

Integration of information literacy training into engineering and technology education

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Abstract:

Information literacy has become an important skill for undergraduate students due to societal changes that have seen information become a valuable commodity, the need for graduates to become lifelong learners, and the recognition that information literacy is an underpinning generic skill for effective learning in higher education. This paper describes a sequence of purposefully designed activities to help students learn and practice information literacy skills that were integrated into a first-year engineering and technology study unit as a core element of the unit syllabus. A formal evaluation of these activities was planned and undertaken in semester 1 2003.

Introduction

Information literacy has become an important skill for undergraduate students due to societal changes that have seen information become a valuable commodity, the need for graduates to become lifelong learners to remain effective across their working lives, and the recognition that information literacy is an underpinning generic skill for effective learning in higher education. We will describe a sequence of activities and technologies designed to help students learn and practice information literacy skills. These activities have been purposefully designed, and integrated into a first-year engineering and technology study unit as a core syllabus element. A formal evaluation of the information literacy elements of the Deakin University School of Engineering and Technology unit SEB121 was planned and conducted in semester 1 2003. These evaluative activities are a corollary of the quality assurance and accountability outcomes emerging from the higher education and professional bodies.

The Importance of Information Literacy

There are many conceptions of what is meant by 'information literacy' (Klaus, 2000), including, "...the ability to access, evaluate, and apply information effectively to situations requiring decision making, problem solving, or the acquisition of knowledge" (Young and Harmony, 1999). The Council of Australian University Librarians has adopted the following definition from the American Library Association, "...an understanding and set of abilities enabling individuals to 'recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information'" (Council of Australian University Librarians, 2001). There are a number of factors that make information literacy an essential skill, particularly for students in higher education.

Developments in information and communication technologies (ICTs) have had (and will continue to have) a profound impact on modern society and culture. Hence, it can be argued that information literacy is now an underpinning 'liberal art' that students require to not only operate effectively during their undergraduate studies and in their future workplace, but also to play an active and critical role in broader society (Blakeslee et al., 2001, George et al., 2001).

It is now recognised that if graduates of higher education are to operate effectively over their entire careers, not just immediately post-graduation, then they need to become 'lifelong learners'; "Discipline specific skills in many areas have only a short life, and what will be needed in even the medium-term cannot be predicted with any great precision." (Higher Education Council (Australia), 1992). Lifelong learning includes all formal, informal and occasional learning throughout life (Candy et al., 1994). Advances in technology, knowledge and society require that engineers, as much as any professionals, must become lifelong learners to deal with these changes. To become lifelong learners as graduates, students need to be appropriately prepared in their undergraduate studies. Many universities have explicitly identified the strategic link between information literacy skills and being an effective lifelong learner post-graduation.

The focus in the last decade on quality assurance and accountability in higher education has lead directly to a focus on the 'outcomes' of higher education, including issues such as graduate employability and graduate attributes (Higher Education Quality Council (UK): Quality Enhancement Group, 1996).

The idea of graduate attributes generally encompasses two main types of student achievement:

- i) the attainment of a discipline- or field-specific body of knowledge; and
- ii) the attainment of more general, or generic, attributes which might be common to all, or most graduates.

Many universities now include information literacy, either explicitly or implicitly, amongst their graduate attributes/outcomes identified in teaching or strategic plans.

In the case of undergraduate engineering education, required graduate attributes are also identified by the professional body that accredits undergraduate engineering programs, in Australia this is the Institution of Engineers Australia (IEAust). Engineering accreditation bodies around the world are moving toward systems based on demonstrated graduate attributes and competencies, and away from systems based on rigidly prescribed course contents. The IEAust course accreditation manual includes the following required 'generic attributes of a graduate' that imply information literacy competency:

“... ”

- ability to apply knowledge of basic science and engineering fundamentals;...
- ability to undertake problem identification, formulation and solution;...
- expectation of the need to undertake lifelong learning, and capacity to do so.” (Institution of Engineers Australia, 1999).

Elements in the Delivery of Information Literacy

Naturally, the library plays a central role in the development and application of information literacy skills for students. However, this role cannot easily be abstracted from the learner's context. This includes both the discipline the student is studying and the mode in which the student's learning is mediated (ie, are they a face-to-face student, are they an off-campus student, are they an on-line student, etc?). It has already been noted that information literacy is an underpinning skill for effective learning, however, in practice, it is often 'integrated' into an existing curriculum or syllabus. This can lead to the simplistic view that it introduces 'extra objectives' into the curriculum and is not a core part of the study unit (Bruce and Candy, 2000). If we accept that information literacy is a key element of professional preparation, then it needs to be considered systematically in curriculum design (George et al., 2001). There are a number of important elements to consider in the design and delivery of information literacy training to undergraduate students.

Collaboration between academic and library staff is essential for the effective planning, development and delivery of training and resources to assist students in the development of information literacy. Information literacy is an essential graduate attribute, and libraries are the principal providers of the relevant discipline knowledge and information resources. However, students normally complete their study in the context of an academic course offered by a faculty or school. Hence both areas must cooperate to deliver these skills to the student (Orr and Wallin, 2001).

If information literacy activities are to be effective, they need to be properly planned; hence the collaboration between academic and library staff needs to commence with the planning of such activities. Library staff can provide input on program guidelines from information literacy professional associations, and academic staff can provide input on the characteristics of the learners and their learning context (Moran, 1998). Once the desired aims and learning

outcomes have been identified, the process of achieving them that is suitable for the individual academic situation must be established (Orr and Wallin, 2001).

Generic approaches to information literacy have been reported by students as lacking relevance (Hill and Woodall, 1999, Orr and Wallin, 2001). It is reported that information literacy, while a generic skill, needs to be interpreted and delivered in the context of a student's specific discipline if it is to be effective (George et al., 2001). So, while we may refer to information literacy as a 'generic' skill because of its underpinning support of all study, it is not really a global, context-free attribute of all students irrespective of study discipline. Each discipline has its own unique 'literacies', and even within a discipline, 'information literacy' may encompass a range of sources and strategies (Candy, 2000).

Information literacy training delivered when students have an immediate need for it in their studies is likely to find students highly motivated (Fjallbränt, 2000) and/or be most effective in teaching these skills (Hill and Woodall, 1999). If the training in, and/or use of, information resources involves on-line elements, and the students' study context also incorporates on-line elements, then it may be possible to directly link on-line information literacy training and/or links to access on-line information resources to study unit web sites (Hill and Woodall, 1999, McCarthy, 2001). Where training focuses on the use of electronic information resources, such training should demonstrate database resources that are appropriate to the students' discipline area (Tenopir, 2002). While the development of generic skills such as information literacy is encouraged by presenting them in a discipline context, it is also suggested that information literacy training must incorporate a balance between cognitive/theoretical and practical skills (Moran and Gibbs, 1999). The most effective learning environment for information literacy development is perhaps not just a discipline context, but also a practical context; activity is important to reinforce theory (Blakeslee et al., 2001).

In many engineering programs, particularly at Deakin University, off-campus and mature age students are a large and important component of the undergraduate student body. Through twinning partnerships with overseas education providers, students studying 'off-shore' are a growing student segment in engineering at Deakin. As the diversity of the undergraduate student population grows, there is a need to consider how information literacy skills training can be effectively designed and delivered to these various student groups (Moran, 1998, Orr and Wallin, 2001). It is recognised that on-line delivery of information literacy training is one way to address the needs of students who cannot attend face-to-face classes, and while off-campus students may be the principal beneficiaries of such on-line training, it then becomes available to all students who have access to the on-line learning environment, regardless of their mode of study (McCarthy, 2001).

While on-line resources can offer greater flexibility in the 'place of offer' of information literacy training, another closely related aspect of the increasing 'client focus' in teaching and learning is flexibility in 'time of offer' (McCarthy, 2001). The undergraduate engineering curriculum is notoriously full, and even for on-campus students (and especially for off-campus students) having information literacy training available on-line/on-call for use as required can be helpful (Hill and Woodall, 1999). The move in many areas (including engineering) to project and problem-based learning means that students may be actively seeking information related to their studies. In this situation however, there is unlikely to be a particular point in time for a formal information literacy exercise that will suit all of the students in a given class. In this circumstance, on-line information literacy training can help (Fjallbränt, 2000). One final aspect of 'timeliness' of information literacy training that relates to on-line delivery is the ability of on-line training materials to be updated promptly to

reflect changes in the discipline of information literacy, the supporting technologies, or the student's discipline requirements.

As both course materials and information literacy instruction move on-line, it is possible to provide both direct links from inside on-line course materials to on-line information literacy materials stored elsewhere, or to embed/integrate the on-line information literacy instruction directly into the on-line course materials – examples of both approaches can be found (Hill and Woodall, 1999, McCarthy, 2001, Tenopir, 2002). There exists guidance for the developers of such on-line information literacy resources to facilitate student usage and learning, such as navigation options for both new and experienced users, and the inclusion of interactivity to allow students to practice and self-assess their skills (Orr and Wallin, 2001).

The Deakin University Engineering and Technology Program

The Deakin University School of Engineering and Technology offers three-year Bachelor of Technology (BTech), four-year Bachelor of Engineering (BE), Masters and Doctoral engineering programs in flexible delivery mode. The undergraduate programs are delivered in both on-campus and off-campus modes. Deakin aims to ensure that its graduates are information literate (Deakin University, 2000). The engineering and technology study unit SEB121 Fundamentals of Technology Management is a first-year/first-semester unit that aims to provide an early element of this information literacy training, as part of the transition for students into university study. Experience elsewhere has shown that information literacy skills development is an important element of the transition into university for many students, and was ranked by students as the most valuable aspect of one 'first year experience' study unit (Blakeslee et al., 2001). At Queensland University of Technology information literacy classes are now an official component of their student orientation program (McCarthy, 2001).

In partnership with the School liaison librarian, a range of academic content, student activities and assessment have been incorporated into the unit as core elements, with the aims of:

- exposing and orientating students to the facilities and services offered by, and accessed through, the Deakin University Library ('the Library');
- exposing students to the rationale for, and the practice of, citing their information sources;
- providing general information literacy training;
- providing training and practice in using specific, discipline-relevant, on-line databases;
- encouraging students to become systematic and habitual users of the information sources available to them;
- providing easy access to information sources; and
- catering for the needs of both on- and off-campus students.

Figure 1 and the following section provide an outline of the information literacy elements of SEB121.

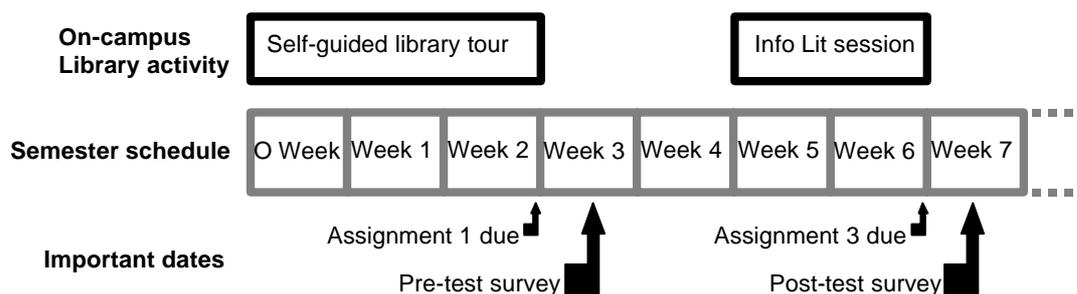


Figure 1 – Outline of the information literacy elements of SEB121

Orientation week (or O-week) is the week prior to the commencement of the formal semester. As part of the engineering and technology activities in O-week for on-campus students, a series of presentations are run. In one of these presentations the School’s liaison librarian addresses the students to provide an overview of the Library services and to invite students to participate in a self-guided Library orientation tour. As part of this tour, on-campus students must book a time to attend, navigate themselves around the Library using a printed guide, and complete an on-line interactive tutorial on using the Library catalogue. Experience has shown that students prefer a self-guided tour in preference to a session led by a staff member. This initial introduction to the Library is voluntary, but is considered important, so students are offered a small reward (some stationery items and a voucher for a coffee at a campus restaurant) and a Certificate of Participation on completion of the tour. The interactive tutorial also provides some information that is required to successfully complete the first item of assessment in SEB121. The approach of providing an informal library orientation tour as part of O-week is documented elsewhere (Hill and Woodall, 1999). The self-guided tour remains available for the first two weeks of the semester, so that any students unable to attend in O-week are able to complete it prior to the due date for the first assignment. For off-campus students there are Library orientation resources available on-line which, again, involve the students completing the interactive tutorial on using the Library catalogue, so that they can complete their first assignment.

The second item of assessment, a topical written report, did not relate directly to information literacy, however, many students will have used the Library as a source of reference material for this report. An important element of this is exposure to, and practice with, systems of referencing, including formats for referencing on-line sources of information.

The third item of assessment for SEB121 requires on-campus students to attend a ‘Library Information Literacy Skills Session’ where students meet in small groups (no more than 15 at a time) with the School’s liaison librarian. The assessment element of this activity requires students to individually produce a formatted bibliography of references that they could use in the completion of the fourth item of assessment for SEB121 (which is a topical/informative report on any issue relating to engineering/technology). The bibliography produced must contain at least two textbooks, two periodicals and two web sites. This information literacy element is designed to provide a discipline-specific follow-up to the more general self-guided tour, purposefully held physically inside the Library, in a small group situation, with hands-on practice of the theory presented in the session, requiring students to practice different types of references, and completing an exercise that will not only fulfil their immediate

assessment requirement, but also directly assist them in the completion of their next assignment. The model adopted here is reported as the emerging trend for science librarians in the US, that is, "...for library instruction to be short (an hour or so), offered to first- and second year students...The classes should be tied as much as possible to specific courses, covering a resource or two that will be immediately relevant" (Tenopir, 2002).

Off-campus students cannot normally attend this library session in person, but have available to them a comprehensive on-line Library skills/information literacy tutorial known as the Smart Searcher tutorial (Churkovich and Oughtred, 2002). Smart Searcher includes interactive tutorials on the following topics:

- the Deakin Library web site;
- searching using the catalogue;
- performing Keyword catalogue searches;
- understanding your research topic;
- referencing;
- finding journal articles; and
- searching the Internet.

Completion of the tutorials requires students to interactively demonstrate their basic mastery of the tutorial topics above. While the Smart Searcher tutorial is generic in the sense that it is designed for students from any discipline, in the context of the third and fourth assessment tasks, this knowledge is immediately put to practice in the discipline area of the student. The Smart Searcher tutorial is available on-line to all students at any time, so on-campus students can also access any part of the tutorial that might be of value to them.

It has been suggested that academic staff and students view assessment from opposing directions; academic staff consider first what is to be taught and then how learning can be assessed; while students first identify what is going to be assessed and then identify what they need to learn (James et al., 2002). If information literacy activities are not assessed, there is a risk that students will give a higher priority to those items that are. It is further suggested that, "Assessment of information literacy in undergraduate education is essential...for faculty members and students to address the skills required to achieve information literacy" (Catts, 2000). Examples of assessment weightings for engineering information literacy activities can be found in the literature – five percent of a unit grade (Moran and Gibbs, 1999), and eight percent of a unit grade plus a further five percent for a project bibliography (Hill and Woodall, 1999). For SEB121, the self-guided Library tour has no direct assessment value, however, there is a non-grade reward (stationery items and a coffee voucher) and completion of the on-line tutorial element of the tour provides students with information required to successfully complete the first assessment item for the unit. The third item of assessment is a bibliography produced on the basis of attending either the on-campus Library session or completing the off-campus on-line tutorial. This bibliography accounts for five percent of the unit grade, and is linked to the successful completion of the fourth assessment item, which is a topical report worth 15 percent of the unit grade. The aim here is not direct compulsion to complete the information literacy activities for unit marks, but to imply and demonstrate that the information literacy activities have an inherent and pervasive value in the completion of a wide range of learning and assessment activities.

Project Evaluation

A formal evaluation of the information literacy elements of SEB121 was planned and conducted in 2003. Approval was sought and received from the Deakin University Human Research Ethics Committee (DUHREC) to conduct an evaluation exercise with the following elements:

1. a formative/qualitative evaluation of the self-guided Library tour – the on-campus session for on-campus students, and the on-line tour for off-campus students;
2. a formative/qualitative evaluation of the information literacy session – the on-campus session for on-campus students, and the Smart Searcher tutorial for off-campus students;
3. a pre-test/post-test evaluation of student knowledge/skills in basic information literacy in recognising common types of references – before and after the information literacy session.

Item 1 and the pre-test were combined in a questionnaire delivered after the end of the availability of the self-guided tour and prior to the information literacy session; item 2 and the post-test were combined in a questionnaire delivered after the information literacy session – see Figure 1. With both questionnaires, general demographic information was also collected, to permit confirmation that sample groups were representative of the class population, comparison of responses between major demographic groups in the class, and comparison of responses between the two questionnaire respondent groups. As required by DUHREC, the questionnaires were voluntary and anonymous. There are examples in the literature of the use of pre-test/post-test competency tests to evaluate the quantitative effectiveness of information literacy training, combined with questions seeking qualitative responses to assess student perceptions of information literacy exercises (Blakeslee et al., 2001, Churkovich and Oughtred, 2002).

At the time of the initial questionnaire the class enrolment was 134, and 66 completed questionnaires were returned, giving a response rate of 49.3 percent. Demographic information about the enrolled population was known, permitting a comparison with the proportions of the respondent group in each of the demographic groupings (gender, study mode and course of study). No significant differences were found. This suggests that valid inferences about the initial population can be drawn from the initial respondent group.

For the initial questionnaire, the mean age of respondents was 20.2 years, with a standard deviation of 5.1 years and a range of 16 to 43 years. 93.9 percent of respondents participated in either the on-campus or on-line O-week self-guided Library orientation activity. These respondents were asked to rank the self-guided tour activity on a scale of 1 (not useful at all) to 5 (extremely useful). The mean ranking was 3.4 out of 5, with a standard deviation of 0.9. These respondents were also asked to indicate the most useful and least useful aspects of the self-guided tour activity. Table 1 gives the responses and frequency of occurrence obtained from both on- and off-campus students. The questionnaire included four different typical examples of reference types: a book, a chapter in a book, a journal article and an Internet page. For each example reference, respondents had to select the reference type from a list including a distracter reference type. The proportions of respondents who correctly identified the type of each example reference were: book = 91.0 percent; chapter in a book = 50.7 percent; journal article = 83.6 percent; and Internet page = 95.5 percent. There was no significant difference in any of these descriptive statistics between the demographic groups (gender, mode of study and course of study) of the respondent sample.

Most useful aspect of self-guided tour activity	Frequency of occurrence
<u>On-campus students</u>	
Finding/searching using the catalogue	12
Knowing where to find resources	9
The on-line tutorial	4
Answer to assignment 1 question	3
Chance to walk around the Library	3
Information about referencing	2
The fact that it was self-guided	2
Identify Library ID number and PIN	2
The checkpoints	1
How to borrow items	1
Information about on-line resources	1
The Library website	1
How to borrow books from other libraries	1
Find out about the Information desk	1
Understand call numbers for books	1
Understand different item types	1
<u>Off-campus students</u>	
Links to on-line resources	3
User-friendly and interactive	3
How simple it was	1
Identifies resources for off-campus students	1
Least useful aspect of self-guided tour activity	Frequency of occurrence
<u>On-campus students</u>	
On-line quiz (too long)	6
No assistance (self-guided)	2
Tour too long	1
Had to book a time	1
To general, not tailored to course	1
Too much to remember	1
Getting lost	1

Table 1 – Student responses to self-guided Library tour activity

The O-week self-guided Library tour was valued positively by students, and there was good agreement on this. On-campus students were more likely to comment positively on specific utilitarian aspects of the activity, such as ‘using the catalogue’, ‘knowing where to find resources’ and ‘getting the answer required for assignment 1’. Off-campus students were more likely to comment positively on general characteristics of the activity, such as ‘user-friendly and interactive’ and ‘how simple it was’. This difference is perhaps partially explained by the different nature of the on-campus and off-campus self-guided tour. On-campus students physically attended the Library and had to locate particular resources and complete particular activities. Off-campus students completed an on-line tutorial on using the Library catalogue. Off-campus students gave no negative comments. The principal negative comment from on-campus students related to the length of the computer-based tutorial on catalogue searching that they were asked to complete as part of the self-guided

tour. The scope to vary this element of the self-guided tour is limited by the fact that this activity is open to all students as part of the on-campus University orientation activities, and any changes would have to be carefully considered for their impact on all students.

After the O-week self-guided Library tour, a majority of respondents were able to correctly identify example references for a book, a journal article and an Internet page. Only half of respondents were able to identify the more complex reference type of a chapter in a book, although, of those who were incorrect, 66.7 percent identified it as a book reference.

At the time of the follow-up questionnaire, the class enrolment was 127 and 45 completed questionnaires were returned, giving a response rate of 35.4 percent. Demographic information about the enrolled population was known, permitting a comparison with the proportions of the respondent group in each of the demographic groupings (gender, study mode and course of study). No significant differences were found. This suggests that valid inferences about the follow-up population can be drawn from the follow-up respondent group.

For the follow-up questionnaire, the mean age of respondents was 20.5 years, with a standard deviation of 5.3 years and a range of 18 to 43 years. 95.6 percent of respondents participated in either the on-campus or on-line information literacy skills session. These respondents were asked to rank the information literacy session on a scale of 1 (not useful at all) to 5 (extremely useful). The mean ranking was 3.5 out of 5, with a standard deviation of 1.0. These respondents were also asked to indicate the most useful and least useful aspects of the information literacy session. Table 2 gives the responses and frequency of occurrence obtained from both on- and off-campus students. The follow-up questionnaire included the same test of identification of common types of references as the initial questionnaire, except that the presentation of choices was re-ordered. The proportions of respondents who correctly identified the type of each example reference were: book = 84.8 percent; chapter in a book = 43.5 percent; journal article = 89.1 percent; and Internet page = 95.7 percent. There was no significant difference in any of these descriptive statistics between the demographic groups (gender, mode of study and course of study) of the respondent sample.

The information literacy session was valued positively by the students, and there was good agreement on this. On-campus students were more likely to comment positively on learning how to search and access on-line and other information sources. The principal negative comment from on-campus students related to the session being too quick, that is, some students would have liked more explanation of certain aspects of searching and accessing information resources. There were no evident trends in the comments received from off-campus students. The concerns of some on-campus students could perhaps be addressed by the provision of information in printed form for them to 'take away'; however, a deliberate strategy of 'no handouts' was employed to actively engage students in taking their own notes on relevant points, and the availability of on-line reference material on the topics covered was identified.

Most useful aspect of information literacy session	Frequency of occurrence
<u>On-campus students</u>	
How to access on-line resources	7
Different types of Library resources	6
How to do searches of on-line material	6
Searching the Library catalogue	3
The computer session	2
Accessing on-line journals	2
How to reference different sources	1
How to locate information in the Library	1
Accessing on-line newspapers	1
Assistance selecting an assignment topic	1
<u>Off-campus students</u>	
Lots of examples	1
Presented interestingly	1
Relevant to student tasks	1
Learnt to use the Library facilities	1
Being able to search for journals on-line	1
Least useful aspect of information literacy session	Frequency of occurrence
<u>On-campus students</u>	
Too quick	4
Too long	1
Sometimes repetitive	1
Too much detail	1
Too much talking	1
<u>Off-campus students</u>	
Prefer to be able to print something off	1
Sometimes repetitive	1
Went off on tangents	1

Table 2 – Student responses to information literacy session

After the information literacy session, a majority of respondents were able to correctly identify example references for a book, a journal article and an Internet page. Less than half of respondents were able to identify the more complex reference type of a chapter in a book, although, of those who were incorrect, 84.6 percent identified it as a book reference.

A comparison was made of the proportions of respondents in each of the demographic groupings between the initial and follow-up respondent sample groups, and no significant differences were found. Additionally, no significant difference was found in the mean respondent age of the initial and follow-up respondent sample groups. This suggests that valid comparisons can be made of the rates of correct identification of example reference types between the initial and follow-up respondent groups. No significant differences were found between the rates of correct identification of example reference types between the initial and follow-up respondent groups. However, the initial rates of correct identification of basic reference types were already high, and the results suggest that future improvements to the information literacy training should focus on more complex reference types, such as chapters in books, and the features that distinguish these types of references from the more basic types.

Conclusion

A sequence of purposefully designed activities to help students learn and practice information literacy skills was integrated into a first-year engineering and technology study unit as a core element of the unit syllabus. A formal evaluation of these activities was undertaken in semester 1 2003. Students valued the activities, and while no significant increase in the ability of the students to identify common types of references was observed, the rate of identification of basic types of references was high initially; students generally recognised three of the four reference types included in a pre-test. It was observed that approximately half of the students had difficulty in identifying the more complex reference type of a chapter in a book. As a result of the research, future development of these information literacy activities can be based on the assumption that a majority of commencing engineering and technology students is familiar with basic types of references such as books, journals and Internet pages. And, more time should be directed to developing the concepts of complex reference types, such as chapters in books, papers in conference proceedings, and other forms of academic monographs with multiple authors, that commencing students may not have encountered prior to university studies.

Bibliography

- Blakeslee, S., Owens, J. and Dixon, L. (2001) 'Chico's First-year Experience Course: A Case Study', *Academic Exchange Quarterly*, **5**(4), 128-132.
- Bruce, C. and Candy, P. (2000) 'Information literacy programs: People, politics and potential', In *Information literacy around the world: Advances in programs and research*, (Eds, Bruce, C. and Candy, P.) Centre for Information Studies, Charles Sturt University, Wagga Wagga, pp. 3-10.
- Candy, P. (2000) 'Mining in Cyberia: Researching information literacy for the digital age', In *Information literacy around the world: Advances in programs and research*, (Eds, Bruce, C. and Candy, P.) Centre for Information Studies, Charles Sturt University, Wagga Wagga, pp. 139-151.
- Candy, P., Crebert, R. and O'Leary, J. (1994) *Developing Lifelong Learners Through Undergraduate Education* (NBEET Commissioned Report No. 28), Australian Government Printing Service, Canberra.
- Catts, R. (2000) 'Some issues in assessing information literacy', In *Information literacy around the world: Advances in programs and research*, (Eds, Bruce, C. and Candy, P.) Centre for Information Studies, Charles Sturt University, Wagga Wagga, pp. 271-283.
- Churkovich, M. and Oughtred, C. (2002) 'Can an Online Tutorial Pass the Test for Library Instruction? An Evaluation and Comparison of Library Skills Instruction Methods for First Year Students at Deakin University.' *Australian Academic & Research Libraries*, **33**(1), 25-38.
- Council of Australian University Librarians (2001) *Information Literacy Standards - First Edition*, Council of Australian University Librarians, Canberra.
- Deakin University (2000) *The Competitive Edge - Deakin University Teaching and Learning Management Plan 2000-2002*, Deakin University, Geelong.
- Fjallbränt, N. (2000) 'The development of Web-based programs to support information literacy courses', In *Information literacy around the world: Advances in programs and research*, (Eds, Bruce, C. and Candy, P.) Centre for Information Studies, Charles Sturt University, Wagga Wagga, pp. 25-36.
- George, R., McCausland, H., Wache, D. and Doskatsch, I. (2001) 'Information Literacy - An Institution-Wide Strategy', *Australian Academic & Research Libraries*, **32**(4), 278-293.
- Higher Education Council (Australia) (1992) *Achieving quality: Higher education* (ANB93/03), Higher Education Council (Australia), Canberra, pp. 189.
- Higher Education Quality Council (UK): Quality Enhancement Group (1996) *What are graduates? Clarifying the attributes of 'graduateness'*, <http://www.lgu.ac.uk/deliberations/graduates/starter.html>, accessed 12 Feb 2003.
- Hill, C. and Woodall, L. (1999) 'Developing Information Literacy Skills in First Year Engineering Students', In *11th Annual Conference of the Australasian Association for Engineering Education*, (Ed, Luong, L.) Adelaide, pp. 310-314.
- Institution of Engineers Australia (1999) *Manual for the Accreditation of Professional Engineering Programs*, The Institution of Engineers Australia, Canberra, Australia.
- James, R., McInnis, C. and Devlin, M. (2002) *Assessing Learning in Australian Universities*, Centre for the Study of Higher Education and The Australian Universities Teaching Committee, Melbourne.

- Klaus, H. (2000) 'Understanding scholarly and professional communication: Thesauri and database searching', In *Information literacy around the world: Advances in programs and research*, (Eds, Bruce, C. and Candy, P.) Centre for Information Studies, Charles Sturt University, Wagga Wagga, pp. 209-222.
- McCarthy, J. (2001) 'Integrating Library Services into the eLearning Environment at Queensland University of Technology', *Australian Academic & Research Libraries*, **32**(3), 222-238.
- Moran, B. (1998) 'Planning a Program of Instruction in Information Management for Engineers', In *10th Annual Conference of the Australasian Association for Engineering Education*, (Eds, Howard, P., Swarbrick, G. and Churches, A.) Gladstone, pp. 141-144.
- Moran, B. and Gibbs, C. (1999) 'Information Strategies - A Learning Module for Engineering Students', In *11th Annual Conference of the Australasian Association for Engineering Education*, (Ed, Luong, L.) Adelaide, pp. 327-330.
- Orr, D. and Wallin, M. (2001) 'Information Literacy and Flexible Delivery: Are We Meeting Student Needs?' *Australian Academic & Research Libraries*, **32**(3), 192-203.
- Tenopir, C. (2002) 'The Age of Online Instruction', *Library Journal*, **127**(14), 36-38.
- Young, R. and Harmony, S. (1999) *Working with Faculty to Design Undergraduate Information Literacy Programs*, Neal-Schuman Publishers, Inc., New York.