Sampling perceptions; testing reality: an evidence-based approach to measurably improve information literacy and student research skills

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Abstract: Do commencing students possess the level of information literacy (IL) knowledge and skills they need to succeed at university? What impact does embedding IL within the engineering and design curriculum have? This paper reports on the self-perception versus the reality of IL knowledge and skills, across a large cohort of first year built environment and engineering students. Acting on the findings of this evaluation, the authors (a team of academic librarians) developed an intensive IL skills program which was integrated into a faculty wide unit. Perceptions, knowledge and skills were re-evaluated at the end of the semester to determine if embedded IL education made a difference. Findings reveal that both the perception and reality of IL skills were significantly and measurably improved.

Background & Introduction

 "Introducing Professional Learning" (BEB100) is a large first year, first semester, cross-faculty unit at Queensland University of Technology (QUT) with over 1,300 students from engineering, design and urban development disciplines. The operation of this unit is described in detail by Smit and Murray (2009).

In previous years, the library team's main method of IL instruction to the BEB100 cohort has been via a fifty minute lecture, with some supporting materials and a library text introduced in 2008.

Milne and Thomas (2008) highlighted the need for librarians to better understand undergraduate information literacy (IL) skills as students enter their academic careers to enable more meaningful and focussed IL programs.

The value of conducting undergraduate self-evaluation prior to delivery of IL instruction has been reported in several studies, notably Caspers and Bernhisel (2007). In comparing students' perceived and actual IL skills, Ivanitskaya et al. (2008) found that those who received feedback on their information skills and knowledge pre-test, performed significantly better in their final outcomes than the cohort with no feedback.

The author's plan was to evaluate student perceptions of their IL skills early in the semester and compare it to the reality. Armed with this knowledge, library components for the unit targeting skills and knowledge were developed based on the cohort's abilities and identified needs. Further testing of the perceptions and the reality of IL skills at the end of the semester was also designed to identify any

improvement in students' abilities and to place a measurable value on embedding IL skills within the curriculum.

Information Literacy – an evaluation of student perception vs. reality in week 2

To establish the cohort's perceptions and the actual reality of their IL skills, an evaluation was undertaken during the week 2 tutorial, prior to any IL instruction. The evaluation was undertaken in a tutorial as it was felt that this would result in a larger response rate than an online evaluation. Questions were presented on a PowerPoint and answers were recorded by students on a paper Multiple Choice Question (MCQ) answer sheet.

Five questions were asked to gauge the cohort's perceptions of their IL skills. These five questions were based around the first five Australian and New Zealand Institute for Information Literacy (ANZIIL) standards (Bundy, 2004). To test the reality, students were required to answer a total of fifteen questions designed to test information skills, three questions per ANZIIL standard (skill area).

The perceptions in week 2

The total number of respondents was 1241. In order to provide a simple and quick evaluation of the data so that feedback could be provided to students, any incomplete or ambiguous responses obtained from the automated marking system were removed from the sample. This reduced the sample used in the week 2 analysis to 1153. The results of the week 2 perception evaluation are in Table 1.
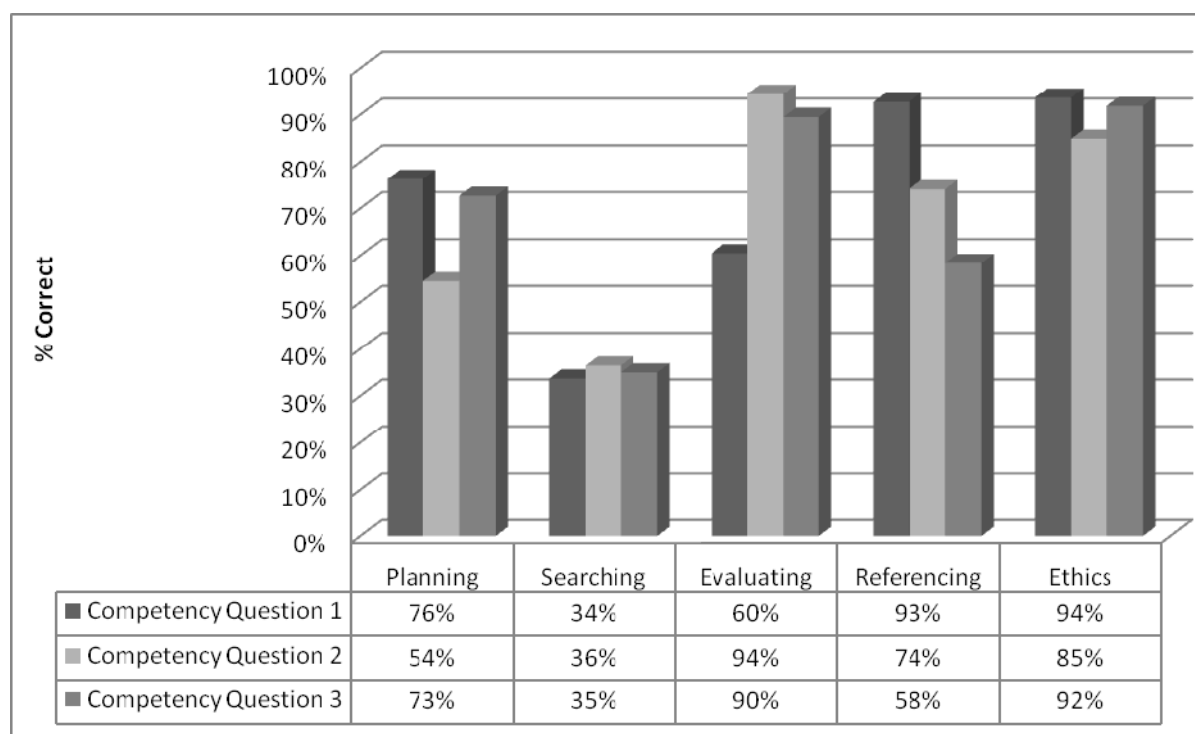
Table 1 – Student Perceptions of their IL Skill level in week 2 (sample 1153 students)

Skill Area	In Your Opinion	Poor	Could be Better	OK	Good	Expert
Planning	How would you rate your ability to plan searches for information you need?	1%	9%	42%	44%	3%
Searching	How familiar are you with search tools needed to find information?	1%	10%	38%	46%	5%
Evaluating	How would you rate your ability to evaluate whether information is correct, reliable and of high quality?	0%	7%	35%	53%	5%
Referencing	How would you rate your ability to reference (or cite) items such as books, articles, websites and so forth?	5%	24%	36%	29%	6%
Ethics	How would you rate your ability to find and use information responsibly and legally?	1%	8%	29%	52%	10%

Table 1 illustrates that few students perceived their abilities as *Poor*. Seven to eleven percent (7-11%) of students ranked themselves as *Poor* or *Could be Better* in all areas with the exception of referencing, where it was clear students felt less confident in their abilities with 29% rating themselves as *Poor* or *Could be Better*. Few students also rated themselves as *Expert* with a range of only 3-10% of students rating themselves at this level across all areas. The fifth perception question is acknowledged to be less than ideal as it actually poses two separate questions.

The reality of IL skills in week 2

Each question testing the reality of the cohort's skills was analysed individually and then grouped within the five skill areas. The results are illustrated in Figure 1 below.

Figure 1 – Students IL Skills: The reality in week 2

	Planning	Searching	Evaluating	Referencing	Ethics
■ Competency Question 1	76%	34%	60%	93%	94%
■ Competency Question 2	54%	36%	94%	74%	85%
■ Competency Question 3	73%	35%	90%	58%	92%

From testing the reality of the cohort's skills it was clear that in some cases their perceptions of their skills were overrated. It is evident from Table 1 and Figure 1 that despite 89% of students perceiving their searching skills and knowledge to be *OK* to *Expert*, only 34-36% of students were able to correctly answer questions in this area. Although students rated their perceptions lower in referencing skills (see Table 1), they were able to cope with referencing basics but as the complexity of the competency questions increased, for example, identifying sources commonly used in the academic environment, there was a significant drop in the number of correct responses (see Referencing in Figure 1).

Re-engineering the curriculum

In 2009 there was a significant increase in the amount of library involvement in the unit in collaboration with the teaching team, tutors and learning designers. Using the data collected and analysed in week 2 about student perception and reality of IL, the library content was tailored to target the identified weak areas.

During the week 3 tutorial, feedback was given to students to highlight that their perceived skills were misaligned with their abilities, particularly regarding searching skills. Furthermore, by continually challenging the perception of their skills through tutorial activities and quizzes throughout the semester, it was hoped students would understand the importance placed on these skills, rather than seeing them as irrelevant or as a "filler" within the curriculum.

The librarians developed and delivered:

- lectures in weeks 7 and 9
- an evaluation of IL skills in week 2
- a re-evaluation of IL skills in week 13
- a second edition of the library text
- 7 hours of weekly tutorial activities (delivered by the tutors)
- 10 hours of weekly tutor training

- assessable multiple choice questions for the mid-semester quiz
- assessable skills embedded into the large group report
- one third of the multiple choice questions for the final exam
- interactive flash objects embedded into the BEB100 Blackboard learning environment

Tutorials – the breakthrough in embedding IL skills into the curriculum

The major breakthrough in 2009 was the tutor delivery of IL content in the tutorials.

From the analysis of the week 2 results, the library team set about creating weekly tutorial activities and resources, for delivery by the tutors, to help develop the IL skills needed by this cohort. The activities were typically half an hour long and covered topics such as choosing the best resources for information, how to search resources more effectively, and referencing of different format types. They were tailored to tie in with the lecture themes and the weekly writing activities which were also carried out during the tutorial. For example, during the week on graphic communication, the library activities dealt with topics such as copyright and the referencing of images.

Being the first year of such an approach to IL delivery, the library team created all the library tutorial materials and attended the weekly tutor training to instruct the tutors in carrying out the activities. This delivery of IL skills by faculty tutors has been a major step towards fully embedding such skills into the first year engineering curriculum. With some updating of the materials and training of the tutors each year, this embedding can continue and may even be adopted by other disciplines.

Supporting materials

To complement this new, tailored mode of delivery in 2009, a number of supporting materials were made available for students to consult in their own time. These included a second edition of *Researching for the Built Environment and Engineering Professions* which, as in 2008, formed part of the prescribed text and contains content that could not be covered in lectures or tutorials due to time constraints. A number of online resources were also developed for students to access via Blackboard, including interactive flash objects to assist students with learning call numbers and the preferred system of referencing. Weekly sample exam questions also gave students a sense of the types of questions that would be asked in the final exam.

The best enabler for developing IL skills in a first year cohort is collaboration between librarians and academics. Past involvement with BEB100 has proven that "if effective blending of information literacy throughout a curriculum is to be achieved and information literacy skill development is to occur in a structured manner, librarians and academics must form collaborative partnerships" (Milne and Thomas, 2008). In 2009, continued support from the unit coordinators and the wider teaching team including tutors and learning designers, has allowed a measurable and tangible value to be placed on IL skills.

Reevaluating student perception and post-testing ability and skills

The perceptions in week 13 vs. week 2

To gauge whether the cohort's perceptions of their IL skills had changed from week 2, a re-evaluation was conducted during the week 13 tutorial. The sample addressing the perception of skills in week 13 was 475 (lower numbers as it was the last tutorial of semester). After removing invalid or incomplete responses and matching the sample to week 2, a final sample of 330 students for comparison was achieved.

Table 2 illustrates the perception of skills in week 13 and the difference in responses from the same sample drawn from the week 2 perceptions. Although the sample for comparing the perceptions between week 2 and week 13 was smaller than the sample obtained in week 2 there was a strong correlation between the samples. Across the five skill areas evaluated there was combined shift of 14-

24% towards the *Good* to *Expert* categories indicating a more positive perception of IL skills in week 13 than in week 2. The improvement in perception of IL skills across all of the areas evaluated is clearly illustrated by Table 2.

Table 2 – Students Perceptions of their IL Skills in week 13 and the change from week 2

Skill Area	In your opinion	Poor	Could be Better	OK	Good	Expert
Planning	How would you rate your ability to plan searches for information you need?	0% (+0%)	5% (-4%)	30% (-15%)	57% (+15%)	7% (+4%)
Searching	How familiar are you with search tools needed to find information?	0% (-1%)	4% (-6%)	32% (-7%)	55% (+8%)	9% (+6%)
Evaluating	How would you rate your ability to evaluate whether information is correct, reliable and of high quality?	0% (+0%)	4% (-3%)	16% (-20%)	62% (+11%)	18% (+12%)
Referencing	How would you rate your ability to reference (or cite) items such as books, articles, websites and so forth?	0% (-5%)	9% (-13%)	29% (-6%)	46% (+17%)	15% (+7%)
Ethics	How would you rate your ability to find and use information responsibly and legally?	2% (+2%)	3% (-5%)	17% (-11%)	54% (+0%)	24% (+15%)

Table 2 is based on a matched sample of 330 students from weeks 2 and 13.

Week 13 Reality

An improvement in perception is one thing but what about the reality? The final MCQ exam contained 35 questions on IL, from which an analysis on the reality of IL skills and knowledge was drawn. After matching the week 2 and the final MCQ datasets and including only those with complete responses, the sample used to compare the reality from week 2 to week 13 was 903. Questions in the final MCQ were not evenly split across the five skill areas, as in week 2, as some areas had been targeted with more intensive instruction and were identified as more important than others. One question from each skill category in week 2 was directly mapped to a question in the final exam testing exactly the same skill but using a different example. Many of the questions in the final exam also tested abilities at higher levels than those in week 2 and further analysis of this data has still to be undertaken.

Table 3 shows the mapping of questions for the first four skill areas and the percentage of correct responses, demonstrating an improvement of between 22 and 32 % across four skill areas from week 2 to week 13.   The fifth skill area of ethics was not able to be mapped directly but results of the three questions used to test students skills in this area were 94%, 98%, 82% showing a high level of understanding as identified in week 2 (see Figure 1).

Table 3 – Comparison of week 2 skill questions and final MCQ exam: the reality

	Week 2 Correct responses	Final MCQ Correct responses	Increase in correct responses	Matched Questions
Planning	54%	85%	31%	7 & 3
Searching	35%	67%	32%	11 & 5
Evaluating	60%	86%	26%	12 & 18
Referencing	59%	81%	22%	17 and 23

Conclusion

At the commencement of BEB100, the student cohort perceived IL skills as being easy. Many of them claimed proficiency or mastery of these skills, yet when evaluated it was clear there was room for improvement. By evaluating student IL skills, the library team was able to develop a program of IL instruction which focused on identified weaknesses.

In collaboration with the unit coordinators and with the support of the tutors, content was delivered throughout the semester rather than in one discrete lecture. As a result of this embedded IL approach, the students achieved a measurable improvement at the end of this unit. There was an increase not only in their perceptions of IL skills but more importantly an improvement in their actual skills.

Further analysis of the final exam data will be undertaken and findings presented later this year. This will take the form of further detailed examination of the 35 questions used to evaluate students at the end of the semester. In addition, a cross-analysis of final exam results from 2007, 2008 and 2009 will be attempted. The purpose of this analysis will be to try and determine if the ramped increase in collaboration with academics, the introduction of a text and embedded IL instruction over the three years has resulted in increased outcomes for students.

References

Bundy, A. (2004). Australian and New Zealand Information Literacy Framework: principles, standards and practice Second edition. Retrieved 3 May, 2008, from http://www.anziil.org/resources/Info%20lit%202nd%20edition.pdf

Caspers, J. & Bernhisel, S.M. (2005). What do freshmen really know about research? : assess before you teach. *Research Strategies* 20(4), 458-468.

Ivanitskaya, L., DuFord, S., Craig, M., & Casey, A. M. (2008). How does a pre-assessment of off-campus students' information literacy affect the effectiveness of library instruction? *Journal of Library Administration, 48*(3/4), 509-525.

Milne, C. & Thomas, J. (2008). Are your foundations sound? Information literacy and the building of holistic professional practitioners. *To Industry and Beyond: 19ᵗʰ Annual Conference for the Australasian Association for Engineering Education.* Yeppoon, Queensland.

Milne, C. & Thomas, J. (2009). *Researching for the built environment and engineering professions.* French's Forest, N.S.W.: Pearson SprintPrint

Smit D. & Murray M. (2009). Finding order in chaos: a problem based collaborative assignment for 1300 students across 19 disciplines. *Proceedings of the Australasian Universities Building Education Association Conference*. Adelaide, South Australia.

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