



Article

Information Skills Survey: Its Application to a Medical Course

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Abstract

Objective - To investigate the validity and reliability of the *Information Skills Survey for Assessment of Information Literacy in Higher Education (CAUL ISS)* (Catts, "Administration Manual") for identifying the information literacy skills of first and fourth-year medical students.

The *CAUL ISS* is a standardised, 20 item self-report inventory of information literacy skills of higher education students. It exists in two forms, namely a generic form and a law discipline specific form. This paper is concerned with the suitability of the generic form of the survey for use with medical students.

Methods - The generic form of the *CAUL ISS* was administered to 86 first-year and 120 fourth-year medical students and the reliabilities were computed. In addition, students were asked to respond to two open-ended questions about their information literacy. Subsequently, having noted that the fourth-year students rated themselves significantly

more severely on seven of the 20 items, four of this cohort were interviewed to identify the extent to which the *CAUL ISS* addressed the range of their techniques for information use and to identify any specific content validity issues in the application of the *CAUL ISS* scale to this population.

Results - The reliability of the *CAUL ISS* was confirmed for both years, but the evidence from an analysis of the individual items and from the open-ended questions and the interviews indicated that the fourth-year students adopt a wider range of information gathering techniques, appropriate to their clinical experience than measured by the survey. The *CAUL ISS* demonstrated content validity for first-year students but its scope was not sufficient for content validity for fourth-year students. Further investigations are required to determine the full scope of competencies required for content validity with the fourth-year cohort.

Conclusion - The evidence suggests that the generic form of the *CAUL ISS* is suitable for use to estimate the information skills of first year medical students. For fourth-year students, suggestions are made for the use of the *CAUL ISS* in the context of their additional situated information literacy.

Introduction

Lifelong learning can be defined as: "A continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes and to apply them with confidence, creativity and enjoyment in all roles, circumstances and environments" (WILL 5).

To become lifelong learners, individuals must have access to needed information, and must also be able to judge the quality of the information to which they are exposed (Candy 8). Therefore, information literacy is an essential component of the set of generic capabilities needed for lifelong learning.

The definition of information literacy has been the subject of debate. The majority of definitions have the learner, rather than the teacher, as a common focus. One frequently used definition is that of the American Library Association Presidential Committee on Information Literacy: "Ultimately, information literate people are those who

have learned how to learn. They know how to learn because they know how knowledge is organised, how to find information and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand" (ALA Final Report 1).

A definition specific to higher education is given by the Society of College, National and University Libraries: "Information literacy encompasses library user education, information skills training and education, and those areas of personal or transferable 'key' skills relating to the use and manipulation of information in the context of learning, teaching and research issues in higher education" (SCONUL 3).

Information literacy is therefore a wider concept than that described by librarians as the information seeking process (U Auckland 1):

- Defining the topic
- Selecting and using resources

- Locating information
- Evaluating resources
- Documenting the research

Being information literate in one subject area does not mean that this expertise can necessarily be carried over to another subject area (Candy 7; George 282). For example, the information skills required in humanities are quite different from those required in a discipline such as engineering (Palmer and Tucker 19). Candy, in his chapter "Mining in Cyberia"(144), notes that information literacy in each discipline may incorporate a range of different sources and strategies. Information literacy also requires the ethical and legal use of information, which again is a situated practice.

Information literacy is therefore discipline-specific and hence requires application in the teaching and learning programmes within each discipline.

The identification of the importance of information literacy in lifelong learning has led to a focus on information literacy instruction in the teaching and learning programmes of university libraries (Marcum 2; Orr and Cribb 43). University librarians recognise that if information literacy is to be acquired, training must be managed using a planned instruction programme (Lupton 25).

In universities, this has translated into a push to include information literacy as part of course curricula, rather than stand-alone sessions run by the library. Many librarians now work closely with faculty to ensure that information literacy is included in curricula along with other generic attributes, such as communication skills (Bundy 1). The emphasis on curricula development has required librarians to collaborate with academic colleagues and put more time into liaison and course development. This, combined with the change from content to

skills-based information training, has become a growing source of demand for resources (Gedeon 2; Marcum 2; Orr and Cribb 49).

In Australia, the emphasis on information literacy in higher education was evidenced by the publication of a major information literacy work. *Information Literacy Standards* was produced in 2001 by CAUL in conjunction with The Australian and New Zealand Institute for Information Literacy (ANZIIL). This publication was updated in 2004 and published as the *Australian and New Zealand Information Literacy Framework* (Bundy). Both of these publications were designed to guide higher education institutions in developing effective information literacy programmes and excerpts from each publication are presented in Appendix 1.

Evaluation of information literacy programmes

The assessment of individual students' learning in information literacy programmes can include quantitative, qualitative and practice demonstrations (Palmer and Tucker 25). Assessment embedded within the course has been able to measure individual students' information literacy learning in a discipline or class context. This has been done in a number of ways including the production of bibliographies and search strategies (Lupton 26; Iannuzzi 305).

The evaluation of programme effectiveness requires data collection from groups of students. Hence the interest at this level is on the aggregate scores and the stability of the group parameters, not the individual parameters because it is the programme effectiveness that is the focus. While the research literature has many examples of information literacy programmes, the evaluation of groups of students has proved to be more problematic and research reporting evaluations that use validated

research tools is very limited (Palmer and Tucker 25, Bernath and Jenkin 4, Brettle 6, Iannuzzi 305, Koufogiannakis and Wiebe 19). A search of the literature for the period 1990 to 2006 (*Embase, ERIC, LISA, LISTA, Medline*) did not identify any reported evaluations of information literacy programmes using validated survey instruments to evaluate changes in information skills throughout the medical course.

The use of a standardized tool to evaluate the information literacy skills of large groups of students would allow comparisons to be made between the effectiveness of information literacy programmes in different populations within the same institution or in benchmarking across institutions. The effect of changes to teaching and learning strategies for information literacy could also be more systematically measured.

Information literacy programmes in medicine

In some disciplines, such as clinical medicine, information literacy forms part of a broader movement that is aimed at ensuring that the skills of clinicians reflect current best practice. In health care, this has been termed Evidence-Based Clinical Practice (EBCP). EBCP follows a five-step process that includes finding the most judicious and explicit clinical evidence, and applying it to an individual patient. Librarians have begun to promote teaching in 'finding the evidence' and are working to ensure that it is part of the university curriculum in a wide range of health science areas (Jacobs 327; McKibbin 25). To be able to find the best evidence, practitioners must be information literate within the medical context. Sackett promotes the role of librarians in assisting practitioners to find evidence-based information (Sackett 210).

The EBCP movement has led to a change in focus for medical librarians. Training has been developed to ensure that practitioners become information literate, rather than simply being orientated in their use of a particular library. Studies have been undertaken on the ability of continuing medical education to change the habits of health practitioners (Dornan 670; Fox and Bennett 466). However, it has been difficult for any studies to pinpoint the effect of information literacy programmes in changing the habits of clinicians. Information literacy is rarely taught in isolation and it is hard to separate the effects of training by librarians from that learnt by other means (e.g. consultation with colleagues).

The trend towards EBCP in the clinical situation has been coupled with a change in the way that medical students learn at university. The shift from lecture-based teaching to that of problem-based learning (from teacher-centred to student-centred), has required students to be more sophisticated in the techniques they use to locate information. There has also been a change in the direction of education away from the principle that everything you need to know can be learned at university, towards an approach that regards university education as a way to learn the critical thinking and research skills required for a lifetime of learning.

CAUL Information Skills Survey

The lack of a suitable validated instrument to evaluate information literacy programmes has been recognized in the United States and Australia. The US Institute for Information Literacy prepared a project plan in January 2004 that has as one of its goals to "Develop criteria for assessing information literacy programs" (Institute Information Literacy 5). In Australia, concerns about how to measure the

information literacy skills of groups of students were identified by CAUL and addressed with the publication of the *Information Skills Survey for Assessment of Information Literacy in Higher Education*. The *CAUL ISS* was designed and developed by the CAUL Information Literacy Assessment Project Team. The *CAUL ISS* in its generic form consists of twenty questions in a self-assessed closed questionnaire, with students ranking their information skills on a scale of 0 (never) to 3 (always). The use of self-report as a valid means of gaining evidence from students has been supported by several writers (Lally and Myhill 27; Marsh 722) and is widely used in evaluating student experiences. For instance, in Australia the Course Experience Questionnaire (Wilson, et al 34) relies on self-report.

The *CAUL ISS* was designed using the *Information Literacy Standards* (CAUL ILS) which were revalidated for use with the second edition, published as the Australian and New Zealand Information Literacy Framework (ANZ ILF) (Bundy) (Appendix 1). The generic form of the survey was benchmarked with students studying education. The reliability (the ability to reproduce the scores) has been demonstrated to meet the criteria for standardised test for the scale overall ($R=0.87$). Satisfactory levels of reliability (between 0.54 and 0.78) were reported for each of the sub-scales that measured standards two to six as listed in the *ANZ ILF*. These results compare favourably with other standardised instruments used in educational research (see for instance, Marsh et al 717). The *CAUL ISS* Project Team noted that the survey developed with students in education was designed for use in a range of social science contexts. The Project Team recommended that the *CAUL ISS* should be tested with students in other disciplines, including science and engineering. This study investigated this

issue in relation to the discipline of medicine.

Validity

Validity is fundamental to the utility of a measurement tool because it confirms that the instrument measures what it purports to measure, and must be examined in the context in which the survey is used. Four aspects of validity have been identified as necessary to establish the quality of a survey (Lally and Myhill 17). These forms of validity are termed content, construct, concurrent and predictive validity. For the *CAUL ISS* the content validity was demonstrated by expert judges matching survey questions with the relevant standards. Evidence of construct validity was demonstrated in the statistical analysis of the *CAUL ISS*, with details reported in the *CAUL ISS* Technical Manual. The concurrent validity of the *CAUL ISS* was established by comparing student self-report on the survey with assessments by librarians of the individual's information skills, using observation and interview. Evidence of predictive validity requires research in specific contexts to demonstrate whether the *CAUL ISS* predicts the information literacy performance of students. The generic form of the *CAUL ISS* has demonstrated content, construct and concurrent validity within the context in which the survey was developed, but Catts ("Administration Manual" 2) calls for consideration of validity in other higher education contexts including medicine which would avoid the costly task of creating a new form of the survey. The central research questions for this study were:

- Is the *CAUL ISS* a reliable instrument for providing data on information literacy outcomes for groups of first year and advanced medical students?

- Is the *CAUL ISS* valid for identifying information literacy skills for the above cohorts of students?

Methodology

The University of Western Australia

This study was conducted at The University of Western Australia (UWA). UWA has an enrolment of approximately 16,000 students in nine faculties. The Bachelor of Medicine and Bachelor of Surgery is a six-year undergraduate and four-year postgraduate programme offering integration of science and clinical teaching.

The information literacy programme for medical students at UWA is based around the 'spiralling' curriculum with incremental development and a revisiting of important concepts over six years. A curriculum-integrated approach has been taken with the development of information skills integrated into the teaching, learning and assessment of curriculum objectives and content. The information literacy programme is based around outcomes required of a medical graduate and uses the ANZ ILF (Bundy) and its associated learning outcomes. An extract from the UWA Information Literacy Framework for Medical Students (first and fourth-year) is in Appendix 3. In 2006, Library staff conducted 100 information literacy sessions for faculty and students.

Study design

The *CAUL ISS* was administered to first-year medical students in October 2004 and fourth-year medical students in January 2005 as described below.

To confirm the content validity of the survey, at the time the *CAUL ISS* was administered, students were asked to

answer two open-ended questions on whether or not they thought the *CAUL ISS* covered all areas of information literacy that would be required by medical students in their academic year.

Sampling and recruitment procedures

Respondents

First year students were assumed to have general information literacy knowledge similar to other groups of first year students with whom the instrument has been validated. It was therefore hypothesised that the generic version of the *CAUL ISS* would be content valid and reliable for this group. First-year undergraduate medical students at UWA complete a general course of study and have not yet been exposed to information sources exclusive to medicine.

Students in their fourth year have been exposed to a significant amount of discipline specific knowledge (see examples in Appendix 3). Ideally, the study would have followed up with the first-year cohort some three years later, but immediate information was sought for the purpose of course review. Although this is a limitation of the study, the content validity and reliability of the *CAUL ISS* in different years of the course can still be determined by gathering data from two different cohorts.

All first and fourth-year students who were attending prescribed lectures, were informed of the purpose of the research, invited to complete the anonymous survey instrument and given the option to withdraw. All students in attendance at the lectures agreed to complete the survey. Eighty-six first year students, representing 46% of the cohort, and one-hundred and twenty fourth-year students, representing 86% of the fourth year cohort provided data. Students under the age of 18 were not permitted to participate for ethical reasons (parental permission would have been

required). Students under the age of 18 comprised approximately 10% of the first year student cohort at the time the survey was completed. However, there were no students under the age of 18 at the lectures where the *CAUL ISS* was completed. Students who were not at the prescribed lectures were not invited to complete the survey.

Materials

The contents of the Information Skills Survey are confidential to ensure that responses are not rehearsed or students encouraged to misrepresent their knowledge and practice. Such actions would harm the validity of the survey to the extent that students were prompted to modify their behaviours. However, recently CAUL agreed to the publication of the survey in academic journals, with the proviso that readers are asked to note that it is to be used in conjunction with the *CAUL ISS Administration Manual* which can be accessed from the CAUL web site (www.caul.edu.au). Consequently the survey is included as Appendix 2.

To confirm the content validity of the *CAUL ISS* in the context of medicine, students were asked at the time of completing the survey to give a written response to two additional questions:

Are there any skills related to research and information gathering for your first/fourth-year medical studies that are not covered by the survey? If so, what are they?
Are there any questions in the survey that are not applicable to your first/fourth-year medical studies? If so, what are they?

Gathering student opinions complemented the expert judgements used in the survey design, and allowed a direct consideration

of content validity in the situation where its use was to be trialled.

Interview procedure

Having noted that the fourth-year students rated themselves significantly more severely than did first year students on some seven items, four students from this cohort were interviewed in a post-hoc analysis to seek to identify the extent to which the *CAUL ISS* addressed the range of their techniques for information use. The selection of these four students was on the recommendation of academic staff from those students who were available. Two male and two female students were selected (the medical course at UWA comprises approximately 50 percent male and 50 percent female students). Interviews were conducted in a semi-structured way with the interviewer asking a series of questions and students responding to build an understanding through discussion as promoted by Holstein (56). An outline of the topics discussed in the interviews is included in Appendix 5.

Reliability

The reliability of a measurement instrument estimates how consistently each item measures the construct of interest, which in this case is information literacy. A perfectly reliable instrument in which the responses to all items by any participant are entirely consistent for that participant would produce a reliability of one across the group of participants. If each individual responded completely at random to each item in the survey the reliability for the group would be zero. Hence the higher the reliability that is reported, the better is the measurement instrument.

The *CAUL ISS* was administered to the groups of students on only one occasion. Coefficient alpha (sometimes called Cronbach alpha) was calculated to

determine the reliability of the *CAUL ISS*. Coefficient alpha is recommended as the best estimate for cases where the survey is administered once and is the most common measure of the reliability of measurement instruments in social science (Bryman and Cramer 77). A high alpha value would demonstrate that the survey questions produce positively inter-correlated responses that measure the same concept (Bryman and Cramer 77). For standardised tests it is recommended that alpha should be above 0.85 for decisions that affect individuals and above 0.65 for inferences about groups (Frisbie 29).

Results

Reliability

Using Cronbach alpha, the reliability was calculated for first year students at 0.85 and 0.84 for fourth-year students demonstrating the consistency of the *CAUL ISS* for both years. These results confirm the reliability of the *CAUL ISS* because they are consistent with the reliability of 0.87 reported in the *CAUL ISS Technical Manual*.

Performance on Survey

The *CAUL ISS* item numbers and their alignment to the core standards from the *Information Literacy Framework*, together with a comparison of mean scores, and standard deviations and reliabilities are shown in Tables 1 and 2. The level of significance of differences is shown in Table 3. Items that are significant at the 5% level are in shaded bold italics. Note that there are no questions in the *CAUL ISS* relating to Standard 1 (the information literate person recognizes the need for information and determines the nature and extent of the information needed).

The mean score for first-year students on the 20 item scale (possible range 0 to 60) was

37.19 with a standard deviation of 8.14. The mean score for fourth-year students on the 20 item scale was 34.88 with a standard deviation of 7.72.

The difference in favour of first-year students is evident in all five subscales. The *CAUL ISS* questions grouped by ANZ ILF Core Standards mean scores for years 1 and 4 are reported in Table 1. The mean score was lower for the fourth-year students in each of the subscales. The significance of this result is discussed below. It is noted that the reliabilities for the sub-scales were consistent with the results reported in the *CAUL ISS Technical Manual* (Catts, 2005).

As the items in the *CAUL ISS* each provide data on an ordinal scale with a maximum range of four, the statistical significance of any difference in performance between first and fourth-year students for each of the twenty items was determined using a non-parametric test (Mann-Whitney). This is a conservative test that does not depend upon the assumption of a normal distribution. Seven of the twenty items were statistically significant at the 5% level. Table 3 shows the results of these calculations. There were seven items that were significantly different and these are shaded in the table. There is a significant difference in results for at least one item from each of the subscales. However, the results of the tests were in an unexpected direction as the first-year students had higher ratings than the fourth-year students on the items that were significant. The specific items are listed in Appendix 4 and the reasons and implications for this finding are considered in the discussion that follows.

Validity of CAUL ISS for Medical Students

To investigate the validity of the *CAUL ISS* for medical undergraduates, students were asked to give written responses to two additional open-ended questions. The

<i>Australian and New Zealand Information Literacy Framework Core Standard Number and associated CAUL Information Skills Survey numbers</i>	<i>Mean 1st-year</i>	<i>Mean 4th year</i>
<i>ANZ ILF Standard 2 finds needed information effectively and efficiently (CAUL ISS numbers 3,12,16,19)</i>	<i>8.00</i>	<i>7.52</i>
<i>ANZ ILF Standard 3 critically evaluates information and the information seeking process (CAUL ISS numbers 5,8,11,14)</i>	<i>6.84</i>	<i>6.12</i>
<i>ANZ ILF Standard 4 manages information collected or generated (CAUL ISS numbers 1,2,6,9)</i>	<i>5.52</i>	<i>5.12</i>
<i>ANZ ILF Standard 5 applies prior and new information to construct new concepts or create new understandings (CAUL ISS numbers 4,15,17,18)</i>	<i>7.60</i>	<i>7.20</i>
<i>ANZ ILF Standard 6 uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information (CAUL ISS numbers 7,10,13,20)</i>	<i>9.24</i>	<i>8.92</i>

Table 1. Comparison of Subscale means for first-year and fourth-year students

responses of the first year students indicated that the *CAUL ISS* survey items represented a satisfactory sample of their information literacy strategies. The analysis of the first-year students who responded to the open-ended questions is reported below. Of the sixty respondents, 30/60 (50%) reported that they could not identify any skills related to research and information gathering for their medical studies that were not covered by the survey. A further 8/60 (13%) gave no response and 2/60 (3%) stated that they “don’t know”. The remaining 18/60 (30%) of first-year students listed comments that relate to elements from the ANZ ILF Information Literacy Standards. These included finding information effectively and efficiently (Information Literacy Standard 2), evaluating information (Information

Literacy Standard 3) and a comment relating to legal issues in using information (Information Literacy Standard 6). These responses suggest that the *CAUL ISS* survey items represented a satisfactory sample of their information seeking strategies. In answering the question as to whether there were any questions in the survey that were not related to their first year studies, 34/60 (57%) students reported that they had no suggested changes, 10/60 (17%) gave no response and 3/60 (5%) stated that they “don’t know”. A further 7/60 (12%) students gave comments relating to applying new information to construct new concepts (Information Literacy Standard 5) and 13/60 (22%) of students wrote comments relating to legal issues in using information (Information Literacy Standard 6). These

<i>Australian and New Zealand Information Literacy Framework Core Standard Number</i> and associated CAUL ISS numbers	<i>Mean</i>	<i>SD</i>	<i>Alpha</i>
<i>ANZ ILF Standard 2</i> finds needed information effectively and efficiently (CAUL ISS numbers 3,12,16,19)	7.71	1.86	0.50
<i>ANZ ILF Standard 3</i> critically evaluates information and the information seeking process (CAUL ISS numbers 5,8,11,14)	6.43	2.32	0.73
<i>ANZ ILF Standard 4</i> manages information collected or generated (CAUL ISS numbers 1,2,6,9)	5.30	2.16	0.55
<i>ANZ ILF Standard 5</i> applies prior and new information to construct new concepts or create new understandings (CAUL ISS numbers 4,15,17,18)	7.36	2.17	0.65
<i>ANZ ILF Standard 6</i> uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information (CAUL ISS numbers 7,10,13,20)	9.06	2.16	0.55

Table 2. Estimates of Subscale means and SD for combined first-year and fourth-year responses (total of 196 responses)

results suggest that the content of the *CAUL ISS* is valid for this group of 1st year students.

A similar analysis was conducted of the responses to the written questions by the fourth-year students. While the majority of responses related to elements of the ANZ ILF standards, a small number of respondents indicated that the situated nature of medical information literacy is an issue. Of the forty-two fourth-year students who responded to the open-ended questions, 25/42 (60%) of the fourth-year students reported that they had no suggested additions to the survey in relation to the skills they needed to research and gather information for their fourth-year medical studies. A further 7/42 (17%) recorded no

response and one student (2%) responded with the comment “don’t know”. Unlike the first-year students, the fourth-year students did not report any additional comments related to standards 2 and 3 but one did make a comment relating to the legal use of information (Information Literacy Standard 6). However, of particular note were a series of comments relating to the use of information in the clinical setting indicating that the situated nature of medical information literacy was an issue. For example, 3/42 (7%) of fourth-year students commented that the survey did not cover the importance of comparing research to actual clinical experience with comments such as “talking to skilled clinicians”, “gathering information from human sources”. A further 4/42 (10%) of students

CAUL ISS item number	ANZ ILF Core Standard Number	Mean 1st-year	Mean 4th-year	Mann-Whitney U	p values
1	4	1.57	1.13	3708	<.001
2	4	1.12	0.93	4448	.060
3	2	2.03	.804	4874.5	.465
4	5	1.68	1.34	3947.5	.004
5	3	1.70	1.29	3703	<.001
6	4	1.68	1.92	4355.5	.075
7	6	2.51	2.48	4820	.357
8	3	1.84	1.51	3949	.002
9	4	1.14	1.13	5019	.723
10	6	2.45	2.48	5151	.980
11	3	1.85	1.78	4854	.434
12	2	1.59	1.37	4303.5	.035
13	6	2.03	2.00	4908	.673
14	2	1.50	1.58	5021	.724
15	5	1.84	1.87	5058	.873
16	3	2.47	2.42	5014	.697
17	5	1.92	1.95	5156	.992
18	5	2.20	1.98	4320	.032
19	2	1.88	1.76	4755	.289
20	6	2.29	2.02	4342.5	.039

Table 3. Level of significance of CAUL ISS questions as determined by non-parametric tests

reported comments relating to the use of consolidated information sources such as *Clinical Evidence* and one student noted that the survey did not cover the need to be aware of library subscriptions to otherwise password protected sources.

The analysis of the second follow-up question for the fourth-year students highlighted that the majority of the students (27/42, 64%) could not identify any items on the survey that were not applicable to their fourth-year studies and a further 5/42 (12%) of students gave no response. However, 4/42 (10%) of the students reported that the questions related to organising information (Information Literacy Standard 4) were not applicable to their fourth-year studies. In addition 2/42 (5%) reported comments relating to applying new information to construct new concepts (Information Literacy Standard 5) and 7/42 (17%) of students wrote comments relating to legal issues in using information (Information Literacy Standard 6).

Interview analysis

The unpredicted differences between the first-year and fourth-year cohorts in the survey responses and the analysis of the follow up questions suggested that there were differences in the way the fourth-year students used information that required further investigation. This was gathered in follow up interviews with four fourth-year students (see Appendix 5).

During the interviews, students described some of the medical resources they use regularly and how they can search these more effectively. The students discussed the process they use to find the answers to clinical questions that arise in the hospitals. One student commented "My first point of call normally is to go to the textbooks. First I tend to refresh the whole problem and the topic in my mind and, say pancreatitis, I

might go and find out in a basic pathology book [from Years 1 and 2] and something a little bit more about the management of it and then for more specific questions I generally tend to start at Medline. The evidence-based stuff [e.g. *Clinical Evidence*] since the lecture at the start of the year". When asked about the differences that they perceived between finding information required for their studies in the pre-clinical versus the clinical years, the fourth-year students covered a number of areas. Selected quotations are: "Well, probably the first port of call would be to speak to the immediate senior. Just ask them for some resources that they might suggest", "I was only really exposed to *Clinical Evidence* this year and some of the other databases", "I think on the wards we refer to senior staff", "You'll get some senior staff who are very good at suggesting [sources of information]." This response illustrates the shift from a naïve learner dependent upon texts, manuals and other documents, toward a professional practitioner engaged in information exchange within the profession.

Discussion

The reliability of the generic form of the *CAUL ISS* for medical students is demonstrated through the high Cronbach alpha scores for both the first and fourth-year students. The high overall reliability is a necessary pre-requisite for concurrent validity – if the survey was not reliable the scores could not be reproduced, and hence one would expect low correlations with other evidence of information literacy. However, the detailed analysis revealed that the responses from fourth-year students to some of the items produced lower self ratings and this raised a question about the predictive validity of the generic *CAUL ISS* for comparing first and fourth-year students.

Issues with Specific Items

On each of the items, the first year students out performed the fourth-year students. For those seven items where the difference is significant, possible explanations for the differences are described below.

ANZ ILF Core Standard 2: Finds needed information effectively and efficiently (CAUL ISS Item 12: I have a system for searching for information on a subject).

Item 12 relates to using a system for finding information. First-year students may have rated themselves significantly higher here because they are using the same system for finding information that they have been using for a number of years. In their university studies, the first-year students would have been researching a topic in much the same way they did at high school (approximately 85% of first year medical students at UWA are school leavers). Finding information for first year assignments revolves around using textbooks, pre-determined journal articles and web sites. The system that has been used in, for example, high school would still be adequate for these first year students. They have yet to become aware of the wide gamut of formal and informal information resources that are required by medical practitioners.

In contrast fourth-year students have become aware of additional resources used in the clinical setting and for more thorough research, but their junior status may limit their access to professional networks. The fourth-year students identified databases such as The Cochrane Library and Clinical Evidence as resources used in addition to Medline. Although fourth-year students are aware of the range of material available to them, they may still be trying to develop a system in which they can identify the

relevant resources for a variety of clinical and non-clinical information needs. Fourth-year students may find it more difficult to develop a system as they have more parts to fit together.

ANZ ILF Core Standard 3: Critically evaluates information and the information seeking process (CAUL ISS Item 5: I critically evaluate each information sources I use, and CAUL ISS Item 8: I evaluate information I read for criteria including accuracy and relevance).

Items 5 and 8 relate to evaluating information. Item 5 relates to evaluating all information sources that are used while item 8 specifies evaluating for criteria such as accuracy and relevance. The first-year medical curriculum has a strong emphasis on evaluating information. By fourth-year, students should be obtaining information only from reputable sources such as refereed journals. Item 5 relates specifically to evaluating information sources. A possible explanation for this difference between the two groups is that the fourth-year students are evaluating their information sources at an early stage of their searching. That is, the evaluation is done at the stage of choosing the information resource itself rather than the specific information that is found within. Further investigation is needed to confirm whether the response by fourth-year students can be explained by their confidence in the information resources they are using. If they believe these resources contain reliable information, this would explain why they do not consider it so important to evaluate each time they select from a specific information resource.

ANZ ILF Core Standard 4: Manages information collected or generated (CAUL ISS Item 1: I have a system that helps me organise the information I need).

Item 1 relates to having a system to organise information. Clinical coursework in fourth-year requires organising different types of information to that used in the pre-clinical years. Fourth-year students are being exposed to patient information, and to hospital guidelines and procedures. Most of these would be new to the fourth-year students and could explain why they do not rate themselves as highly as first-year students. First year students are organising a limited amount of information from familiar resources (books, journals, web sites) whereas the fourth-year students are organising those as well as the clinically specific information.

ANZ ILF Core Standard 5: Applies prior and new information to construct new concepts or create new understandings (CAUL ISS Item 4: When I get a new idea, I work out how to explain it effectively, and CAUL ISS Item 18: I compare information as I'm reading with what I already know).

Standard 5 relates to applying found information to construct new concepts. Item 4 regards effectively explaining new ideas and item 18 relates to comparing found information with what the student already knows. It is unclear why the fourth-year students would rate themselves lower on these items than the first year students. One possible explanation is that the fourth-year students are no longer engaged in research essays that require them to look at information from a wide variety of books and journals and then summarize these and add their own ideas. Rather, in the clinical setting, the students are required to apply the best available evidence to the individual patient. Therefore their focus may be more on making the best judgement based on known protocols of practice rather than formulating new concepts. Resources used in the clinical setting (such as Clinical Evidence) are pre-packaged sources of information and the students are not

required to explain new ideas in the same way that they do in a standard undergraduate essay. Teaching and learning revolves around case studies and problem-based learning.

ANZ ILF Core Standard 6: Uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information (CAUL ISS Item 20: I comply with stated restrictions on the use of intellectual property).

Item 20 relates to intellectual property which is not a term that is often used in information literacy teaching and learning activities in the UWA medical course. First year students are possibly not as aware of the restrictions of intellectual property and so rated themselves more highly than the fourth-year students who “know what they don’t know”.

A short survey need not cover every aspect of information literacy in order to be a valid survey. It appears from the responses of first year students that this applies and the survey can be considered valid in their context. However, for fourth-year students, it appears that regard to the information sources that best inform evidence based practice need to be considered. The significant difference between the two groups of students in seven of the survey items and the lower self-rating of the fourth-year students may indicate that the content is not sufficiently broad to reflect the situated information literacy of the higher level medical students.

This is confirmed by the responses to the additional questions and the interviews with the higher level students. The information skills that students need for the higher (clinical) years of the medical course are different to that for the lower (pre-clinical) years. Analysis of the areas of difference showed that the fourth-year

students' approach to finding, evaluating and using information has begun to change in line with their exposure to clinical practice. First year students focus their information skills around the use of textbooks, journal articles and web sites (in this way first year medical students are similar to the other first year cohorts for whom the *CAUL ISS* was designed). Fourth-year medical students are becoming aware that there is a much broader range of information resources to draw from, including colleagues. Information resources for fourth-year students must include those they develop as they are exposed to the clinical setting, and the consequential lowered self-rating on the generic *CAUL ISS*, which illustrates their increasing awareness of the complexity of information retrieval. The information from the additional questions and interviews indicates that the *CAUL ISS* content is not valid for higher level medical students. This is in line with the concept of situated information skills anticipated by the developers of the *CAUL ISS*.

In their responses to the questions posed at the conclusion of the administration of the *CAUL ISS*, 30% of the first year students identified information relating to Standard 2 as not being included in the *CAUL ISS*. The four *CAUL ISS* items that relate to Standard 2 are general items on searching for information (I use a combination of search tools including library catalogues and web search engines, I have a system for searching for information on a subject, if my searching returns too much irrelevant information, I change my keywords, I decide how best to find the information I require for a particular task) and do not specifically mention, for example, using databases to find journal articles. Database searching is a requirement for first year medical students. Their responses may indicate that either they do not associate the items with database searching, or that as novice researchers

they do not associate generic statements about search methods with the procedures they employ.

Fourth-year students identified two main areas of difference in the additional questions and in the interviews relating to the clinical setting. The first is the need to consult with colleagues and the second is the specific skills that are required to find information to answer clinical questions. These are areas that could be included in the development of a form of the *CAUL ISS* suitable for use with advanced medical students.

Conclusion

The generic *CAUL ISS* is reliable when used with both first and fourth-year medical students. The validity of the generic *CAUL ISS* for first year medical students is consistent with the findings in the Technical Manual and it can be used for this group. For fourth-year students validity has not been confirmed and further research in the area should focus on designing and validating a discipline specific version of the survey. This could include additional questions on recognizing the need for information, using colleagues as a source of information and the use of consolidated information resources integrated with relevant questions from the current version of the *CAUL ISS*. These findings are consistent with the situated nature of information literacy in higher education.

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APPENDIX 1

Information Literacy Standards (CAUL, 2001)

1. The information literate person recognizes the need for information and determines the nature and extent of the information needed
2. The information literate person accesses needed information effectively and efficiently
3. The information literate person evaluates information and its sources critically and incorporates selected information into their knowledge base and value system
4. The information literate person classifies, stores, manipulates and redrafts information collected or generated
5. The information literate person expands, reframes or creates new knowledge by integrating prior knowledge and new understandings individually or as a member of a group
6. The information literate person understands cultural, economic, legal, and social issues surrounding the use of information and accesses and uses information ethically, legally and respectfully
7. The information literate person recognizes that lifelong learning and participative citizenship requires information literacy

Australian and New Zealand Information Literacy Framework (Bundy 2004 p.11)

Core Standards

These standards identify that the information literate person:

1. Recognizes the need for information and determines the nature and extent of the information needed
2. Finds needed information effectively and efficiently
3. Critically evaluates information and the information seeking process
4. Manages information collected or generated
5. Applies prior and new information to construct new concepts or create new understandings
6. Uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information

APPENDIX 2
CAUL Information Skills Survey Questions

1	I have a system that helps me organise the information I need.
2	I keep accurate details of everything I read.
3	I use a combination of search tools including library catalogues and web search engines.
4	When I get a new idea, I work out how to explain it effectively.
5	I critically evaluate each information source I use.
6	When I make notes about the information I am reading, I include the author and title.
7	I reference websites that I have used in my assignment.
8	I evaluate information I read for criteria including accuracy and relevance.
9	I develop a system to keep track of the information I find and its sources.
10	I apply my institution's policies regarding plagiarism.
11	In selecting information, I evaluate the quality of the information.
12	I have a system for searching for information on a subject.
13	I need to keep relearning because life is constantly changing.
14	I revise my research plan and strategy if I need to gather more information or data.
15	I present the information in a medium that suits the audience.
16	If my searching returns too much irrelevant information, I change my keywords.
17	When I consider information I have found, I state the key ideas in my own words.
18	I compare information as I'm reading with what I already know.
19	I decide how best to find the information I require for a particular task.
20	I comply with stated restrictions on the use of intellectual property.

APPENDIX 3

University of Western Australia

Medicine Information Literacy 2007

	IL Outcomes based on CAUL IL framework	Learning Reinforcement	Faculty Learning Outcomes by year	Graduate Outcomes
1st-year Session 1 Lab FAHB	<p>The student is able to :</p> <ul style="list-style-type: none"> • recognise the need to seek librarian help in the information seeking process • distinguish between the various types of material on reading lists. (eg. books, journals, chapter in a book, internet resource) • find and access items on reading lists 	<p>lecturers encourage use of library resources for assignments</p> <p>PBL resources list includes a range of resources</p>	<p>Yr 1 Demonstrate ability to access a range of information resources</p>	<p>Use effective communication skills & styles</p> <p>Apply the principles of lifelong learning continuing education</p>
Session 2 WebCT FCP	<p>The student is able to :</p> <ul style="list-style-type: none"> • clarify the meaning of an [assignment] topic using reference sources • list the keywords in an [assignment] topic • identify types of resources (e.g. books, journal articles) likely to be useful • construct an appropriate search strategy for specified resources • determine the reliability [trustworthiness] of resources (eg. web sites, journal articles) • demonstrate an understanding of the purpose and 	<p>search strategy included in FAHB assignment. Strategy is evaluated and lecture given to students by Librarian on performance of group as a whole as part of assignment feedback</p> <p>Vancouver style required for all submitted material (PBL, assignments etc)</p> <p>lecturers encourage range of</p>		

	<p>coverage of different information access tools</p> <ul style="list-style-type: none"> • begin to recognise the need to locate a variety of resources, representing a range of viewpoints • cite sources and quotes accurately (avoid plagiarism) • use Vancouver correctly to cite sources 	<p>resources in assignments and rural week report</p> <p>PBL have shorter reference lists and students are encouraged to add more</p>		
1st-year	IL Outcomes	Learning Reinforcement	Faculty Learning Outcomes by year	Graduate Outcomes
Session 3 Lab FCP	<p>The student is able to :</p> <ul style="list-style-type: none"> • plan an appropriate search strategy • evaluate results and revise search strategy accordingly • identify sources of health information including population data, major health issues in rural areas, health services and facilities in rural areas • discuss the authority of information found • cite resources correctly using Vancouver 	<p>community health information required for rural report</p>	<p>Yr 1 Demonstrate ability to access a range of information resources</p>	<p>Use effective communication skills & styles</p> <p>Apply the principles of lifelong learning continuing education</p>
Session 4 Lab FCP	<p>The student is able to :</p> <ul style="list-style-type: none"> • identify the special characteristics of medical literature (structured thesaurus, health statistics) • identifies when different resources are appropriate (journals, books, databases, web sites) 	<p>students email articles from session to themselves to show/discuss in next tutorial</p>		

	<ul style="list-style-type: none"> • recognises that the search strategy has to be designed for the particular resource (database, web) • gain an overview of a topic using review articles 			
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	IL Outcomes	Learning Reinforcement	Faculty Learning Outcomes by year
4th-year Session1 1-on-1 reference interview EBM	The student is able to : <ul style="list-style-type: none"> • find papers to answer their individual question in the following tutorial session 	individual reference interviews inform discussion in following tutorial	Yr 4 Use appropriate information management methods
Session 2 WebCT	The student is able to: <ul style="list-style-type: none"> • construct a well built clinical question • understand the parts of a clinical question • apply the clinical model to a patient • identify and search the sources of synthesized evidence-based information; • access evidence-based resources to inform decisions • comment on the reliability and authority of information found • base a clinical decision on the evaluated information found 	WebCT backed up with a teaching slide series that they go through either before the question, or at different points along the way. question may be assessed and compulsory	

APPENDIX 4

The seven items on which fourth-year students rated themselves more severely than did first year students are as follows:

1. I have a system that helps me organise the information I need.
2. When I get a new idea, I work out how to explain it effectively.
3. I critically evaluate each information source I use.
4. I evaluate information I read for criteria including accuracy and relevance.
5. I have a system for searching for information on a subject.
6. I compare information as I'm reading with what I already know.
7. I comply with stated restrictions on the use of intellectual property.

APPENDIX 5

Topics discussed in the interviews

1. Formal and informal sources that are resources for finding information while working in the hospitals as opposed to those used in the pre-clinical years.
2. Specific types of information sources e.g. textbooks, evidence-based summaries.
3. Importance of timeliness in information retrieval in the clinical setting.
4. Limiting searching to particular study types e.g. randomised controlled trials.
5. Critically evaluating sources of information.
6. Clinicians involvement in directing students to information.

All the quantitative analysis reported was undertaken using SPSS version 12.

There were 84 first year students and 112 fourth-year students.

CAUL Australian and New Zealand Information Literacy Framework