Aligning Information Literacy with the Faculty Teaching and Learning Agenda

RICHARD DEARDEN, JULIAN DERMOUDY, CHRISTINE EVANS, LEON BARMUTA, SUSAN JONES, REGINA MAGIEROWSKI, JON OSBORN, JANE SARGISON and DAVID WATERS

ABSTRACT In 2004, the Faculty of Science, Engineering and Technology at the University of Tasmania undertook a project to evaluate students' information literacy skills and to get a picture of how and where information literacy is taught in the faculty. This paper outlines how relationship-building between the Science Library and faculty led to the project, the context of the project within a range of faculty teaching and learning initiatives, and the effectiveness of the survey instruments. The paper will also show how the project has aided the expansion of information literacy teaching across the faculty and how it will lead into further teaching and learning initiatives.

The Science Library at the University of Tasmania (UTAS) was established in 1999 as the result of the amalgamation of two, smaller branch libraries, and is situated in Hobart's main campus, Sandy Bay. The Faculty of Science, Engineering and Technology (SET) is a major client of the Science Library and is made up of 12 schools and six research units. The faculty teaches and researches in a range of disciplines comparable to those offered at larger Australian universities.

The establishment of the Science Library provided an opportunity to reinvigorate outreach to faculty and information skills teaching, both activities having been dormant or low-key for some time. This reinvigoration occurred at a time when, in the Australian higher education environment, there was a move

Richard Dearden Morris Miller Librarian, University of Tasmania Library, Hobart, 7001. Email: Richard.Dearden@utas.edu.au

Dr Julian Dermoudy Lecturer in the School of Computing, University of Tasmania, Hobart 2001. Email: Julian.Dermoudy@utas.edu.au

Christine Evans Science Librarian, University of Tasmania, Hobart 2001. Email: Christine.Evans@utas.edu.au

Dr Leon Barmuta Lecturer in the School of Zoology, University of Tasmania, Hobart 2001. Email: Leon.Barmuta@utas.edu.au

Associate Professor Susan Jones Lecturer in the School of Zoology, University of Tasmania, Hobart 2001. Email: S.M.Jones@utas.edu.au

Regina Magierowski Research Higher Degree Candidate in the School of Zoology, University of Tasmania, Hobart 2001. Email: reginam@utas.edu.au

Dr Jon Osborn Lecturer in the Centre for Spatial Information Science, University of Tasmania, Hobart 2001. Email: Jon.Osborn@utas.edu.au

Dr Jane Sargison Lecturer in the School of Engineering, University of Tasmania, Hobart 2001. Email: Jane.Sargison@utas.edu.au

David Waters Lecturer in the Flexible Education Unit, University of Tasmania, Hobart 2001. Email: David.Waters@utas.edu.au

away from library-centred ownership of information skills training, toward a shared ownership with faculty for teaching information literacy.

This transition has not come about without initiative, energy and a shared commitment from both librarians and academics to improve the teaching and learning in their universities. Librarians and academics from most faculties at UTAS have discovered this shared commitment in each other. Since this discovery, relationships and collaborative efforts have developed between science librarians and academics in SET. The library has become part of broader faculty and school teaching and learning initiatives. Collaboration between academics and librarians has produced pockets of good practice and useful models of information literacy teaching.

Good relationships, shared commitment and emerging models of information literacy teaching led to a SET information literacy project in 2004. This project recognises the need to embed information literacy skills (ILS) into the curriculum and to teach ILS in a structured and incremental manner appropriate to the discipline.[1] Two survey instruments were developed: one based on a QUT survey to measure the current information skills of students; the other to map the explicit teaching of ILS across the faculty. Both instruments were linked to the information literacy outcomes in the *Australian and New Zealand Information Literacy Framework (ANZILF)*.[2]

The project is the first step toward a strategic, faculty-wide approach that aims to ensure that all SET students develop information literacy as part of the broader range of generic skills. The project has already had an impact on improving information literacy teaching within SET and is informing a current teaching and learning project on generic attributes.

Relationship Building and Collaboration: A Short History

Building a Case for Teaching Information Skills
In 1999 the Science Library injected new life into its information skills program by targeting first-year undergraduate students and, at the other end of the continuum, honours and research students. This initiative achieved three things: it met the information skills needs of strategically important groups; was central to the library's outreach strategy; and provided an insight into the information skills level of its client groups.

A zoology first-year unit was the only first-year unit in SET with an information skills component, and one of few delivered to undergraduate SET students as a whole. The information skills component included an assessable worksheet that was marked by librarians. The results of the worksheet provided an insight into the effectiveness of the program; for example, only one third of the group demonstrated a sound ability to formulate effective search strategies.[3]

The library used the student results data to produce a report that reflected on the effectiveness of the program and the skills of students.

At the same time workshops for honours and research students and staff provided an opportunity to gather feedback from participants and another perspective for librarians to observe the skills levels of participants. Similar to the zoology program, formal feedback was used to develop reports on the initiative.

The experience with undergraduate, honours and research students enabled the library not only to reflect on the effectiveness of its initiative, but perhaps more importantly to build a case for the faculty to become involved in expanding the teaching of information skills and to improve the way information skills were taught.

The reports were central to discussions with individual academics, in staff meetings and other faculty forums. In this way the library signalled its interest in teaching and learning and its eagerness to work with academics. There were tangible outcomes of these discussions and the responsiveness of academics. In 2000, programs were introduced in first year agriculture, third year plant science and third year chemistry.

These outcomes indicate that the library had been able to show, by documenting experience and feedback from training and teaching initiatives, that students' grasp of information skills was tenuous. The library had gone some way to building a case for information literacy skills as a teaching and learning issue – not just a library issue – and established relations for further collaboration.

Emergence of a model for vertical integration of information literacy

In 2001 there were two significant developments that were a fillip to the information literacy agenda. On the national front there was the publication of the CAUL Information Literacy Standards, and at UTAS, the introduction of Generic Graduate Attributes. The graduate attributes included information literacy as part of problem solving skills, which are recognised as underpinning the knowledge and communication attributes.[4] The standards provided learning outcomes that could be adapted to teaching and learning; the graduate attributes identified core skills that should be embedded in teaching and learning.

Reflecting the pedagogy of these initiatives, the School of Zoology collaborated with the library over a period of time to include information literacy in a key second year unit and also in an entirely new, third year unit. These initiatives provided an opportunity for students to develop the skills introduced in first year. Subsequently, students in a third year unit were introduced to EndNote as a way of supporting their organisation of information for a major research assignment. This prepared the students for their honours

project and altered the goals of the honours workshop to accommodate the changing experience of undergraduate students.

The vertical integration of information literacy in the zoology undergraduate curriculum is now achieved through the introduction of first-year students to the scholarly information infrastructure and methods for finding information; exploring information in the context of communicating science in the second year Tasmanian Fauna unit; confronting issues and controversy in the context of scholarly communication in evolution, ecology and society; and learning how to use information management software for a major third-year research assignment (Evolutionary Biology and Biogeography).

The success of the collaboration between the School of Zoology and the Science Library established ingredients of good practice for students to build their information literacy skills – customised for a specific discipline and units, embedded into curriculum, linked with assessment and developed incrementally.

The value of evaluating and reporting on initiatives is demonstrated by the uptake of information skills teaching in the early stages of the science information skills program. The achievements of the collaboration between the library and School of Zoology was reported at the UTAS Teaching Matters conference in 2003[5] and formed the basis for a paper delivered at the Lifelong Learning Conference in 2004.[6]

Teaching and learning in the Faculty

In the late nineties there was no learning development unit at UTAS. At that time, teaching innovation was carried out at a grass-roots level, professional development was undertaken and teaching issues were discussed in staff-initiated forums. In 2001, the Pro Vice Chancellor Teaching and Learning Division was created and funding was made available for major teaching and learning initiatives.

The Scientific Communication Project was one such initiative funded by the division. It was a major achievement in drawing together academics from across the faculty, learning developers and librarians. The projected outcomes were to improve the writing skills of students through the production of online teaching modules, by developing the teaching skills of academics and by embedding the teaching and learning of these core skills into the curriculum. Professional development occurred through meetings of the Project Reference Group and other interested staff, and provided a forum for academics to present, critique and learn about current practice in a supportive environment. These forums also provided an opportunity for librarians to learn about teaching issues and to introduce the concept of information literacy as a part of scientific communication. The CAUL Information Literacy Standards were presented by the Science Library in a context of scientific communication and research

method, coupled with the emerging model of incremental skills teaching in the School of Zoology under development at that time.

The highly successful Scientific Communication Project pooled the commitment of academics, learning developers and librarians, and established a model of cross-faculty collaboration for embedding generic skills into the curriculum. On the strength of its success a core group from the project proposed a follow-up project entitled *An Undergraduate Information Literacy Initiative to Strengthen Research Led Teaching*.

The aim of the project was to develop a more systematic approach to the explicit teaching of information literacy skills across the sciences, building on established programs and pockets of excellence. The project proposed three interconnected initiatives:

- information literacy curriculum incrementally developing students' skills from years one to three
- self help tools for staff explicitly modelled on, and to extend, the science communications project, and
- an undergraduate journal of science engineering and technology as a focus for the research-teaching nexus and the engagement of students in research-led learning.

It was envisaged that the project would take a similar approach to the Scientific Communication Project, by developing the teaching skills of academics, embedding information literacy in the curriculum and producing teaching tools. In this way the outputs of the projects would interlock and complement each other.

While the proposal was not successful in getting funding in this form, two important components of the original proposal did receive initiative funding as separate projects:

- evaluation and assessment of information literacy skills of science students: a pilot study (discussed below), and
- the *Undergraduate Journal of Science Engineering and Technology*.

The *Undergraduate Journal of Science Engineering and Technology*, conceived as the crowning piece of the original information literacy proposal, aims to provide a model for the teaching-research nexus in the undergraduate faculty curriculum by encouraging academics to incorporate learning outcomes related to information literacy, research methodology and the effective communication of scientific research into undergraduate teaching.

These projects, undertaken in 2004, show how far the information literacy agenda had progressed in the past several years and how information literacy

has started to become accepted by academics as central to teaching and learning in SET.

The Project: Evaluation and Assessment of Information Literacy Skills of Science Students: A Pilot Study

The information literacy project is significant in that the project was driven by SET academics and, as discussed above, is integral to the SET teaching and learning agenda. The project team was made up of academics from the Schools of Computing, Engineering, Zoology, Geography and Environmental Science and the Flexible Education Unit, the Science Librarian and the library's Information Services Coordinator.

The project is grounded in current theory of teaching in higher education, recognising that there is a need for curriculum alignment of generic skills where there is correlation between learning objectives, content and assessment.[7] The project also builds on the local experience of teaching ILS in the School of Zoology which aims to be incremental, iterative, embedded and assessed[8] and includes information literacy as a set of generic skills that get students to think critically.[9]

The underlying questions that the project sought to answer were

1   how to determine what skills SET students already possess? and
2   how can ILS best be taught and assessed within the context of the specific discipline?

To answer the first question, the project adapted a survey instrument developed by QUT Library, which aimed to identify students' knowledge, skills and information-seeking behaviour.[10] At UTAS the survey had two sub-aims: to investigate whether there are discipline-specific differences in students' ILS across the faculty, and to see if students' knowledge and skills improved from years one to three.

To answer the second question, staff teaching undergraduate units across SET were surveyed – the first systematic study of how ILS and associated assessment practices are incorporated into the faculty's programs. This survey also used the information literacy core standards outlined in the *ANZILF* and all questions were linked to specific standards.

The Student Survey

The UTAS SET survey reduced the size of the QUT survey and revised the questions to match the target disciplines: engineering, zoology and computing. The questions were linked explicitly to the *ANZILF* standards, in order to test the students' knowledge and skills against these standards.

The surveys were discipline-specific so that students are asked questions couched in the context of terms familiar to them. This approach complies with

that taken by the CAUL Information Skills Survey: 'that assessment of individual skill in information literacy should be within the context of the discipline.'[11]

The 15 question survey asks students to answer multiple choice questions to indicate how they would act in a given situation. Eleven of the questions aim to compare actual practice with awareness of the 'correct' practice by requiring students to indicate what they would do as compared to what they should do in a certain situation. As with the QUT survey, we aimed to focus on information seeking behaviour as well as students' knowledge and skills. A total of 377 students participated in the survey: engineering: 171; zoology: 148; and computing: 58. A full report of the research methods and results is available elsewhere.[12]

To provide an idea of the insight that the survey results have given us, the results of questions that aimed to test aspects of three standards are selected: determining the nature of information needed, finding needed information, and using information with understanding as it relates to ethical and legal practice.

Determining the nature of information needed (Standard 1.2)

Students were asked to indicate their first action when undertaking a literature search for any essay topic. While a majority of computing and engineering students indicated that they would start with a search of the World Wide Web,

Figure 1
### Starting a Literature Search (Standard 1)
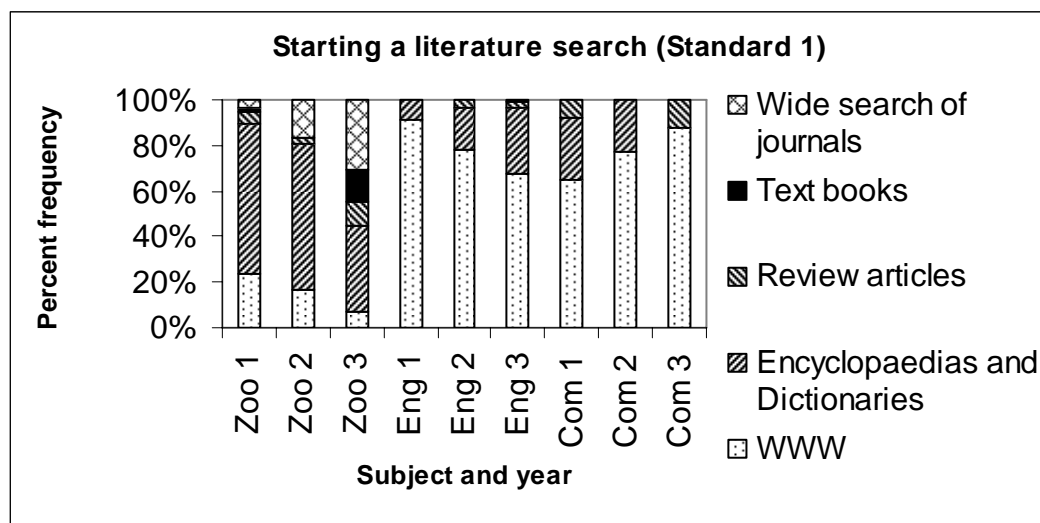
Zoology students indicated that they would start with a variety of scholarly information sources, with approximately 60 % of first and second year students choosing to look for background information or an overview of a subject

(Figure 1). This result was comforting for zoology lecturers and the Science Librarian because first-year students complete an information skills activity in that semester that requires them to access information from dictionaries and encyclopaedias.

Finding needed information (Standard 2)

This question tests the students' understanding of Boolean logic in database searches, and asks students to select the strategy that retrieves the highest number of citations. The black-and-white correct answer is the search phrase using the Boolean 'or' operator. As a whole, students did quite poorly, with less than 60% correct answers from all but one group (Figure 2). This result is significant in that Boolean logic continues to be a skill that evades students, although essential for exploiting vendor databases that are fundamental information seeking tools.

Figure 2
Search Strategy to Retrieve the Highest Number of Citations (Standard 2)
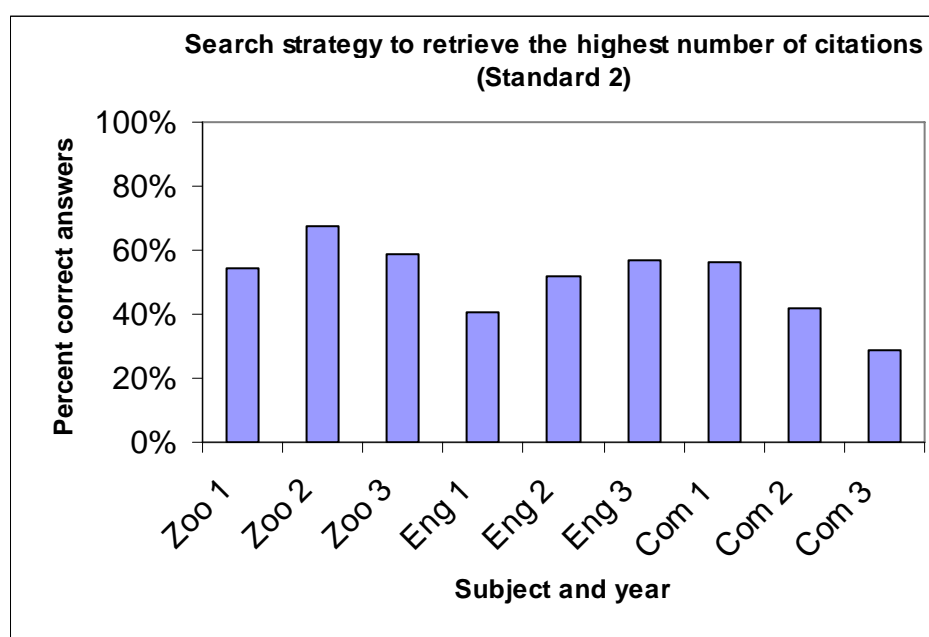

Using information ethically and legally (Standard 6)

This question asked students how much of a book can be copied, and demonstrates the usefulness of asking students what they should do and what they would do as a way of gaining an insight to actual behaviour. There was a very low rate of correct 'should' answers, with less than 50% of most groups answering correctly – ie photocopy no more than 10% or one chapter. Of the

50% that answered correctly as to what they should do, less than half indicated that they would actually comply with the copyright requirement (Figure 3).

Figure 3
Compliance with the 10% Rule
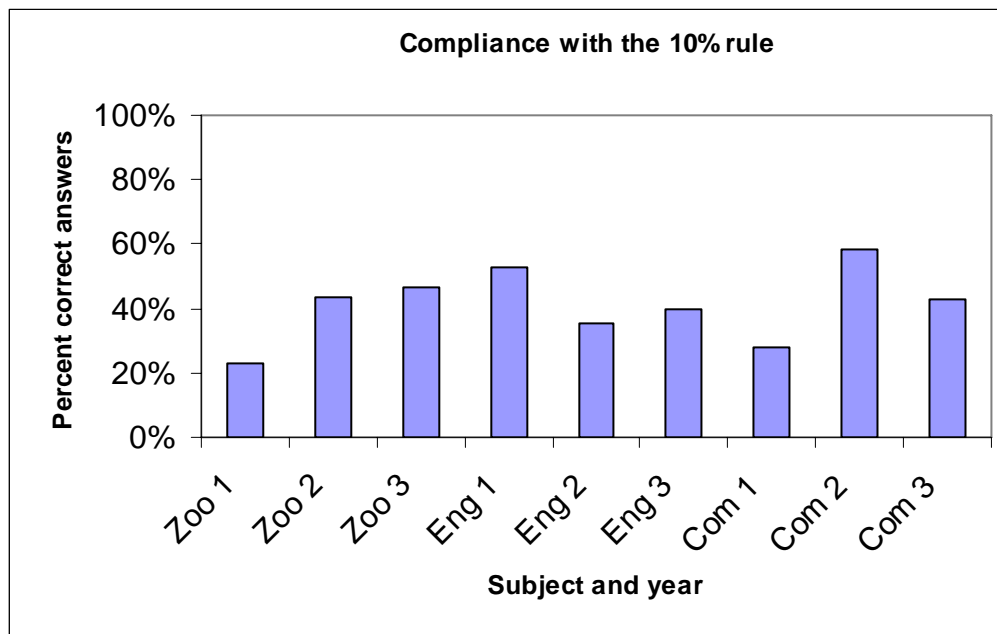
These results are useful in that they provide us with a picture of student knowledge and behaviour. They also force the question of how the applicability or appropriateness of information seeking skills and behaviour will vary between disciplines. For example, it is probably quite appropriate for computing students to go to the web when starting a literature search, while zoology students will depend more on traditional scholarly information sources.

Regarding the sub-aims of the survey, where we sought to detect a difference between the disciplines and over the years, the results were not so clear. They did not show statistically significant differences between the subjects or the years. However, the results do indicate that there was a trend for zoology students to do better in terms of choosing the correct answers, and that there was a trend for an improvement in the number of zoology students selecting the correct answers over the three years.

These trends are detectable in the analysis of the results when questions are grouped according to the standards they test, and the number of correct answers is averaged. Figure 4 relates to ILS Standard 2 (the information literate person finds information effectively and efficiently) and shows a tendency for zoology students to have a higher percentage of correct answers, and to improve over the years.

Figure 4
Standard 2 – Average Number of Correct Answers
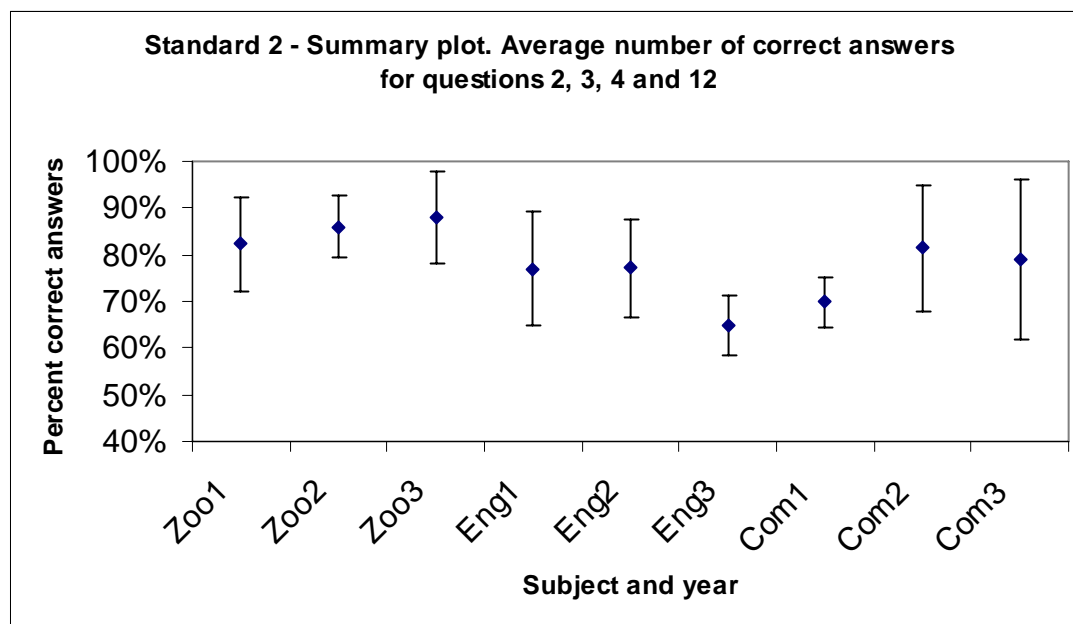**for Questions 2, 3, 4 and 12**

Figure 5, relating to ILS Standard 6 (the information literate person… acknowledges cultural, ethical, economic, legal and social issues...) also shows this tendency. The picture gained from this analysis is less bleak than the results of the copyright question above seems to indicate.

The results of this analysis – by grouping and averaging correct answers – should be interpreted with caution, as the questions have not been fully tested for validity, and the differences were not statistically significant.

The results of the survey do provide an insight into the students' skills overall and provide some guidance for SET to improve teaching of ILS and for informing further teaching and learning initiatives in SET. The project team plans to undertake another survey in the second half of 2006, to see if improvement in teaching ILS has made a difference. In this way the survey results are very useful, and we are confident that the survey is sufficiently reliable to detect a change in students' skills.

To achieve the sub-aims of the survey – to detect differences between disciplines and improvement between years – the survey was not so successful because of the lack of statistical significance. However, the analysis of the survey provides indicators where improvements can be made to survey questions. The other issue possibly contributing to the lack of significance is the number of students surveyed, and larger sample groups are required.

Figure 5
Standard 6 – Average Number of Correct Answers
for Questions 5, 6, 7, 11 and 15

Standard 6 - Summary plot. Average number of correct answers for questions 5, 6, 7, 11 and 15.
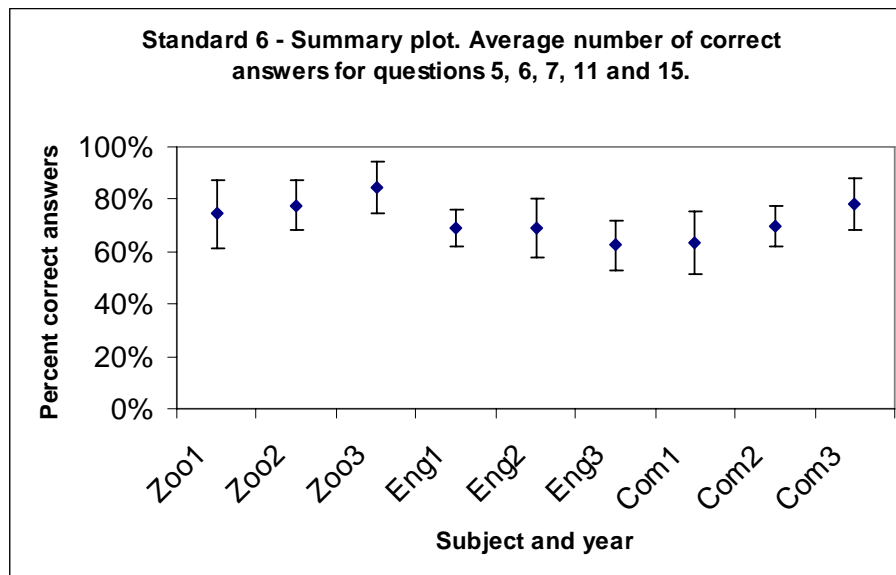
The Teaching Survey

The survey of undergraduate teaching staff in SET complements the student survey and aims to create a picture of how information literacy skills are explicitly taught in the faculty. The survey form listed and described each of the information literacy standards. For each standard, and for each unit they coordinated, teaching staff were asked to indicate if the standard was explicitly included in their unit's learning objectives, content, and assessment.

Venn diagrams were used to summarise the staff survey data. Data for each information literacy standard were separately collated for each school. This allowed diagrams such as that shown in Figure 6 to be compiled. The data in Figure 6 show that, for one school, amongst eight units surveyed, six explicitly included information literacy standard 3 in the learning objectives, content and assessment; while two explicitly included standard 3 in the content and assessment, but without an explicit statement in the learning objectives. No units were classified into any of the remaining combinations.

Figure 6 is a Venn diagram showing the number of units that explicitly included Information Literacy Standard 3 in a statement of learning objectives, the teaching content, or the assessment. These data are for all units surveyed in one school (Psychology). Sets of Venn diagrams were constructed for:

• each literacy standard within each school for each year of study (1st to final year units)

- each literacy standard within each school across all years of study, and
- each literacy standard across all schools and across all years of study.

These provided a faculty-wide summary of the inclusion of teaching for each standard, and allowed comparison between standards, between schools and across years.

Figure 6

**Literacy Standard Three. Across all Years.
School of Psychology.**
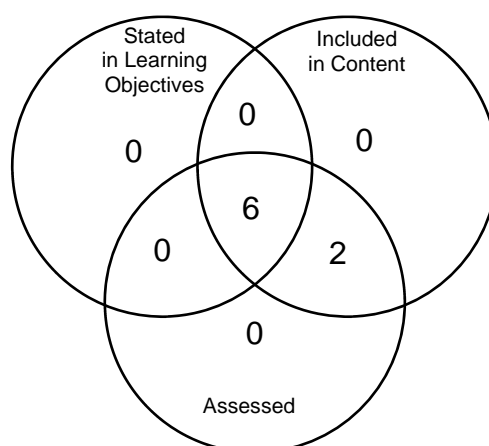
A likely starting point for discussion of a curriculum might be that certain literacy standards should be introduced early in the curriculum and should be stated explicitly in a unit's learning objectives, content and assessment. Those literacy standards might later in a course 'migrate' to being assumed knowledge, and so no longer appear in the learning objectives and content, but still form part of the assessment. These simple diagrams, derived from the survey data, provide an effective tool for describing the way in which information literacy is appearing in current curricula, and provide a tool for mapping information literacy into a planned curriculum.

To date the results have not been fully analysed, but they will allow the project team to build a picture of the extent to which the various aspects of information literacy are being taught, and to look for any significant differences between schools and across years. The analysis will also be useful to compare with the results of the student survey and inform the Generic Attributes Project currently underway.

Our experience is that the teaching survey form provides a useful tool for collecting sufficient data to explore the ways in which information literacy standards are being explicitly incorporated into teaching. In this first iteration,

we concentrated on *explicit* evidence, rather than implicit teaching or assessment. This, of course, led to some discussion amongst the team designing the form, and also staff completing the form, with the boundary between explicit and implicit difficult to define. If we were to repeat the survey, it is likely that we would attempt to tease out this issue more clearly.

The teaching survey was distributed to all staff in the faculty and relied on voluntary completion and return. The participation rate was not high: 21 staff responded to the survey with data collected for only 62 of the units offered across the faculty. There is a likelihood that the data are therefore biased, given that staff who choose to contribute may not be representative of the entire faculty. This is not of great concern to the current project, because our primary objective is to develop tools for measuring the teaching and learning of information literacy, rather than to collect baseline data. A better sampling strategy is required if representative data is to be assured. Acknowledging these limitations, the survey form and the subsequent classification of data have provided simple and effective tools.

Outcomes of the Project

Outcomes of the project can be assessed at a faculty and school level. At the faculty level, information gained in this project has highlighted some disparity across the faculty in approaches to teaching ILS. These may reflect discipline-specific requirements of students but may also reflect differences in teaching priorities between schools.

At the school level, the results of the student surveys have highlighted some areas of concern that need to be addressed with more proactive, explicit teaching of ILS. In first semester 2005, the School of Computing rewrote a core first year subject to incorporate a range of generic skills. The information literacy component was developed by the lecturer and the liaison librarian for computing.

Involvement in the project by the current Science Librarian has prompted a review of the goals of the zoology ILS program. The Science Librarian aims to align learning outcomes more explicitly with specific ILS standards (not just 'information skills') appropriate at various levels of study. The need to review assessment methods has also been made apparent by the survey results and this review is underway with individual units. The project has also highlighted the difficulty in reaching all zoology students in first year, as no single unit is undertaken by every zoology student. In order to ensure a strong ILS foundation, teaching will need to be extended to other first year units in SET.

The project has resulted in the development of an instrument for evaluation of students' ILS. Further comparisons of results across year cohorts will allow evaluation of the effectiveness of our teaching strategies. This will become more

important as new ideas on teaching ILS are incorporated into the faculty's curricula.

The experience and findings will inform the faculty Generic Attributes Project currently underway. The Generic Attributes Project team includes some of the academic staff and the Science Librarian from the information literacy project.

Having developed the survey in collaboration with QUT Library, there is an opportunity to continue the collaboration to refine the instrument and to compare student results between the institutions. The student surveys can also be used in conjunction with a future CAUL Information Skills Survey (ISS) that is validated for science (currently the CAUL survey has only been validated for social science and law). The ISS Administration Manual recognises the importance of using results of the ISS in conjunction with other data.[13]

Conclusion

This paper demonstrates the benefits of sound, consistent liaison and outreach initiatives by librarians to discover and explore shared teaching and learning interests with academics. The case study shows the importance of evaluating and reporting on library initiated teaching and learning programs and using this experience to develop and consolidate collaborative relationships with faculty staff.

At UTAS, the information literacy agenda has been progressed in SET by engaging academics and participating in the core teaching and learning agenda of the faculty. The academic-driven information literacy project has provided important groundwork for developing a project to embed generic attributes as a whole in the SET curriculum.

The benefits of evaluating student information literacy skills are also apparent in the results of the survey, especially when analysing results in the context of the staff survey results. By providing a picture of current student skills and teaching practice, the surveys will help librarians and academics review teaching practice, and will be useful for assessing outcomes of improvements to teaching. The survey may also provide a model for evaluating a broader range of generic skills.

Finally, the project has been a professional development opportunity for the project team members, from both the academics' and librarians' perspectives, has deepened relationships between the library and SET, and consolidated the Science Library's position in SET's teaching and learning agenda.

Acknowledgements

Notes

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