student transition of students across a number of academics.

The 2006 program will also pre-enrol new students in cohorts of 15 to core lectures, tutorials and laboratories so that by default they will see the same faces in at least 3 of their 4 classes thereby reducing the potential feeling of isolation and increase connectivity in the cohort. The advantage of pre-enrolling students, while incurring an extra administrative cost, will ensure students know their timetable early, and will give them the most advantageous timetable possible (e.g. lectures before tutorials and a four day week if possible). This administrative activity is a small change that logically will increase sense of belonging in students, a key aim of the HIT0103 IT Transition subject.

The growth and evolvement of this program has been an interesting and challenging development and provided many positive experiences for the convenor, tutors and peer tutors, and importantly the students themselves. However, without the commitment of a credit point load to give the subject validity in its own right, its future was always doomed.

CONCLUSION

In general the positive outcomes of this subject were the experiences and understandings the students gained from their reflective journal writing, their improved team work and communication skills and the knowledge gained of the need to become more responsible for the management of their learning. These are important benefits of the IT Transition subject in meeting its objectives and far outweigh the negative factors of a compulsory pass, weekly attendance commitment, assessment and lack of credit points. However, the fact that there were never any credit points allocated to the subject has led to its demise.

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AN MP3 A DAY KEEPS THE WORRIES AWAY:
Exploring the use of podcasting to address preconceptions and alleviate pre-class anxiety amongst undergraduate information technology students

Anthony Chan & Mark J.W. Lee
Charles Sturt University

Creating a productive and satisfying learning experience involves actively engaging students and having them take responsibility for their own learning. However, the anxiety students bring into the classroom, along with their preconceptions about subject content and other course-related matters, often works as an immediate impediment to effective learning, even prior to the commencement of a course or subject. This paper describes, with reference to relevant literature, the rationale and design of a pilot study involving an investigation into the application of podcasting to address these issues and foster “good practice in practice” in university teaching and learning with first year information technology undergraduates. The authors believe that given the large uptake of portable music players, the use of a series of informal, talkback radio-style audio clips, delivered in a timely fashion through podcasting, can help alleviate some of the pre-class anxiety and allay student concerns about issues such as assessment, and do so more flexibly and effectively than the traditional methods of using subject websites and printed handouts.


The impetus for the research described in this paper stemmed from an informal teaching evaluation effort, in which the first author implemented a variation on the Harvard “Minute Paper” as part of his own reflective teaching practice. Essentially, the Harvard Minute Paper (Mosteller, 1989; Cross & Angelo, 1993) involves students responding to some variation of the following two questions: “What was the most important thing you learned during this class?” and “What important questions remain unanswered?” (i.e., “What is the ‘Muddiest Point’?”). Students return their anonymous responses on paper to the lecturer, who can analyse the information fairly quickly. This type of impromptu evaluation is useful as it is relatively simple to administer and therefore can be conducted at various stages of a subject, allowing the lecturer to elicit and respond to student feedback in a timely fashion formatively throughout the semester. Students’ areas of misunderstanding or non-comprehension can be identified and targeted as they occur, rather than simply at the very end.

ITC125 Information Superhighway is a first year undergraduate information technology (IT) subject offered in on-campus mode by the School of Information Studies at Charles Sturt University. A questionnaire was distributed at the very first meeting with the new students of the subject in the Autumn 2005 (February to June) semester. Prior to commencing the les-
son, students were asked to respond anonymously in writing to the open-ended question, “What are the concerns you have about this subject?” At the end of the lecture, a second questionnaire was distributed, posing the question, “Have your concerns been addressed at this opening lecture?”, and asking students to list the concerns that had yet to be addressed.

Although the results of the post-lecture questionnaire indicated that most of the students’ initial concerns had been addressed by the end of the first meeting, many students appeared to have a number of preconceptions about the subject, even before the lecturer had begun formally introducing it (Table 1). Identifying the source of these preconceptions is beyond the scope of this paper; however it was evident that they caused a degree of anxiety about the subject. For example, over one quarter of the respondents (8 out of 28) indicated that they already found the subject too difficult to understand.

Table 1: Concerns raised by ITC125 students in the Minute Paper, administered prior to the commencement of the first lecture in the Autumn 2005 semester (N = 28)

<table>
<thead>
<tr>
<th>Category of concern</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too difficult to understand</td>
<td>8</td>
<td>28.6</td>
</tr>
<tr>
<td>No concerns</td>
<td>7</td>
<td>25.0</td>
</tr>
<tr>
<td>How to code/validate XHTML</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Worried about assignment and exam</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Detailed subject description needed</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Don’t like Friday class</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Subject is too easy</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Set up of practicals and tutorials</td>
<td>1</td>
<td>3.6</td>
</tr>
</tbody>
</table>

The preconceptions and anxiety that students bring into the classroom act as barriers that must be overcome before effective learning can take place. This prompted the authors to explore strategies to help alleviate students’ pre-class anxiety and address their preconceptions prior to attending lessons. The remainder of this paper explores the potential for the use of podcasting technology to address these issues by providing a mechanism for disseminating a series of informal, talkback radio-style clips in MP3 format to students for listening prior to attending class, via a “just-in-time” delivery model.

ADDRESSING STUDENTS’ PRECONCEPTIONS AND ANXIETY

The constructivist classroom is founded on the premise that students learn by reflecting on their experiences and social interactions, from which they formulate “mental models” representing their own understanding of the concepts. The provision of effective instruction is therefore highly dependent on comprehending the mental models that students use to perceive the world and the assumptions they make to support those models (Brooks & Brooks, 1999). In the words of Powers & Powers (2000), “the new knowledge affects the new” (Introduction section; para. 6) – Students’ existing knowledge is used as the starting point in guiding them through their search for understanding, and quest of making personal meaning. Their preconceptions therefore have a profound impact on the learning process, right from the outset, as one author notes: “…[I]t is necessary…to take into account the learner’s ideas. This may mean revising what we consider to be the starting points in our teaching – the ideas we can assume pupils have available to them.” (Driver, Guesne & Tiberghien, 1985; p.199)

Powers & Powers (2000) present a collection of common preconceptions held by students of Computer Science and Information Systems (CSIS), and discuss the constructivist implications of these preconceptions for teaching methods. Research in other disciplines demonstrates that there are numerous prevalent preconceptions among students, and that educators can tackle these preconceptions through the careful selection of appropriate learning experiences (Powers & Powers, 2000, citing Tobin, 1993). The bulk of this research appears to have been in the mathematics (eg. Gourgey, 1984; Harvey, Plake & Wise, 1985; Gal & Ginsberg, 1993) and science (eg. Clement, 1982; Kass & Lambert, 1983; Aguirre, 1988; Carlsen & Andre, 1992; Camp & Clement, 1994; Kokotas, Vlachos & Kardaidis, 1998) domains. Tanimoto, Carlson, Husted, Hunt, Larsson, Madigan & Minstrell (2002)
suggest that one way to draw out these preconceptions is to ask students leading questions and have them answer the questions in small-group discussions. Driver, Guesne & Tiberghien (1985) say that once student ideas have been identified and understood, they can be used to improve learning by helping to guide the sequencing and timing of the teaching of specific concepts, as well as how the learning experiences for particular concepts may be adapted. The authors take this one step further by proposing that student preconceptions can and should be confronted before formal instruction begins, so that the learning that occurs in class can be as productive and meaningful as possible.

Ramsden (1992) asserts that any anxiety students have about a subject will affect the learning styles they exhibit. Research has shown that the same student can have “deep”, “surface” or “strategic” learning styles, even within the same subject (Prosser, 1994). Biggs (1987) suggests a close association of deep learning strategies with active participation and social interaction in an “affective” setting. This affective domain of student learning is often left to chance by university educators, but the issue of student anxiety in an introductory subject, indeed any subject, warrants serious consideration. For new students, recognising and addressing concerns about anxiety is critical in assisting them with their integration into the tertiary learning environment.

Many articles refer to student anxiety, but there have been few definitive studies conducted in this area (Roiter & Petocz, 1996). Stevens (1982), Gourgey (1984) and Harvey, Plake & Wise (1985) are some of the authors that have investigated this issue in depth within the statistics education realm; however, Roiter & Petocz (1996) reports that current literature on anxiety does little to provide suggestions that can be easily incorporated into daily practice.

Another issue that has surfaced in recent years is the effect that students’ attitudes or beliefs about a subject have on their anxiety. Gal & Ginsberg (1993) argue that students’ preconceived ideas about the nature of a subject and its content can produce anxiety, and give a critical review of two surveys that are designed to assess student anxiety towards statistics. A study by Ballantyne (2000) showed that 216 students (16%) had withdrawn from one of more units during their first semester at an Australian university and 398 (28%) had seriously considered withdrawing from the university altogether. Organisation and interest in the area of study are closely related to student success; the presence of anxiety adversely affects students’ interest in a subject and puts a damper on their motivation to learn and excel, in addition to interfering with memory, attention, and concentration and being emotionally draining (Chan, 2001).

The issue of student anxiety can be addressed by the use of appropriate teaching methods, and the demonstration of effective teaching behaviours within the classroom (Murray, 1997). Active learning strategies such as peer instruction, mentoring and pair/groupwork have also been shown to help reduce anxiety (Owens & Walden, 2001; Tremblay & Rodger, 2003; Freeman, Jaeger & Brougham, 2004). Once again, however, as with students’ preconceptions the authors of the present paper advocate attacking their anxiety before they arrive in class, to as to maximise their ability to benefit from the formal instruction, and indeed from any learning activity. Modern methods based on social constructivist theory, such as discovery-based learning, problem-based learning and collaborative learning, have a significantly higher probability of success, particularly within the time constraints of the university timetable, if students are able to come to class already inspired to learn and willing to actively participate.

Traditionally, instructors have used a number of out-of-classroom support mechanisms to assist students in addressing their preconceptions and allaying their concerns, both about the subject content and on administrative matters. One-on-one instructor support for each student via face-to-face consultation, telephone or e-mail may be ideal in a small group situation, but for large cohorts such as those commonly found in introductory subjects, this method is impractical at best. For
this to be effective as a primary method of targeting students’ preconceptions and anxiety, the time and resources demanded of the instructor would be prohibitive. Collaborative learning practitioners promote the use of computer-mediated communications (CMC) technologies like chat rooms, MOOs, threaded discussion boards (forums) and now Wikis to have students solve one another’s problems. According to Tanimoto et al. (2002), through the use of an appropriate CMC tool, students can carry out their discussions in a way that facilitates the discovery of preconceptions and makes it easier for an instructor to provide appropriate guidance. However, Northover (2002) cautions that the overall effectiveness of such activities is largely dependent on their planning and implementation, and emphasises the instrumentality of the tutor or moderator in their success.

A popular solution is the production and distribution of supplementary material, usually in the form of printed handouts. The advent of consumer-level digital multimedia hardware and software have prompted the more technologically inclined instructors and educational designers to construct CD-ROM based resources to engage and excite students using the richness and flexibility of text, graphics, sound, video, animation and interactive content, as well as the combination of these elements. Many educators have also leveraged the pervasiveness of the World Wide Web by putting both text-based and multimedia content online on websites created specifically to serve the subjects they teach, and more recently taken advantage of the simple and informal nature of weblogs (blogs).

**Music to the Ears: The Case for Audio Technologies in Teaching and Learning**

Audio has been vastly neglected and underused as a teaching and learning medium in recent years (Bates, 1981; Romero-Gywnn & Marshall, 1990; Scottish Council for Educational Technology, 1994). Perhaps this is because according to the popular view, “[listening to audio is] not learning...[listening is not synonymous with comprehension and action” (Walsh, 2004). However, in the words of Clark & Walsh (2004; p.4):

> Hearing is a specific and powerful sensory channel. The ‘cocktail party effect’ allows us to home in on conversations and sounds ignoring other background noise. Our brains are acoustic analysers able to distinguish, select and interpret an amazing variety of sounds.

Clark & Walsh (2004) further add that human hearing is “an astoundingly efficient skill” as we are able to understand real speech at 10 to 15 phonemes per second for normal speech and up to 40 to 50 phonemes per second for artificially speeded up speech. Furthermore, they note that “listening is instinctual, [whereas] reading and writing are not” (p. 5) — linguistic psychologists have found that unlike with reading and writing, children do not learn how to understand the spoken word, but are hard-wired with the skill.

Durbridge (1984) emphasises the distinct educational advantages of audio over printed media, stating that “[a]s compared with a written text, the spoken word can influence both cognition (adding clarity and meaning) and motivation (by conveying directly a sense of the person creating those words)”. Power (1990; para. 1) concurs: “The ability to adjust or modulate [the] frequencies [of the human voice] allows us to communicate in a correct and artistic way with words and sounds...[T]he ability to adjust intonation, inflexion, phrasing, pacing, volume, loudness and timbre [distinguishing speech from print].” He points out that “spoken words through heightened intonations or subtle nuances can communicate...emotions and create a sense of intimacy at the same time”; by contrast, “[p]rint does not allow a learner to identify or interpret audible nuances that personalis[e] content because print cannot stimulate the auditory senses” (para. 2).

Historically, radio has been used in education ever since it became available, for a variety of purposes ranging from on-campus school and university broadcasts to in-service teacher support and training and adult literacy and basic education campaigns (World Bank, 2000). In combination with tutorials, print materials, local listening groups, and face-to-face meet-
ings, radio has been used to teach a wide range of subjects at various levels of the education system.

Audio cassette tapes, and more recently, optical recording media such as compact discs (CDs), have been used as a solution where the ephemeral nature and fixed transmission times characteristic of radio broadcasts (World Bank, 2000) pose a problem, where the audience is geographically dispersed over too large an area (for example, in a distance learning scenario), or where radio air time is simply not readily available. Learners see cassettes as more personal and informal than radio, and cassettes have also been found to be more appropriate than audio for controlled, didactic teaching (Power, 1990, citing Bates, 1981). Kates (1998) proposes the use of voice recordings, distributed on audiotape cassette, to provide feedback to student writing assignments, and discusses the benefits of this method over the traditional, written form, particularly for commuter students.

More sophisticated multimedia elements such as video, animation and interactive media like simulations and games may have a high success rate in terms of boosting attention, motivation and interest, but they are expensive and time consuming to develop, typically requiring a great deal of technical expertise. If well designed, they may be optimised for reuse from semester to semester, but are difficult to create or modify mid-semester to suit the needs of a particular cohort. Digital audio, on the other hand, is cheap and simple to produce and manipulate, due to the availability of basic sound recording and playback hardware and software in homes and educational institutions. This makes a “just-in-time” delivery model possible – Content can be produced on the fly in response to information obtained from formative feedback mechanisms (like the Harvard Minute Papers alluded to earlier in the present paper), enabling educators to address their students’ needs and concerns as they surface.

Moreover, although the portability of other digital media forms is becoming increasingly viable with portable video players, 3G mobile phones and smartphones, the true mobility of students is severely restricted due to the need for visual fixation on a screen. Listening, however, “frees eyes and hands” (Clark & Walsh, 2004) to perform other manual tasks, including doing household chores, walking the dog or driving the car. As such, it is an unobtrusive activity that is able to integrate with other activities in our daily lives.

**Table 2: Strengths and weaknesses of audio (Scottish Council for Educational Technology, 1994)**

<table>
<thead>
<tr>
<th>Strengths of audio</th>
<th>Weaknesses of audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>The equipment is cheap and robust. It is also widespread and familiar.</td>
<td>Access to a player is necessary, restricting portability.</td>
</tr>
<tr>
<td>Audiotapes are easy, quick and cheap to produce and update. As a result there is a high degree of author control.</td>
<td>Complex branching and routing is difficult.</td>
</tr>
<tr>
<td>Tapes are also cheap to distribute and store.</td>
<td>The information conveyed is intangible and, as a result, learners require concentration to absorb facts.</td>
</tr>
<tr>
<td>They are interesting, personal and intimate. They can be used to provide human contact and advice.</td>
<td>It is difficult to absorb complex information, eg a logical argument may be hard to follow and will need confirmation from print or another visual medium for maximum effect.</td>
</tr>
<tr>
<td>They can be used to incorporate sounds and music and can be a powerful stimulus to the imagination.</td>
<td>It can be difficult to find the relevant point of a tape. They cannot necessarily be used everywhere without headphones, eg. in a library.</td>
</tr>
<tr>
<td>They can be used more effectively than print to talk learners through a passage and to document discussions, case studies and language pronunciation at work.</td>
<td>They are convenient to use. There is a large degree of learner control.</td>
</tr>
<tr>
<td>They can be recorded on by the learner and returned to the tutor to provide feedback.</td>
<td></td>
</tr>
</tbody>
</table>
weaknesses of audio as a technology for learning and teaching (Table 2). The shortcomings of audio appear to be in the area of providing complex and/or detailed information that needs to be heavily processed, logically deconstructed, committed to memory, or otherwise requires a great deal of concentration. It is not the authors’ intention to use audio for these purposes. The Council mentions a case study in which as part of a multimedia training package on how to write materials based on occupational standards, Kelvin Consultants included an audiotape as a means of allowing learners to hear about others’ experiences. It is this type of application that audio is ideal and well suited to, and that inspires the research in this project:

Audio is an extremely powerful medium for conveying feelings, attitudes and atmosphere. It is less good at conveying detail and facts. In other words, you will not remember very many facts and figures after listening to a 30-minute audiotape. You will, however, be able to remember general opinions, and arguments. (Scottish Council for Educational Technology, 1994)

PORTABLE MEDIA PLAYERS AND M-LEARNING

The widespread popularity of portable media players, in particular MP3 players and other music-capable handheld devices such as mobile phones and personal digital assistants (PDAs) will help realise the vision of “anytime, anywhere” education. Furthermore, true mobile learning (m-Learning), also termed nomadic learning, is coming to fruition, since these modern devices eliminate the need for transporting physical media like audio tape cassettes and CDs. This is because these devices have their own digital storage capabilities, usually in the form of hard drives or solid state memory (eg. flash memory). Many of these devices are also network-ready, often with wireless functionality already built-in.

The explosive growth in sales of portable MP3 players suggests that these devices are becoming increasingly ubiquitous. The Informa Media Group predicts that worldwide sales of MP3 players will reach 20 million units in 2005, with an average rate of 45 per cent growth for the next six years. They predict that a total of 194 million units will have been produced by the year 2010 (Macworld UK, 2004). Royall (2005) reports that in Australia, the sales of MP3 players, fuelled by the popularity of the Apple iPod (see Apple Computer, 2005a), increased seven fold in 2004. The sale of cheaper imports from China played a part in this growth (Royall, 2005). Already, 13,000 units of MP3 players were sold in the first quarter of 2005 (Sydney Morning Herald, 12 May 2005, Radar section, p. 2).

Clark & Walsh (2004) discuss the psychological advantages of “iPod-learning” in relation to lifestyle and society. Aside from the benefits of portability and ease of use, listening to an iPod or similar device in public is “socially acceptable”. These devices have a tremendous consumer appeal that works to their advantage, particularly for younger students who may be impatient with traditional forms of teaching and learning.

Portable media players have already begun to be adopted in higher education spheres. Since the fall of 2002, various courses at the Georgia College & State University (2005), including a number of study abroad courses, have been “iPod-enhanced” to include a diverse range of audio material ranging from lectures and audio books to language study material and music. In August 2004, Duke University (2005) distributed 20-gigabyte iPods to its 1,650 new students, pre-loaded with orientation information. Administrative as well as academic materials in MP3 format are available for students to download from the Duke web server and via iTunes (see Apple Computer, 2005b). In a significantly smaller-scale project, Drexel University is planning on distributing iPod Photo players, which are capable of displaying digital photos as well as playing music, to its School of Education freshmen in September 2005 (Read, 2005).

PODCASTING: THE NEXT BIG THING?

A new and emerging technology known as podcasting may offer the “best of both worlds” in audio by combining the benefits of the broadcast nature of radio with the flexibility, learner
control and personalisation afforded by recorded audio. Podcasts may be thought of as time-shifted radio broadcasts over the web. Through podcasting, audio content from one or more subscribed feeds (channels) can be automatically downloaded to one’s computer as it becomes available, then later transferred to an iPod or other portable media player, to be listened to at a time and place convenient to the owner. Users who do not have access to a portable music player can simply listen to the content on their PCs.

Podcasting has its roots in RDF Site Summary (RSS – formerly Rich Site Summary, and sometimes also known as Really Simple Syndication). RSS is revolutionising the way we view web-based information, in particular dynamic content. RSS-enabled web sites generate a feed of XML data summarising the content of the site, which may be anything as diverse as news headlines, stories, weather and stock market data, community-specific announcements and discussion board postings. Programs called aggregators periodically poll one or more subscribed feeds for updates and deliver or syndicate them directly to the user’s desktop. RSS content can be filtered based on user-defined criteria, and content can be aggregated from across multiple feeds to suit the specific needs and interests of the user. RSS promises to be a time saver as the user does not have to manually plough through a plethora of sites for relevant content; nor is there a need for the even more tedious process of continually monitoring these sites for updates and additions.

**THE BENEFITS OF PODCASTING**
Podcasting provides a low-cost, low-barrier tool for disseminating content across the Internet. The prohibitively large bandwidth requirements of streaming audio and video, which by definition involves playing this media while it downloads from across the Internet, often lead to poor performance for many users, leading to a “click and wait” situation that negatively affects the quality of the listening/viewing experience. Podcasting overcomes this through what Adam Curry, of MTV fame and one of the pioneers of podcasting, calls “The Last Yard” (Curry, 2004). This involves having a computer continuously connected to the Internet so that content that bandwidth-intensive content can be “dripped in” and made available when ready, thereby eliminating the “click and wait”. In this sense, podcasting has also been likened to a TiVo or similar digital video recorder (DVR) that uses a process of time-shifting to allow for flexible viewing a time convenient to the user.

Other advantages of podcasting include the fact that it is subscription-based and therefore not subject to unsolicited material like spam, and that subscriptions can be added or cancelled at any time. Because podcasting is based on RSS, users can filter and search content downloaded from a single feed, or across multiple feeds, opting to listen to only those podcasts that are of interest to them.

Last but not least, of course, podcasts, being MP3 files, are able be transferred to a variety of mobile devices to be listened to on the move. As mentioned earlier, this promises to make true m-learning a possibility.

**PODCASTING TO ADDRESS STUDENT PRECONCEPTIONS AND ANXIETY: PILOT STUDY AT CHARLES STURT UNIVERSITY**
Based on their review of the literature and their own observations and experiences as tertiary educators, the authors put forward the following theses as a basis for further research:

- Short pre-class listening segments, delivered through podcasting, are more effective than (web or print-based) pre-class reading in addressing students’ preconceptions and anxiety; and
- Podcasting of such audio material can be easily integrated into the professional practice of most university teachers.

The first thesis is based on the premise that student preconceptions must be addressed up-front. Assigning pre-class reading that is improperly planned or without appropriate guidance can do more detriment than good to students’ understanding of the subject matter, and ultimately their confidence. This may lead to a vicious cycle where misconceptions lead to further misconceptions and anxiety.
The m-learning options facilitated by portable MP3 players mean that students are more likely to be able and willing to spare a few short minutes of their “deadtime” (eg. while traveling to and from or walking between classrooms) listening to audio than to read large amounts of text. Conversely, students who fail to successfully complete their assigned pre-class reading, or struggle to fully comprehend it, may come to class feeling ill prepared. This has a negative, compounding effect on their confidence and motivation to learn. Hence the authors propose that it is more educationally beneficial to students to simply whet their “learning appetites” by means of small, “bite sized” audio clips.

Although it is possible for MP3 files to simply be published on a web server for students to download using a standard web browser, or even distributed to students on CD at the start of semester, podcasting allows fresh content to be delivered to students’ desktops and handheld devices, as it becomes available. This makes it possible to tailor content “just-in-time” to suit students’ needs, and promotes a sense of currency and direct relevance of the content to the cohort, rather than distributing “one size fits all” material that is reused from semester to semester.

RESEARCH METHODOLOGY

The research methodology adopted in the project involves an Action Research (AR) case study in two cycles or stages. Stage AR-1 is being used to show “proof of concept” through a pilot study involving students enrolled in ITC125 Information Superhighway. In preparation, a questionnaire and a focus group were conducted with students in the Autumn 2005 offering of the subject, the same cohort mentioned earlier in the present paper. A trial podcasting implementation is being carried out in the subsequent offering of the subject (Spring 2005 semester), beginning in August 2005.

Reflection on the research in AR-1 will result in a revised plan and research questions leading to further actions, observation and reflection in the next stage, as per Kemmis and McTaggart’s (1988) iterative model. Further work in Stage AR-2 will see the project expand to more subjects and involve the development of a resource kit to assist academics and students with podcasting.

RESULTS OF ITC125 AUTUMN 2005 END OF SEMESTER QUESTIONNAIRE AND FOCUS GROUP

In order to obtain an indication of students’ accessibility to MP3-capable equipment, as well as to gauge their willingness to partake in additional material made available in this format, an additional questionnaire was distributed to the students of ITC125 at the end of the Autumn 2005 semester. The results are summarised in Tables 3 and 4 below.

Table 3: ITC125 Autumn 2005 student responses to Question 1 of MP3 questionnaire (N = 26)

<table>
<thead>
<tr>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Do you own or have access to an MP3 player?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>b. If yes, what type?</td>
<td></td>
</tr>
<tr>
<td>Portable audio player (iPod, mobile phone, PDA)</td>
<td>2</td>
</tr>
<tr>
<td>PC (desktop or laptop)</td>
<td>13</td>
</tr>
<tr>
<td>Both</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 4: ITC125 Autumn 2005 student responses to Question 2 of MP3 questionnaire (N = 26)

<table>
<thead>
<tr>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. If additional material (not covered in lectures/tutorials) were made available for download in MP3 format, would you listen to this audio material?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>b. If yes, how many minutes would you be willing to listen to such a recording per week?</td>
<td></td>
</tr>
<tr>
<td>3 – 5 minutes</td>
<td>7</td>
</tr>
<tr>
<td>6 – 8 minutes</td>
<td>6</td>
</tr>
<tr>
<td>9 – 10 minutes</td>
<td>11</td>
</tr>
<tr>
<td>Invalid response</td>
<td>1</td>
</tr>
</tbody>
</table>

All 26 respondents reported owning or having access to an MP3 player. A portable MP3 player, or both a portable as well as a PC-based player, was accessible to half (50%) of these students. Almost all (96%) of the respondents answered “yes” to a willingness to listen to additional audio material made available in MP3 format, and the data would suggest that these
students did not appear to be overly concerned with the length of the material within 3 to 10 minute range.

A number of volunteers from the cohort also participated in a focus group to help brainstorm ideas for the content of the podcasts. The focus group participants raised the following concerns that they had about the subject, which they felt could be addressed through the use of podcasts:

- **Campus orientation** – “finding my way around”;
- **Time management**, i.e. balancing work and play;
- **Following the course content**, taking notes and the fear of missing content;
- **Social aspects of the subject** (seating arrangements, different characteristics of students: talkers, note-takers, etc.);
- **Fears of not being able to talk to anyone**, leading to helplessness;
- **Assignment details and submission procedures**.

**Research Plan for Trial Implementation / Pilot Study in Spring 2005**

The questionnaire and focus group data from Autumn 2005 will guide and inform the authors’ continuing research, including the trial implementation in the Spring 2005 offering of the subject. The authors’ intention is to perform a One Minute evaluation of the students at the beginning of the pilot and at the end of the podcasting experience on the same areas, as per Table 1 above. The “before” and “after” results will then be compared to ascertain whether podcasting had any effect on the preconceptions or anxiety of the students. Interim results will be presented at the conference.

**Initial Thoughts on the Style and Format of the Proposed Podcasts**

In attempting to determine the optimum length of the podcasts to be used in the trial, the authors noted that students who reside on-campus at Charles Sturt University’s Boorooma campus in Wagga Wagga take 8 to 10 minutes each day to walk from their halls of residence or dormitories to the lecture block. Those who travel by university bus spend 10 to 30 minutes in a bus, and those who travel by car will take at least 5 minutes to walk from any of the car parks to the classrooms. This “wasted” time or “deadtime” is too short to listen to a full music album. Hence, the idea of a 3 to 5 minute audio clip became a possibility. This philosophy is consistent with the views of Walsh (2004; para. 6), who advocates designing audio learning material in adherence to the metaphor of a song:

There’s a reason most songs are less than four minutes. If you haven’t gotten to the hook by then, you’re not going to make it in the next nine. People go to the bar during the drum solo. They do the same in their minds when you don’t tell it quick and tell it straight in your learning delivery, whatever the mechanism.

Referring to an analysis of 100 audio tape cassette productions at the Fern-Universität in Hagen (University of Hagen), Germany, Laaser (1986) undertook a classification exercise of these programmes’ designs in hope of assisting educational designers in selecting an appropriate approach:

i. **dramaturgical design**, i.e. the interaction between persons participating;
ii. **the didactic function or teaching objective**; and
iii. **the reciprocal relations to other media and to student activities**.

The authors used this work to help them decide on the design and format of the proposed podcasts. It was felt that the latter two categories are less appropriate for the intended purposes of dispelling students’ erroneous or misapplied preconceptions and reducing their pre-class anxiety levels. The podcasts will not, by any means, act as a primary method of instruction, and will in no way replace face-to-face lectures and tutorials – As mentioned earlier, the intention is not to use audio to teach complex concepts. A far more important design goal is to maximise interest and appeal to students. It was also resolved that, as far as possible, the students themselves should be actively involved in the production of the podcast material.

To this end, it was decided that the podcasts be structured as a series of weekly, 3 to 5
minute talkback radio-style “shows”, with two or more students from the current and/or previous cohort holding discussions on pertinent issues related to the subject and its content in a relaxed and informal style. The lecturer and other subject matter experts may occasionally be brought in as “guests” to offer insight into, or clarification of, the more complex or difficult topics and issues. By listening to background material and being exposed to the terminology used in the subject, such as technical IT jargon, students will be better prepared to participate in formal classes, and to do so with motivation and confidence. The material will also help allay students’ concerns about issues such as the scheduling of classes and the subject’s assessment.

This model appears to be similar to what Gee (1992; 1996) terms socialising into a “Discourse”, and is reminiscent of the “legitimate peripheral participation” of newcomers to a community of practice portrayed by Lave & Wenger (1991). A prototype podcast, recorded with students from the Autumn 2005 offering of the subject, will be presented at the conference.

CONCLUSION AND FUTURE PLANS
The authors believe that the affective and cognitive benefits associated with audio, along with its cost-effectiveness, make it an ideal medium for producing material to address students’ preconceptions about a subject and its content, and to alleviate the anxiety that students bring into the classroom. The proliferation of portable, MP3-capable devices such as iPods opens up exciting new possibilities for mobile learning (m-learning) that will have a high level of social cachet and appeal amongst the target audience, and can deliver educational value in their “deadtime”. It is hoped that the aforementioned pilot study, set to commence in August 2005, will show that these factors, combined with the use of podcasting as a time-shifted, syndicated mechanism to “push” content to students’ desktops and mobile devices as it becomes available, hold massive potential in the way of producing and disseminating pre-class listening material targeted at addressing students’ preconceptions and anxiety, so as to enhance their overall learning experience.

It is also hoped that the pilot study will help answer a number of questions relating to the use of podcasting to address students’ preconceptions and alleviate their pre-class anxiety. Amongst other things, the authors aim to identify the specific types of pre-class listening that are effective in addressing students’ preconceptions and anxiety, from a content perspective. It is envisaged that in part, this will entail delving deeper into content-specific anxieties faced by students within a particular discipline, such as information technology. There is much existing literature on the content-specificity of anxieties in areas such as mathematics and languages (eg. Marsh, 1988); these sources will be of assistance in analysing students’ anxiety to programming and IT/networking terminology, for example.

In the near future, the authors also hope to examine the following areas, possibly in collaboration with other researchers and organisations:

• the use of music to enhance the outcome of the pre-class listening material from a cognitive and affective standpoint, as well as improving its overall appeal;
• the distribution of post-class listening material for revision and reinforcement;
• the application of the technology to collaborative learning and teaching practice, by supporting the sharing of student-generated audio content through a model for community building and knowledge construction;
• the benefits of participation in this type of community in relation to enhancing subsequent face-to-face classes (see Dietz-Uhler & Bishop-Clark, 2001); and
• the use of podcasting to promote inclusiveness for distance education students who are part of a “mixed mode” cohort.

Finally, there are plans within the School of Information Studies, Charles Sturt University, for the development of a resources kit incorporating technical guides or “HOWTO’s” relating to MP3’s and podcasting, as well as a set of best practices for the design, creation and distribution of audio learning objects to act as
supplementary material to address students’ preconceptions and anxiety. It is hoped the resources will ease the integration of these technologies and strategies into contemporary university curricula, and promote their uptake amongst tertiary teachers.

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ONE REALITY OF THE DIGITAL DIVIDE:
An exploration of individual computer lab usage at a regional university in Australia

Dirk HR Spennemann, John Atkinson & David Cornforth
Charles Sturt University

Studies have shown the presence of a digital divide in the community relating to computer access. Universities, eager to embrace the benefits of digital technology, rolled out on-line environments that provided wide-spread benefits, but also potential disadvantages to individuals who were less well off. To mitigate any disadvantages derived from access issues, universities established support systems and programs, through the provision of free access to computer laboratories. But as IT has become more widespread, and the education sector goes through a transition, the question arises whether that still holds true and whether such provision is still necessary. This study looks at the computer lab use at a regional university in Australia to examine how on-campus students use university-provided computer laboratories.


Much has been written about the “digital divide.” Curtin 2001; Leigh & Atkinson 2001, Rooksby et al. 2002, Shade 2003) The issue of whether a gap has opened up between the digital ‘haves’ and the digital ‘have-nots’, has been raised for the English-speaking world for the USA (cf. NTIA 2000, but see Martin 2003), Australia (cf. MacLaren & Zappala 2002; Gibson 2003), Canada (Looker and Thiessen 2003); and New Zealand (Parker 2003) to name a few.

Digital divides have been placed at various dichotomies. At the global level they exist between countries of the developed and the developing world (cf. Spennemann 2004b). At the country level they have been identified such as metropolitan vs rural (cf. Donnermeyer & Hollifield 2003; Looker and Thiessen 2003; Parvathamma 2003); gender (cf. Losh 2003; Kennedy et al. 2003); age (cf. Millward 2003); ethnic composition (cf. Jackson et al. 2003; Parker 2003); cultural attitudes (Jackson et al. 2003; Warschauer 2003; Turk 2003); the level of education (cf. Robinson et al. 2003); disabilities (Williamson et al. 2001); income (Martin 2003); homelessness (Grogan 2003); and household income (cf. MacLaren & Zappala 2002). While some of these issues are being resolved, new variations of the theme are appearing: although existing computer and network performance continually improves, new technologies are being rolled out (cf. broadband and wireless) which leads to new differences between metropolitan and rural locations (Zhang & Wolff 2004).

Access to ICT has traditionally been a major issue in the debate (Curtin 2001, Leigh et al. 2001, Rooksby 2002) and a number of steps
have been taken by various stakeholders to mitigate this matter, including public access to internet and communication technologies (Curtin 2001, Rooksby et al. 2002, Servon 2002) and computer lending schemes (cf. Selwood 2004).

The dramatic rise in the usage and popularity of the Internet in the past decade, with the number of Australian households connected to the Internet increasing from 6% in 1996 to 53% in 2003, has been fuelled by its usefulness to a wide range of sectors of the community (cf. Spennemann in press a and sources quoted therein). The education sector has been an early adopter world-wide, continually pushing the capabilities of the network and it applications. Today, academic life without access to the Internet is hardly imaginable. On-line data repositories, library catalogues, journals and news services, student and financial administration systems (in intranets) as well as on-line supported or solely on-line conducted teaching have become ubiquitous, as has digital communication with fellow researchers, staff and students.

There is substantial rhetoric that the 24/7 availability of the Internet, ie every hour of every day, allows students and academics to study and research independent of normal working hours (cf. Gorman 2003). The underlying assumption to all of this is that students can make use of this opportunity and that there are no barriers posed by inequality of access due to the individual socio-economic position of a student. Universities recognised that while many students may own personal computers, with or without internet access, others may not. In addition, computer access may be required while present on campus, even though the students may own machines located at their place of residence. To alleviate any problems derived from this, universities have established support structures and programs, such as computer laboratories, which provide students enrolled at that institution with free unlimited access to the machines and to all materials held on the intra-nets. Such machines usually also provide access to the internet, with a number of institutions establishing download thresholds beyond which students are being charged for download volume.

Anecdotal evidence at Charles Sturt University has it that there is insufficient access to computer labs. This is reinforced by findings at other institutions (cf. Ballantyne 1998). Studies of computer use by university students looked at questions of e-mail use (Spennemann 1997; Spennemann & Atkinson 2003); data management (Spennemann & Atkinson 2002b); use of web browsers and other programs (Spennemann & Atkinson 2002). While the difference between students originating from metropolitan and rural areas was minor, some gender differences were observed (Spennemann 1996; Spennemann & Atkinson 2002a). The inherent problem with such data is the fact that the digital environment changes rapidly and the findings of these studies may quickly become out of date.

Given the increased rate of computer ownership in Australian households, increasing from 26% in 1991 to 66% in 2003 (ABS 1997; 2003), paralleled by an increase in internet access (ABS 2003; Spennemann in press a), the question arises whether the digital divide between the have and have-nots among the student population is still valid, or whether access to technology is no longer a matter which universities have to consider when developing information technology options for staff and students.

To test this question, this study explores how students use the machines provided in the computer labs of Charles Sturt University, a major regional university in Australia. Elsewhere, we have examined the sessional, weekly and diurnal patterns of computer lab use and have shown that the labs are seemingly under utilised (Spennemann et al. in press) and constructive solutions for the apparent idle time have been found (Atkinson et al. 2005). The earlier study found that students utilise the computer labs mainly during the term period (87%) and further that more than 90% of the utilisation occurred between Monday and Thursday (Spennemann et al. in press). It is now time to see whether this is a factor of the overall number of students or whether individual student predilections play a role. Clearly, some students are technophobes, while others can be classed as ‘power-users.’ In this paper
we will consider the usage patterns on an individual level.

**THE SETTING**

Established in 1989, Charles Sturt University is a multi-campus institution in New South Wales, Australia. It maintains campuses in Albury-Wodonga (with a subcampus at Thurgoona), Bathurst, Dubbo, Wagga Wagga and (as of 2005) Orange, with associated facilities in Goulburn and study centres in additional localities. In 2003, the majority of a total enrolment of 38,365 students studied via distance education (71.8%) with another 10.1% studying bimodal (i.e. some of the subjects are studied in distance education mode). Table 1 shows the breakdown of the on-campus population. On average, on campus students are younger than distance education students, with little age difference between the genders. In Albury, Bathurst and Dubbo the gender balance is skewed towards women, while in Goulburn and Wagga Wagga men are in the majority.

Table 1. Gender and age breakdown of the on-campus CSU student population in 2003 (Spennemann 2004a, mixed mode students added)

<table>
<thead>
<tr>
<th>Campus</th>
<th>Total</th>
<th>Women</th>
<th>Men</th>
<th>Average Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Women</td>
</tr>
<tr>
<td>Albury</td>
<td>1649</td>
<td>67.6</td>
<td>32.4</td>
<td>23.3</td>
</tr>
<tr>
<td>Bathurst</td>
<td>3063</td>
<td>63.0</td>
<td>37.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Dubbo</td>
<td>363</td>
<td>79.1</td>
<td>20.9</td>
<td>26.1</td>
</tr>
<tr>
<td>Goulburn</td>
<td>1562</td>
<td>32.7</td>
<td>67.3</td>
<td>26.3</td>
</tr>
<tr>
<td>Wagga</td>
<td>3199</td>
<td>31.8</td>
<td>68.2</td>
<td>22.9</td>
</tr>
<tr>
<td>Other</td>
<td>959</td>
<td>58.1</td>
<td>41.9</td>
<td>29.4</td>
</tr>
</tbody>
</table>

In 1991/92 students were given e-mail accounts, thus extending the staff e-mail network established in 1990. By 1995 most students were encouraged to use e-mail for communications with their lecturers (cf. Spennemann 1997). Since the early 1990s, various schools at Charles Sturt University also required that students submit their assignments in word processed format. In 1995 Charles Sturt University’s Teaching and Technology Plan envisaged that by 1999 on-line access would be mandatory. The CSU Senate deemed this too ambitious in view of equity issues. In 2001 CSU introduced ‘eBox’ as a digital means of communication between the institution and its students (Burr & Smith 2003). For reasons of equity, academic senate declared that students may elect to opt out of the digital environment, thus requiring the university to resort ‘back to’ paper-based communications. Anecdotally, very few students do so. Since some students do so only for a short time, accurate numbers have never been kept. In 2005 Charles Sturt University passed a policy that beginning with the academic year 2006 all communications with a student be carried out digitally and it will become mandatory that students must be able to access the internet (Smith & Burr 2005).

To overcome cases where on-campus students may be disadvantaged in accessing computer resources due to financial reasons, CSU introduced as early as 1990 a scheme to roll out or make available computers in laboratories for general student use.

During 2003, the period for which the data of this study were collected, computer laboratories contained a total of 463 IBM machines and 99 Apple Macintosh computers available to students in Albury-Thurgoona, Bathurst and Wagga Wagga (the other CSU campuses are omitted here). These machines, which are regularly updated through a lease agreement, are scattered in computer laboratories, media centres as well as central libraries. Access to most of these machines is during business hours only (08:00 to 18:00/21:00), although a number of machines on each campus are accessible 24hrs a day (Table 2).

Table 2. Student Access Computer Infrastructure

<table>
<thead>
<tr>
<th></th>
<th>IBM</th>
<th>Apple</th>
<th>IBM</th>
<th>Apple</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Hours Only</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albury</td>
<td>8</td>
<td>–</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Thurgoona</td>
<td>49</td>
<td>–</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>Bathurst</td>
<td>191</td>
<td>45</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Wagga</td>
<td>96</td>
<td>16</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>344</td>
<td>61</td>
<td>119</td>
<td>38</td>
</tr>
</tbody>
</table>

**THE DATA**

The data used for the study were initially collected with the aim of better understanding the demands student computer laboratories placed on CSU’s Division of Information Technology (DIT), which is charged with providing IT
infrastructure throughout the university. The data represent the individual log-in records for each of the computer laboratories at each of the three campuses. The data collection period ran from June 2001 to June 2003, spanning two (southern) autumn and two spring semesters, as well as the inter-semester periods and the mid-semester breaks.

The data were provided to the authors only after all log-ins were extracted from the log-files and were aggregated into numbers of log-ins per user. At the time of writing only the aggregated data remain available, which provide some limitations as to the questions that can be asked. The data are limited inasmuch as they only recorded log-in events, but not the durations of the log-ins. Thus a student using a laboratory computer for 10 minutes registers the same in the data as a user who spends five hours in front of the machine. We can estimate the average duration by proxy: data from the key server, which provides users with programs (Word, Excel, etc), suggest that the average log in is less than one hour.

Excluded from the initial data capture were log-in data for the Apple Macintosh laboratories. Even though Apple Computers make up about 20% of the total of 562 machines installed at Albury-Thurgoona, Bathurst and Wagga Wagga, (Table 2), data on program usage show that only 1% of the demand for Microsoft Word/Excel/Powerpoint and 2.7% of the demand for web browsers (Internet Explorer/Netscape) originates from Macintosh computers. Macintosh machines have a quite specific user base in the visual arts and educational design world, but not for the general student population. In the light of this small percentage the omission of these lab data does not cause concern in the overall analysis.

Excluded from the analysis were also all non-student log ins (4.9% of all lab logins), caused by formal computer training courses for staff as well as by the casual use of lab computers by staff (academics, research assistants and administrative staff).

**COMPUTER LAB USE**

Overall, the usage frequency of the computer laboratories is very low. The log-in frequency for the years 2001 to 2003 (Figure 1) shows that the pattern for all three years is similar. A sizeable proportion of users logs in only once or twice. The data show a higher percentage of ‘heavy’ users during 2002 than during the other years. This may well be an artefact caused by the circumstance that the 2002 data are comprised of two semesters, while 2001 and 2003 represent only one semester each. As the data only exist in aggregated form by year, this can no longer be validated.

The data shown in Figure 1, only provide the frequency of lab usage, but not the rationale for it. What gives rise to concern is that between 12 and 14% of all students logging into any of the lab computers did so only once in the whole session (or once in the two sessions of 2002). At first such a high percentage makes little sense. However, if we consider that a number of subjects taught include single orientation sessions on generic skills components, such as advanced library catalogue and database use, then these single log-ons can be explained as part of these compulsory sessions. On the other hand, many students require computer facilities to be able to access on-line lecture materials or to access the on-line subject discussion forums.

For the following analysis, these single log-ons have been ignored. It is worth placing the usage into the context of a teaching term. Figure 2 shows data expressed as the frequency of logins per week, using a 15-week semester (2002 data corrected, using a 30-week period). This, of course, assumes that the computer labs are not being used during the residential school break (but see below).

As is evident from Table 3, between 55 and 65% of all students used the computer less than once a week. Less than 10% of all students use the computer labs more than twice a week. These data are, of course, only approximations, as they are based on recorded log-ins. A scenario where a student utilises a laboratory, say in the morning, then logs out and attends a lecture, after which the student logs on again, would result in two separate log-ins. As this influences the interpretability of the data, it need to be stressed that the percentages shown in Table 3 may well overstate actual weekly usage.
One Reality of the Digital Divide

Figure 1. Absolute log-in frequency of students 2001-2003 (in %).

Figure 2. Weekly log-in frequency of students 2001-2003 (in %)
One Reality of the Digital Divide

Table 3. Weekly log-in frequency of students 2001-2003 (single log-ins omitted)

<table>
<thead>
<tr>
<th>Individual Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>56.7</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>9.72</td>
</tr>
<tr>
<td>3</td>
<td>5.53</td>
</tr>
<tr>
<td>4</td>
<td>3.21</td>
</tr>
<tr>
<td>5</td>
<td>1.43</td>
</tr>
<tr>
<td>6</td>
<td>1.11</td>
</tr>
<tr>
<td>7</td>
<td>0.71</td>
</tr>
<tr>
<td>≥7</td>
<td>1.58</td>
</tr>
<tr>
<td>n</td>
<td>5330</td>
</tr>
</tbody>
</table>

The fact remains that well over 50% of all students who access the on-campus computer laboratories do so less than once a week. This represents a significant cohort of on-campus students and represents a reason why the computer laboratories are under utilised.

It is worth noting, of course, that the preceding analysis draws only on those students, who accessed a computer in a computer lab at least once. A breakdown of all log-ins by type of week (teaching vs non teaching) shows that the average student in Bathurst and Wagga Wagga logs in less than once a week (0.81 times a week), while in Albury-Thurgoona log-in occurs 1.6 times a week. The discrepancy between the campuses is significant but may be attributable to the fact that many subjects taught at Albury-Thurgoona have a compulsory participation in on-line discussion forms, which requires students to access the network.

Table 4. Average number of log-ins per student and week (Spennemann et al. in press)

<table>
<thead>
<tr>
<th></th>
<th>During Semesters</th>
<th>Residential Break</th>
<th>Mid-Year Break</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(59 weeks)</td>
<td>(10 weeks)</td>
<td>(27 weeks)</td>
<td></td>
</tr>
<tr>
<td>Albury/Thurgoona</td>
<td>1.57</td>
<td>0.57</td>
<td>0.31</td>
<td>0.19</td>
</tr>
<tr>
<td>Bathurst</td>
<td>0.81</td>
<td>0.22</td>
<td>0.12</td>
<td>0.09</td>
</tr>
<tr>
<td>Wagga</td>
<td>0.81</td>
<td>0.26</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>Total</td>
<td>0.97</td>
<td>0.31</td>
<td>0.19</td>
<td>0.11</td>
</tr>
</tbody>
</table>

One of the questions to be posited is whether a student’s usage of the computer laboratory facilities would change over the duration of his or her three-year undergraduate course. Because the individual log-on IDs were never individually correlated to a student’s year of enrolment, and as the data available to the authors are aggregated, we cannot ascertain differences between first, second and third-year students. An approximation, however, can be provided. Over the duration of the data collection, individual log-on IDs were compared with each other to see whether the same IDs used the labs in consecutive years. These data were provided. The autumn 2003 term is the only semester for which we can determine the percentage of first, second time and third time users (Table 5). As the data are derived from the ‘discovery’ of log-on IDs, they only record that during a given year that ID first appeared in the logs. While the underlying assumption is that the ‘first discoveries’ for 2003 are actually first-year students, some may well be second or even third year students who never used a lab machine before and thus are recorded as new discoveries.

Some general trends are evident. Usage of computer labs was much higher among first year students than among second of third year students. The percentage of students using the lab machines during their second and third year of study remains relatively comparable (with Albury-Thurgoona Campus standing out as different). At the same time, the average number of log-ins increased, in particular during the third year. This seems to suggest a higher reliance of lab machines during the last year of
study, possible caused by the increased volume and complexity of the assignment tasks.

However, the data need to be interpreted with some caution. For Autumn 2003 we can compare the number of students enrolled as on-Campus students (Spennemann 2004a) with the number of individual students who logged in at least once (Table 6). The figures show that for the first and second years more students logged on than those who were enrolled on campus, presumably during the residential school periods. The sessional analysis (Spennemann et al. in press a) showed that the use during the residential school period was low, but nonetheless present (Table 4). During year 1 the number of non-Campus users makes up almost 20% of the total. Only in year three are there fewer logons than on-Campus students. This suggests a substantial use of the facilities by residential school students. It can be posited that the lab usage by residential school students will be limited, however, as most residential schools are of two to three day duration.

Table 5. Lab computer use during Autumn 2003 (first to third year students)

<table>
<thead>
<tr>
<th>Year</th>
<th>All Log-on IDs</th>
<th>Avg logins per user</th>
<th>Single log-ons omitted</th>
<th>Avg logins of logins</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of CSU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>3442</td>
<td>43.1</td>
<td>17.2</td>
<td>2751</td>
</tr>
<tr>
<td>2nd Year</td>
<td>2247</td>
<td>28.2</td>
<td>17.9</td>
<td>1985</td>
</tr>
<tr>
<td>3rd year</td>
<td>2290</td>
<td>28.7</td>
<td>23.9</td>
<td>2111</td>
</tr>
<tr>
<td>Albury-Thurgoona</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>684</td>
<td>40.7</td>
<td>23.7</td>
<td>586</td>
</tr>
<tr>
<td>2nd Year</td>
<td>435</td>
<td>25.9</td>
<td>26.7</td>
<td>388</td>
</tr>
<tr>
<td>3rd year</td>
<td>562</td>
<td>33.4</td>
<td>39.9</td>
<td>535</td>
</tr>
<tr>
<td>Bathurst</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1282</td>
<td>43.6</td>
<td>15.8</td>
<td>1003</td>
</tr>
<tr>
<td>2nd Year</td>
<td>852</td>
<td>29.0</td>
<td>14.3</td>
<td>754</td>
</tr>
<tr>
<td>3rd year</td>
<td>805</td>
<td>27.4</td>
<td>17.7</td>
<td>741</td>
</tr>
<tr>
<td>Wagga Wagga</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1476</td>
<td>43.9</td>
<td>15.4</td>
<td>1162</td>
</tr>
<tr>
<td>2nd Year</td>
<td>960</td>
<td>28.6</td>
<td>17.1</td>
<td>843</td>
</tr>
<tr>
<td>3rd year</td>
<td>923</td>
<td>27.5</td>
<td>19.6</td>
<td>835</td>
</tr>
</tbody>
</table>

Table 6. Number of students on campus and lab computer use during Autumn 2003 (first to third year students)

<table>
<thead>
<tr>
<th>Year</th>
<th>Internal Students</th>
<th>Logon IDs</th>
<th>Logon IDs &gt;1x use</th>
<th>Logon IDs &gt;2x use</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of CSU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>2877</td>
<td>3442</td>
<td>119.6</td>
<td>2751</td>
</tr>
<tr>
<td>2nd Year</td>
<td>1952</td>
<td>2247</td>
<td>115.1</td>
<td>1985</td>
</tr>
<tr>
<td>3rd year</td>
<td>2503</td>
<td>2290</td>
<td>91.5</td>
<td>2111</td>
</tr>
<tr>
<td>Albury-Thurgoona</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>584</td>
<td>684</td>
<td>117.1</td>
<td>586</td>
</tr>
<tr>
<td>2nd Year</td>
<td>401</td>
<td>435</td>
<td>108.5</td>
<td>388</td>
</tr>
<tr>
<td>3rd year</td>
<td>617</td>
<td>562</td>
<td>91.1</td>
<td>535</td>
</tr>
<tr>
<td>Bathurst</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1103</td>
<td>1282</td>
<td>116.2</td>
<td>1003</td>
</tr>
<tr>
<td>2nd Year</td>
<td>758</td>
<td>852</td>
<td>112.4</td>
<td>754</td>
</tr>
<tr>
<td>3rd year</td>
<td>938</td>
<td>805</td>
<td>85.8</td>
<td>741</td>
</tr>
<tr>
<td>Wagga Wagga</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1190</td>
<td>1476</td>
<td>124.0</td>
<td>1162</td>
</tr>
<tr>
<td>2nd Year</td>
<td>793</td>
<td>960</td>
<td>121.1</td>
<td>843</td>
</tr>
<tr>
<td>3rd year</td>
<td>948</td>
<td>923</td>
<td>97.4</td>
<td>835</td>
</tr>
</tbody>
</table>
Table 7. Number of students on campus and lab computer use during Autumn 2003 (first to third year students, weekly users only)

<table>
<thead>
<tr>
<th></th>
<th>Internal Students</th>
<th>Logon IDs &gt;15x use</th>
<th>%</th>
<th>Logon IDs &gt;30x use</th>
<th>%</th>
<th>Logon IDs &gt;60x use</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All of CSU</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>2877</td>
<td>1117</td>
<td>38.8</td>
<td>599</td>
<td>20.8</td>
<td>218</td>
<td>7.6</td>
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<tr>
<td>2nd Year</td>
<td>1952</td>
<td>839</td>
<td>43.0</td>
<td>424</td>
<td>21.7</td>
<td>118</td>
<td>6.1</td>
</tr>
<tr>
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<td>2503</td>
<td>1074</td>
<td>42.9</td>
<td>594</td>
<td>23.7</td>
<td>217</td>
<td>8.7</td>
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<td><strong>Albury-Thurgoona</strong></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>584</td>
<td>294</td>
<td>50.3</td>
<td>180</td>
<td>30.8</td>
<td>77</td>
<td>13.2</td>
</tr>
<tr>
<td>2nd Year</td>
<td>401</td>
<td>224</td>
<td>55.9</td>
<td>146</td>
<td>36.4</td>
<td>50</td>
<td>12.5</td>
</tr>
<tr>
<td>3rd year</td>
<td>617</td>
<td>357</td>
<td>57.9</td>
<td>271</td>
<td>43.9</td>
<td>134</td>
<td>21.7</td>
</tr>
<tr>
<td><strong>Bathurst</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1103</td>
<td>497</td>
<td>45.1</td>
<td>187</td>
<td>17.0</td>
<td>61</td>
<td>5.5</td>
</tr>
<tr>
<td>2nd Year</td>
<td>758</td>
<td>276</td>
<td>36.4</td>
<td>105</td>
<td>13.9</td>
<td>24</td>
<td>3.2</td>
</tr>
<tr>
<td>3rd year</td>
<td>938</td>
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<td>35.0</td>
<td>141</td>
<td>15.0</td>
<td>31</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Wagga Wagga</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>1190</td>
<td>426</td>
<td>35.8</td>
<td>232</td>
<td>19.5</td>
<td>80</td>
<td>6.7</td>
</tr>
<tr>
<td>2nd Year</td>
<td>793</td>
<td>339</td>
<td>42.8</td>
<td>173</td>
<td>21.8</td>
<td>44</td>
<td>5.6</td>
</tr>
<tr>
<td>3rd year</td>
<td>948</td>
<td>389</td>
<td>41.1</td>
<td>182</td>
<td>19.2</td>
<td>52</td>
<td>5.5</td>
</tr>
</tbody>
</table>

To accommodate for this, Table 6 also provides data on the number of log-on IDs with more than one, and with more than two log-ons.

How many students rely on the facilities, and does that percentage change over time? To assess this, only those log-on ID were selected that showed more than 15 log-ons, i.e. used the computer at least once in each week of the teaching term of 2003 (Table 7). This showed that between 38 and 43% of all on-Campus students did so, with some variation between the campuses. Once we consider the usage twice in each week of the teaching term, the percentage drops to 21 to 23%, with the Albury-Thurgoona campus showing by far the highest usage. Both of these, however, can be explained by checking e-mail once or twice a week. To isolate the percentage of really dependent users, only those were chosen that logged on more than 4x a week. This reveals that between 6 and 8.6% of all students are heavy users of the facilities. Inter-campus differences can be observed, with students at Albury-Wodonga three times as likely to be heavy users than students at other campuses. Overall though it does illustrate that less than 10% of students can be classified as heavy users of the computer laboratories (i.e. logging on more than four times a week).

There are two factors that could influence these data: a higher requirement to use on-line facilities by the courses offered at Albury-Thurgoona, or the fact that the Albury campus is in the middle of town, rather than on its outskirts (as are Thurgoona, Bathurst and Wagga Wagga). If the latter were a causal factor, however, it should also manifest itself in increased after hour usage on that campus. That, however, is not the case (Spennemann et al. in press). Thus it can be surmised that it may be the requirements of the courses taught that influence the heavy usage of the laboratory machines.

Overall, with the exception of Albury, where the usage among third-year students was particularly high, the usage drops off after the first year, suggesting that students have access to internet facilities from home, or that the need or desire to use laboratory machines has decreased.

**IMPLICATIONS**

There can be no doubt that computer laboratories are heavily under utilised (Atkinson et al. 2005). An analysis looking at the computer laboratory utilisation in general has shown that
students utilise the computer labs mainly during the semester period (88%) and furthermore that that 90% of the utilisation occurred between Monday and Thursday (Spennemann et al. in prep). If we combine these observations with the results of the present study, namely that 78% to 85% of all students (depending on campus) are utilising a lab computer once a week or less, and that fewer than seven percent of all students rely on the lab machines (as assumed through use more than four times as week), then the presence of a large quantity of lab machines is no longer warranted. Moreover, the analysis of the student usage data no longer supports the notion that computer laboratories are needed to offset equity of access issues. This suggests that this digital divide is closing however it is acknowledged that there are other reasons for this under-utilisation of computers. These reasons could include lack of support for students, students are not required to use computers in their course, and/or students are discouraged from using computers after their initial experience.

This, then, has serious implications for university management in the provision of support systems and programs. Management can now engage in new policy directions. It can be posited that the design and furnishing of current, and especially of computer laboratories should be solely driven by the need for such laboratories as teaching spaces. When not used for class, these machines can be made accessible to casual users, as well as to cluster computing use as discussed elsewhere (Atkinson et al. 2005; Cornforth et al. in press). A small number of machines should be accessible at all times to cater for casual users and passing traffic. An information kiosk design might well be appropriate for this.

The access policy question faced by a university should not be framed in terms of the presence or absence of a computer laboratory facility, but whether the very small number of students reliant on the existence of the laboratories should be catered for in more innovative ways, such as through low-interest loans that facilitate students leasing a laptop computer for the duration of their study. The annual financial loss (if any) incurred to the university through the interest rate differential is bound to be much less than the lease costs of excess machines currently populating computer laboratories. With the move to portable student computing, the university would only need to provide an array of network stations where students can connect with a universities’ intranet.

ACKNOWLEDGEMENTS
The authors are indebted to Clint Zikesh (formerly CSU, Albury, now Mt Hotham) for making available his collection of data.

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Curtin, Jennifer (2001), *A digital divide in rural and regional Australia?,* Department of Parliamentary Library, Canberra.


Spennemann, Dirk H.R., Atkinson, John, Cornforth, David & Zikesh, Clint (in prep) Sessional, weekly and diurnal patterns of computer lab usage by students. Submitted


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THINKING INSIDE THE BOX
Supporting commencing students via the online environment

Liz Smith & Leslie Burr
Charles Sturt University

As distance education grows in popularity, so too does the need to provide adequate levels of student support at an institutional level. The introduction of online technology has meant that student services units can now more effectively support the needs of students studying by distance, in particular the affective needs of students, which have been difficult to address in the past. This paper outlines the development of an online support strategy at Charles Sturt University that aims to reduce feelings of isolation and lack of motivation in commencing students. Program rationale, theoretical underpinning and initial evaluation are discussed.


Distance learning is an increasingly attractive option for students. Geographic location, competing work and family commitments and juggling responsibilities are no longer a barrier to tertiary education, as more students choose courses of study that allow them to progress at a time and location convenient to their needs. Paradoxically, the very features that make distance education attractive to students (no need to attend face to face classes and the ability to study independently) can sometimes become problematic. Issues such as isolation, feelings of loneliness and lack of motivation require coordinated institutional student support in order to ensure that these issues do not overshadow the many advantages of studying by distance education.

Support for students studying by distance education can be broken into three main categories: cognitive, affective, and systemic (Tait, 2000). In the past, cognitive and systemic needs of students have been relatively easy to address. Help desk support and information booklets have been typical examples of student support for dealing with systemic issues. Cognitive support, that is, support that relates to developing learning skills has also been addressed in the past by initiatives such as self-paced study courses, information booklets, and opportunities to attend orientation tutorials on campus. However, support for the affective domain has been more difficult to address. Although once a student self-selects themself as ‘at risk’, many support strategies become available (such as phone counselling, sending information packs etc), this does not address the students who may not come forward and identify themselves as requiring support. In this sense, affective support has been reactive.

The introduction of online technology has enormous potential for enhanced support to students, particularly in the area of proactive affective support. This is particularly true in an environment of mandatory online access. Although the online environment was initially seen as a barrier in itself to some students due
to access problems, once a university is working under a guaranteed rather than assumed online access paradigm, many enhanced possibilities for student support become available.

This paper will outline the current state of play with regard to the support of students studying by distance education, with a particular focus on online support. A specific program of online support for commencing students at Charles Sturt University (CSU) will be described, including the program’s origins, theoretical underpinning, initial evaluations and future plans.

PERPECTIVES FROM THE LITERATURE
The experiences of commencing tertiary students in Australia have received increasing attention in the past decade (McInnis & James 1995; McInnis et al., 2000; Krause, Hartley, James & McInnis, 2005). In an environment of decreased public funding, yet heightened accountability and global competitiveness, it has become imperative to attend to the transitional needs of commencing tertiary students in order to enhance student experiences, increase satisfaction levels and address the complex issue of student attrition (Kift, 2003).

The unique needs of distance education students have also been well covered in the literature (Bates, 2005; Duffy, 2004). Studies suggest that lack of motivation is a significant contributing factor in student withdrawal (Wolcott & Burnham, 1991; Zaveck, 1991; Visser et al., 2002; Ludwig-Hardman & Dunlap 2003). Often contributing to this lack of motivation are feelings of isolation or ‘aloneness’, which some believe is the hardest symptom for educators to combat (McInnerney & Roberts, 2004; Palloff & Pratt, 1999; Ludwig-Hardman & Dunlap 2003).

Research also clearly indicates that distance education students require support services that contribute to: maintaining student motivation, promoting effective study skills, generating a sense of belonging, providing guidance, providing access to resources and answers to administrative queries. (Purnell et al., 1996; Bernt & Bugbee, 1993; Carmichael, 1995; Peters, 1992). Although untested, these support services are widely assumed to positively impact on enrolment attrition (Promitz & German, 1996; Student Services Australia, 1993; Ludwig-Hardman & Dunlap 2003).

It is important to clarify what is understood by the term student support at this point. While those working in the tertiary sector have various understandings of student support, and the various organisational structures within Australian universities reflect these differences in thinking, Tait’s (2000) model is deferred to in this paper. Tait outlines the primary functions of student support as being cognitive (supporting and developing learning), affective (related to the emotions that support learning and success) and systemic (helping students to manage rules and systems of the institution in ways that that support persistence) (Tait, 2003).

Such support is offered outside the formal learning and teaching materials of a course. (This is often referred to as Student Affairs in the North American context.) Student support units, (termed Student Services at Charles Sturt University) are well placed to provide the level of support referred to by Tait as they are in the unique position of being at the intersection of all three areas.

Although there is an abundance of literature regarding both distance education and student services, there is little that relates to how these areas intersect. In a comprehensive literature review, Kretovics (2003) was unable to locate a single article within major peer reviewed journals that spoke of the delivery of student ser-
vices to distance education students. Woodward, Love and Komives (2000) support this view and acknowledge that “distance education is a topic not being addressed by student affairs” (2000, p.31). Further, Barratt (2001) contends that Student Affairs professionals are not taking advantage of the potential afforded by new information technologies, and Ryan (2001) asserts that much of the online learner support provided is systems driven rather than student driven. That is not to say that initiatives are non existent in the area of online support for students studying by distance education, but the area is underreported. Many Student Services units have been based on an on campus service delivery model, and have yet to come to terms with how they will translate these services to the distance education context. Although Tinto (1997) suggests that the most effective and far reaching support for first year students must come from within the faculty, it is worthwhile to consider the potential value of dedicated support units in the context of a student’s university experience. As Ludwig-Hardman and Dunlap (2003) state, lecturers may be ill prepared to provide the required level of support for students outside the content area.

“Learner support services personnel can provide the consistency and individualised attention learners need to be successful in an online learning environment because they are involved with learners throughout their educational experience with the institution… In this way, learner support services can provide scaffolding for success.” (2003, p.9)

Krause (2003) highlights the importance of communicating the results of student support programs to relevant stakeholders, but cautions that in order for the communication to be effective it must be evidence based on monitoring and evaluation. Accordingly, this paper will outline a specific student support initiative and report on the first phase of monitoring, student evaluation and future plans based on this information.

LAYERING THE FOUNDATIONS FOR AN ONLINE STUDENT SUPPORT STRATEGY
At Charles Sturt University it was clear both from a theoretical perspective and from anecdotal evidence, that a strategy was required to reach distance education students in their commencing semester of study. Well known as a time of “high risk” the first semester is often characterised by uncertainty, doubt, confusion and sometimes withdrawal from study. A means of contacting these students to offer support, encouragement, motivation and direction to appropriate resources and information was needed.

Historically, internet access has been seen as a barrier to equitable participation in higher education, particularly for distance education students. Research conducted at CSU has challenged many of the traditional assumptions regarding online access, and has demonstrated that the willingness of a student to gain online access outweighs traditional demographic disadvantages (Burr & Smith, 2003a). Following this research, in 2004, a phone call-out program was established to make contact with students who did not access the CSU online environment within the first 6 weeks of semester. Of the 500 students phoned, no significant access issues were raised. As a result of this research, CSU introduced a policy for students commencing in 2005 of minimum online access. This process and subsequent policy implementation was crucial in ensuring that all students would be able to access the online environment and meant that for the first time, support programs could be developed with the confidence that they would not exclude any of the intended audience due to accessibility issues (Smith & Burr, 2005).

AN ONLINE SUPPORT STRATEGY
The first phase of the CSU online student support strategy and that which is reported in this paper, revolves around the regular delivery of messages of support and information to commencing students during their first semester of study. Building on the work reported by Kift (2003), Visser et al. (2002), and Emmitt et al. (2003), the messages were delivered via the
Thinking Inside the Box: Supporting Commencing Students via the Online Environment

eBox, which is the online delivery point of official CSU communications to students at CSU. The eBox delivery point was seen as preferable to methods used in previous reported studies, as unlike email or post, the eBox has the ability to track student read rates and to ensure message delivery (Burr and Smith, 2003b). The eBox is promoted to students as an essential component of their University studies and they are told that only official and important information will be delivered in this manner. Consequently, any message delivered in this way takes on the McLuhanist significance of the medium (McLuhan, 1964).

Although initially developed as a support strategy for distance education students, the increasingly ‘blended’ nature of student learning and the associated student experience made the support program equally relevant to those studying on campus. Studies suggest that on campus students are spending less time on campus and are possibly less engaged with their studies than in previous years. (Krause et al., 2005). Researchers of distance education also agree that it is the psychological rather than geographical distance that is the issue at hand when dealing with supporting students (Shin, 2003). To this end, it is important to note that all commencing students, irrespective of mode of study, were included in the support strategy.

THEORETICAL UNDERPINNING OF THE eBOX MESSAGES

Based on the following theoretical underpinnings, messages were sent approximately every two weeks. The eBox messages were sent from the Executive Director of Student Services to all newly enrolled students at CSU.

Motivation

Motivation or lack thereof has been described as a major influencing factor in the withdrawal of distance education students from their courses (Tinto, 1997). As such, addressing this issue was one of the main objectives of this component of the online student support strategy. Although more often used in relation to the design of formal instruction, Keller’s ARCS model of motivation (Keller, 1987; Dick and Carey, 1996) was influential in the design of the eBox messages. The model proposes that four major facets be included in the design of any instruction in order to motivate the learner: attention, relevance, confidence and satisfaction. It was these four components that guided the design of the eBox messages. For instance, Keller suggests that gaining the student’s initial attention can be achieved by using emotional or personal information or using human interest examples. To this end, the messages were sent from the Executive Director of Student Services, signalling the importance placed on this program. However, rather than employing the usual formal and informational tone used by the Senior Executive, the messages were written in a personal and empathetic way, sharing reflections of the Executive Director’s own current experiences as she studied by distance and juggled her career and family.

The relevance of the messages was underpinned by a skills competency audit that was undertaken with academic and support staff of CSU. This audit gathered information on the key skills required by students in their first semester of study. Information relating to these skills was sent out at appropriate times throughout the semester ensuring that messages remained highly relevant to students. Confidence and satisfaction were also attended to in the content of the messages and the effect illustrated in student responses such as these:

Thankyou for your reassuring email. I was encouraged as I am constantly by the support at CSU. It is making a difference.

I just wanted to say thank you for your timely, confidence building messages. As somebody who hasn't studied for over 20 years I really appreciate them!

Adhering to the principles of adult learning, as espoused by Knowles (1970, 1980), was also considered important in the development of online student support. Knowles emphasises the importance of setting a climate that is informal and conducive to learning. This philosophy strongly influenced the tone of the messages sent and the subsequent interaction with students. Andragogy also promotes learner participation. In line with this theory,
the eBox messages more often included a direction to an activity or action to complete, rather than just a text-based support message. An example of this strategy was directing students to participate in a near real time moderated web forum on specific issues such as exam preparation and academic skills development.

Timing
The eBox messages were sent out on a fortnightly basis, and were related closely to happenings in the student’s life, for example, first assignment falling due, exams looming. The ‘just in time’ model of message delivery was intended to ‘drip feed’ information at the most relevant times and to avoid the information overload that many students experience during their orientation to tertiary study. It is also important to know that the messages are not only being sent in a timely way but also being read in a timely way. To that end the read rates of the messages were monitored and it was found that approximately 50% of students read the eBox support messages within one week of the send date.

Content
As discussed, the content of the eBox messages was based on aspects of the skills competency audit undertaken for first year students. The information was also selected in order to attend to the three areas of student support as identified by Tait, that is, cognitive (eg. links to resources on academic skills), affective (eg. advice regarding motivation) and systemic (information pertaining to support systems and contacts). Responses from students were also codified into these three areas in order to identify areas that may require greater attention in future iterations of the support program. Although this online support program originated from within Student Services, it is important to note that the content of the eBox messages linked to and related to many areas of the University such as Library, IT and Student Administration. This was an attempt at breaking down the ‘information silos’ that often occur in large organisations. It was seen as more relevant to students to present information in the context of their journey through their first semester rather than as information that related to the organisational structure of the institution.

Awareness
Anecdotal evidence and supporting studies have reported that despite providing extensive student support services, students often remained unaware of their availability (Cain et al., 2003). The eBox messages aimed to ensure that through regular and supportive contact with commencing students, they were fully aware of all possible support and resources available to them.

Quality Assurance
The eBox messages also served as a form of quality assurance for the University’s administrative processes. Messages included content such as “by now you should have received your study packages”. Students experiencing difficulty of delays with areas such as despatch were provided with follow up support details.

Evaluation
The eBox online support strategy was measured through a formal evaluation survey and also from the analysis of individual student responses to the sent messages. Student comments received during the evaluation phase are used throughout this section of the paper.

Online evaluation survey
Nine eBox messages were sent to approximately 6,000 commencing students throughout the first session of 2005. The final message included a link to an online evaluation form. Three hundred and thirty four (334) replies were received, the responses of which are included in table 1.

The messages were proven to be timely in that 96% of respondents agreed or strongly agreed that the messages arrived at the appropriate time. As previously stated this reinforces the “just in time” approach to orientation that has been developed and helped maintain the relevance of the message.

It was important that the program did not diminish the perceived “official” nature of or-
ganisational eBox messages. 93% of respondents either agreed or strongly agreed that the number of messages (i.e. nine over the first session) was “just right”. This finding was further reinforced by the very low number of requests (2) to be removed from those receiving the messages. Interestingly, several post graduate students (inadvertently included in the cohort) sent messages of support for the program.

Table 1: Student responses to online survey (n=334)

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The messages arrived at the appropriate times during my first semester</td>
<td>62</td>
<td>34</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>2. The number of messages sent was just right</td>
<td>48</td>
<td>45</td>
<td>5</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3. The information contained in the messages was helpful to me</td>
<td>46</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>4. The information contained in the messages was relevant to me</td>
<td>43</td>
<td>49</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>5. The messages included links to important information and resources</td>
<td>40</td>
<td>50</td>
<td>7</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>6. The messages made me feel I was a valued member of the CSU community</td>
<td>0</td>
<td>34</td>
<td>6</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>7. The messages made me feel like I had chosen the right institution</td>
<td>50</td>
<td>42</td>
<td>6</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>8. The messages made me feel ‘connected’ to CSU</td>
<td>0</td>
<td>42</td>
<td>3</td>
<td>55</td>
<td>100</td>
</tr>
<tr>
<td>9. The messages made me feel that support was available</td>
<td>66</td>
<td>30</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>10. The messages motivated me to continue my studies</td>
<td>44</td>
<td>47</td>
<td>6</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

The emails and encouragement are great, it makes DE students feel not quite so isolated.

Your message means a lot to me. Thank you and your great team to make my distance study the best.

I just wanted to say thank you for your timely, confidence building messages. As somebody who hasn’t studied for over 20 years I really appreciate them!

Thanks so much for the words of encouragement. So often as a distance student it is easy to feel cut off and overwhelmed by the sheer volume of materials and the lack of hands-on support. It was with a wave of relief that I read your message and realised that you, all at the uni, want us out here to succeed, just as we want to succeed.

You are the first person to actually communicate with me - thankyou

Given that in the development of the messages establishing a level of empathy was an important consideration, responses such as the following were encouraging:

Have you been looking into my house! You described me exactly .... It’s great that we are not alone out here and that CSU understands what we are going through.

How did you know that this assignment is following me around like a bad smell? I think that all the help that CSU offers to its students is terrific.

EVALUATIONS OF eBox responses

Students are able to respond directly to messages delivered via the eBox. Each response
was codified against Tait’s model of student support in order to analyse student reactions, needs and wants, to identify common themes, and to inform the revision of message content for further iterations of the support program.

![Figure 2: Analysis of student responses according to Tait’s (2000) student support framework](image)

Certainly the past focus toward distance education students was to ensure that systemic support was available through a variety of access points with the main focus being on the Student Services Help Desk (via phone, email, web, forums and reception). Increasingly cognitive needs have also been addressed for distance education via services such as “Ask Us”, an online point of contact supported by Learning Skills Advisers. This result however demonstrates that affective needs require a channel of communication which is now provided by the eBox support program.

**Future Plans**

The pilot phase of the online support program and its subsequent evaluation has provided the basis for further development and refinement of the eBox messages for commencing students. While Promnitz & Germiane (1996) acknowledge the dearth of research into the effectiveness of such support programs, plans are underway to carry out qualitative to not only extend the online support program for commencing students, but to conduct qualitative analysis research into the use of such support, and its impact on the overall student experience. Rumble (2000) also argues that the rationale for many student support programs are weakly conceived. However, the knowledge being gleaned form this support program, in particular the student experiences, are providing a solid base from which to continue to develop and deliver sound and well conceived programs of support for students.

Although the eBox messages did not set out to build a community among students, two questions regarding this issue were asked in the evaluation survey in order to judge the nature of the personalisation as perceived by students. In particular when asked whether they felt “connected to CSU”, 55% disagreed and 42% agreed.

Equally respondents did not feel that the messages had made them feel “valued members of the CSU community”. Clearly the support messages are not the correct instrument for building community and if this is to be done, then another less “personal” avenue needs to be found. Plans to address this aspect of student support will be included in the 2006 online support program, as several more elements to the online support environment are added such as chat rooms, group forums and moderated activities. Plans are also underway to initiate the support program prior to the start of the semester. As many students have applied and accepted enrolment into the University several months before semester officially commences, this time will be used to begin building community among student, establish a feeling of connectedness and begin to attend to some of the informational requirements of commencing students.

**CONCLUSION**

In the past, Student Services units have focused on providing support to distance education to address their systemic and to a lesser degree cognitive needs. Historically it has been difficult to support affective support for students not on campus, even though this type of support has been documented as critical to distance education particularly within the first session for commencing students.

Students have an expectation that systemic needs will be attended to as a matter of course. Interestingly cognitive needs do not seem to rate highly in students need for support. Affective needs have been identified as being sup-
ported and indeed students have indicated the importance of these needs.

The student services support program, delivered via the eBox at CSU, has provided an opportunity to support the affective needs of students. Initial evaluation of the program has shown the program to be supportive of those needs together with providing an alternative avenue to support systemic and cognitive needs.

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MORE THAN BEDS
Spirituality, St Martin’s and Students. A Case Study

A W (Bill) Anscombe
Charles Sturt University/ St Martins College

For many, the student experience includes leaving home and family to attend a University. This paper addresses the purpose and mission of the Charles Sturt University, addresses the issue of student needs and the importance of spirituality, briefly details the role of St Martin’s College, considers the issue of the College as community, focuses upon the 2004 St Martin’s College student experience and predicts challenges for the future.


The mission of Charles Sturt University is: Charles Sturt University will be a bold and innovative leader in providing an accessible, adaptable and challenging learning environment to develop graduates and research that meet the needs of its regional, national and international communities.

The University seeks to achieve this mission by committing itself to, and being accountable for:

• providing a student-centred educational environment to develop highly employable graduates who will be able to contribute to the economic, social and cultural life of their University and wider communities and have the capacity for, and commitment to, continued personal and professional development;

• producing high-quality research of significance to its regions and the professions, and of national and international distinction;

• undertaking dynamic and sustainable regional engagement; and

• ensuring effective resource management and generation.

Statement of Values
The key values relevant to Charles Sturt University achieving its mission are:

• the discovery, preservation, refinement, and dissemination of knowledge through teaching, research and scholarly inquiry, which draw strength from each other;

• social justice- equity of opportunity, tolerance, ethical conduct and accountability;

• intellectual independence and freedom of inquiry;

• personal, regional, national and international enrichment;

• economic, social and environmental sustainability; and

• participation, cooperation and collaboration.

Universities, at least in the Western Tradition have origins that have frequently focussed upon spirituality and an early acceptance that spirituality is a key component of the holistic
development of graduates. Notwithstanding the origins of Universities, they are now primarily places of secular learning in which spirituality sits uneasily.

John Ralston Saul, the Canadian academic and “trend thinker” says (1997 p3):

“The portrait of our society is one that is addicted to ideologies – a civilization tightly held at this moment in the embrace of a dominant ideology: corporatism. The acceptance of corporatism causes us to deny and undermine the legitimacy of the individual as a citizen in a democracy. The result of such a denial is a growing imbalance which leads to the public good. Corporatism is an ideology that claims rationality as its central quality. The overall effects on the individual are passivity and conformity in those areas which matter and non-conformism in those areas which don’t”

“What the corporatist approach seems to miss is the simple, central role of higher education- to teach thought. A student who graduates with mechanistic skills and none of the habits of thought has been educated. Such people will have difficulty playing their role as citizens. The weakening of the humanities in favour of profitable specialization undermines the universities ability to teach thought.”

THE STUDENT

Students are human beings – not only “human doings,” and an essential part of a University education is to teach thinking and understanding within a value system that inclusive. In my own field of Social Work, I have coined the phrase:

“If you think and don’t to do- you are use- less;
If you do and don’t think- you are danger- ous;
Fundamental to thinking and doing is be- ing”.

The student may holistically be perceived in terms of intersecting circles. These circles highlight the physical needs of students (food, clothing and shelter); the mental/emotional needs of students (academic programme, mental stimulation, freedom from harassment and stress, security etc); the social/relational needs of students (relationships with peers, opportunity for recreation and rest, relationships with the academic and general staff, recognition of changed relationships in the family of origin, possible development of new family of pro-creation relationships, development of new ways of thinking etc); and spiritual (re-assessing and developing new answers to existential questions, re-considering the integration of new learning with the student’s sense of being etc).

These intersecting dimensions of the student’s life are set within an environmental, political, economic and cultural context which defines, limits and places boundaries upon the student experience. For example, the necessity for many student’s to work to support themselves at University may be a limit on the student’s capacity to develop social or spiritual aspects of his/her life.

THE IMPORTANCE OF THE SPIRITUAL

By spiritual, I mean the broad existential questions of who am I, do I matter, do I have responsibility to others, how am I connected to the cosmos? A University education ought to be a reminder of the enormous diversity of the world in which we live. A recent book by Bill Bryson (A Short History of Nearly Everything) and an outstanding book by the Jewish rabbi, Jonathon Sacks (The Dignity of Difference) have been reminders that the world we live in is complex, unique, brilliant, troubled, joy-filled and creative. I have been reminded as well to the privilege that most of us enjoy and the responsibility that it also brings. Two-thirds of the world’s children are born into families that earn less than AUD$3 per day. Australians with an average income are in the richest 10% of the world. Today’s 30,000 children will die of malnutrition or preventable diseases. Whether, as students studying to be teachers or nurses, agriculturists or information technologists, accountants or business people, artists or radiographers, TV Producers or bio-medical scientists, or social workers or any other of the courses that are offered through Charles Sturt University, the skills and abilities that are developed are for the whole community.
In my own field of Social Work, textbooks (eg Zastrow’s 7th Edition) are recognizing the essential need for spirituality. The recent International Federation of Social Workers Conference had a theme and multiple presentations on spirituality from a range of religious and non-religious perspectives. Bolman & Deal (2003) in Reframing Organizations, state:

An organization, like a temple, can be seen as a sacred place, an expression of human aspirations, and a monument to faith in human possibility. A temple is a gathering place for a community of people with shared traditions, values, and beliefs. Members of a community may be diverse in many ways (age, background, economic status, personal interests), but they are held together by shared faith and a spiritual commitment to one another. In work organizations, faith is strengthened if individuals feel the organization is characterized by excellence, caring, and justice. Above all, they must feel that the organization is doing something worth doing - the work is a calling that adds something of value to the world. Significance is partly about work itself, but even more about how the work is understood…… Spiritual leader's help people find meaning and faith in work and help them answer fundamental questions that have confronted humans of every time and place: Who am I as an individual? Who are we as a people? What is the purpose of my life, of our collective life? What ethical principles should we follow? What legacy will we leave?…..Spiritual leaders offer the gift of significance, rooted in confidence that the work is worthy of one's efforts and the institution deserves one's commitment and loyalty. (p404-406).

Charles Handy, British oil executive, management scholar, best selling author, radio commentator and social philosophy argues in “The Hungry Spirit,” that the search for meaning applies to individuals and to institutions.

A student experience that does not seriously offer the opportunity to consider the spirit is a lesser experience that denies capacity and stifles development.

Harry Blamires popularised the expression “the Christian mind” in a publication in 1963 (reprinted in 1997) that has had wide influence. By a Christian mind he was referring not to a mind occupied specifically with religious topics but to a mind which could think about even the most secular topics christianly (that is from a Christian perspective). It is not a mind of a schizoid Christian who hops in and out of the Christian mentality as the topic of conversation changes from the bible to the daily newspaper. The Christian mind he writes is “a mind trained, informed, equipped to handle data of secular controversy within a framework of reference which is constructed of Christian presuppositions”. Blamires goes on to list what he sees as the six essentials marks of a Christian mind:

1. Its supernatural orientation (it looks beyond time to eternity).
2. Its awareness of evil.
3. Its conception of truth.
4. Its acceptance of authority.
5. Its concern for the person (recognition of the value of human personality against servitude to the machine).
6. Its sacramental cast.

David Gill in his book “The Opening of the Christian Mind” proposes an alternative cluster of six characteristics which marks the Christian mind namely:

1. Theological (focussed on God and the Word).
2. Historical (informed by the past, responsibly alive to the present and thoughtful about the future).
3. Humanist (deeply concerned for the person).
4. Ethical (submissive to God's moral standards).
5. Truthful (committed to God's self-revelation in nature and Scripture).
6. Aesthetic (appreciative of beauty as well as truth and goodness).

ST MARTINS COLLEGE
The College was established in 1992 through the vision of the Right Reverend Barry Hunter (Anglican Bishop of Riverina), and the generosity of Mr. George Tassell, whose bequest made possible the building of the first cottage and St. Mary’s Chapel.
The college is the first non-University provided accommodation on the Wagga Wagga campus. I represent a genuine partnership of the secular (the University) and the religious (the Anglican Church).

The Name
The College was named after the Anglican Church in Moulamein, where George Tassell worshipped for many years. St Martin is a Saint from the fourth century and is best known as the Bishop of Tours, France. Notably, he cared for the poor, fought for truth, spread the good news of Jesus Christ and lived simply. Matin was conscripted into the army when he was fifteen. It was while he was in the army, on a bitter winter day, Martin saw a near naked man at the city gate trembling from the cold, begging for charity from passers by. Seeing that the passers by took no notice of the man, Martin cut his cloak in two pieces. He gave one half to the beggar and wrapped himself in the other half. While he was sleeping that night, Martin saw Jesus dressed in the piece of cloak he had given away. He heard Jesus say “Martin has covered me with his garment”.

The name and the story encapsulate the interest of the College. St Martin was in the secular (military), he responded to local need with compassion and self depreciation. He responded individually when others did not. He responded graciously. The “otherness” endorsement and a sense of significance were Martin’s outcomes (and half a coat!!).

The Mission
The Mission of Saint Martin’s College Incorporated is a proclaim at the Christian message, faith and values as expressed by the Anglican Church, by an active presence which supports quality education and is a catalyst for advocacy and challenge to all members of the University Community at CSU Riverina.

In particular, the College respects the inherent dignity and worth of every human being and seeks to ensure that, within the scope of its work, human and social liberties are safeguarded.

It seeks to equitably deal with all people, displaying standards of honesty and integrity, respecting confidentiality and fairness where there are competing demands.

It seeks to contribute to the CSU, Riverina educational plan by providing maximum opportunities for people to study and succeed in undergraduate and post graduate courses.

It seeks to live the Christian message, faith and values.

It seeks to have clearly outlined priorities through a triennial plan with annual review.

Interestingly, the mission statement does not mention anything to do with housing, residential facilities or brick and mortar infrastructure.

The College seeks to be inclusive and value people of all faiths or no faith. It eschews any notion of separateness- but like St Martins – seeks to be in, and of use to, the surrounding community. It seeks to develop the whole student.

The College today
The College has grown from 8 residents in 1992, to a current capacity of 88. The college offers accommodation, pastoral care and social activities for the residents during the academic year.

The College has 11 cottages, with 8 bedrooms per cottage. They are fully air conditioned and heated. Each bedroom has a bed, cupboard, phone, desk, chair, small refrigerator, rubbish bin, doona, pillow and bed linen. Also, the bedroom has a data point connection to enable those with a computer to connect with the World Wide Web. Every cottage has a kitchen and a common room. The kitchen has a convention microwave oven and gas cook top. There is also a freezer. Each resident has a lockable food storage cupboard in the kitchen. Each cottage has a washing machine and clothes dryer.

St Martins College Board
The St Martin’s College Board has overall responsibility for the college. There is one Student Representative Position on the College Board. The Board has 4 appointees from each
of the two Anglican Diocese and a University appointee as well as 2 Board nominees.

The College Staff
The Head of the College is responsible for the administration, management and pastoral care of the college. The Head of the College is full time and lives on site. The Administration officer is part-time.

There are three Senior Students (Residential Advisors). They assist in pastoral care and have current first aid training. The Senior Students take on special responsibility for Academic, Sporting, Christian and Social development programs.

St Martin’s College as Community
St Martin’s is a special place. While it exists as a home for students that takes care of physical and social and mental/emotional issues whilst they are at the University, the college is more than bricks and mortar- being a community of people living, working, dreaming and learning altogether. Communities are relational, interactive and mutually inter-dependent. The Board sees that the community of St Martin’s has the potential to shape future leaders of Australia and the world as a whole.

The College seeks to develop a community. Community is a concept that can be constructed in different ways. Some writers use the term to mean a geographic entity defined by physical boundaries such as a neighbourhood or locality. Others use the term to refer to common attributes which are used to identify membership (eg Christian community, gay and lesbian community, Goths, etc). The term is sometimes used to define both attributes and locality (Ashmont, Community of the Redeemer; Turvey Park Parents and Citizens Association).

Plant, in his book Community and Ideology, offers a systemic examination of the problems of the usage of the term community, emphasising the distinction between “descriptive” and “evaluative” elements in the use of the term. The evaluative ideological assumptions of the user of the term must be seen as integral.

Community can be locality, social activity, social structure and/or a community of sentiment (eg shared beliefs). Whatever the definition, the two fundamental communal elements of any social system are a sense of solidarity and a sense of significance. These two elements of community are closely linked. Rarely can a person feel a sense of belonging without also gaining a sense of significance.

The strengths- based approach and /or a narrative approach to working in communities have been advocated. Moving away from a focus on deficits these approaches note the importance of ‘solution focused stories’ which are more likely to produce transformations than complaint focused stories. In communities, how particular situations are perceived will depend upon the leadership, the people involved, time and context.

An underlying theme is the question of what constitutes a community that can care effectively for its members. Kenny (1995) makes the point that community is essentially a subjective notion and that we define community as what we experience as community.

Ife (1995, p.90-91) talks about community as ‘a form of social organization’ with human scale (i.e. a size where interactions are readily accessible to all); identity and belonging (a sense of rights and responsibilities); ‘gemeinschaft’ (people can interact with each other in a variety of roles and as whole people); and culture (local culture expressing the unique characteristics of that community).

Communities can best be understood as organic rather than mechanistic; dynamic and interrelated with the environment, rather than constant in structure and form. Each community has its own attributes, depending on the local social, economic, political, cultural, and environmental and person/spiritual characteristics.

Community building refers to strengthening social interactions within a community by bringing people together and helping them to communicate in ways which build genuine dialogue, understanding and potential for social action. The fundamental principle of community building is empowerment and participa-
tion. Participation is seen as a key 'tool' in community development with Slocum & Thomas-Slayter (1995pg5) writing that it is "a process of employment (that) can help to amplify traditionally unacknowledged voices. It can strengthen the confidence of all members of a group in the knowledge and capacity of each and may foster the ability to question and contribute to both local and international systems of knowledge'. This involves consciousness raising and knitting together " a shared understanding of problems and a vision for the future that leads to commitment and ownership by the community'(p.5).

**THE 2004 STUDENT EXPERIENCE AT ST MARTINS**

In 2004, the residence of St Martin's recorded their student experience year for the St Martin's Annual dinner. This was a student-initiated project that reflected the concern for all aspects of the student experience – physical, social, academic and spiritual. I am very grateful for the student leadership and cohesiveness and energy that lead to this production. The DVD enabled students from a variety of courses (especially the TV Production programmes) to showcase both their year in review but also the talent and learning that is part of the University. As well as the DVD, students developed a parallel production of a St Martin's student magazine.

The student-produced DVD highlights the physical (much is centred around food and the buildings), the mental/emotional (as evidenced by the study and work aspects of the DVD), the social/relational (as indicated by the value and significance placed on community, shared experience and the sense of identity, sport, trivia nights, balls etc) and the spiritual (as evidenced by the Bible studies, the issues nights, the linkages with Churches and community activities including the Cancer Council Relay for Life etc). This is a masterly way of students recording their student experience.

The DVD has been used with the College Open Days for potential supporters and donors. This has provide a very valuable link between the student experience and the experience and interests of non-students. Its acceptance has been universally positive.

**FUTURE CHALLENGES**

A number of challenges face St Martin’s in the development of the college and the enhancement of the Student experience. The challenge to keep the focus upon the development of community while needing to ensure the physical and financial future of the College is significant.

The College has a history project in development as it comes towards its fifteenth year of operation. As part of the development of significance and solidarity, it is time to remember and reflect on its outcomes and achievements and celebrate the achievements of its current and former residents.

The Anglican Church has moved rapidly to the notion of an eco-church and there is opportunity for St Martins to develop an eco-cottage that provides a theology and a practical expression of that theology through the physical and social and communal infrastructure.

The opportunity exists to build small communities within the larger St Martins Community with the smaller communities having the opportunity for specialisation. In the future, there may be cottages that pool economic resources in order to meet their living and infrastructure costs but find ways to share their social and financial resources to the benefit of a third world project (eg child sponsorship etc). There may be cottages that take on responsibility for a community garden or have a focus upon music or drama etc.

The College has the opportunity to offer diversity through its residential mix and to build cross-disciplinary solutions to the increasing complex issues of our society. It offers this opportunity to explore diversity from a position of a stated and secure value position.

**CONCLUSION**

St Martins is a partnership between the Church, the University, the Board, the wider community and most importantly the students. The student experience is multi-dimensional
and inter-dependant. It is life-affirming rather than life-denying. It is as much about giving, as getting. It is inter-dependant in the areas of physical, social/relational, mental/emotional and spiritual. Whole people require whole-person experiences.

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