

# From cornerstone to capstone: information literacy collaboration across the curriculum

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# From cornerstone to capstone: information literacy collaboration across the curriculum

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### **Abstract**

Librarians and academics alike are passionate about how students engage with scholarly information. We want students to build on their existing information literacy skills when they commence university and to graduate with the information skills needed for lifelong learning in their chosen profession and society at large. Collaboration between librarians and academics to embed information literacy into curriculum design is a key strategy for developing students' information skills. But what impact does our collaborative effort have on student learning outcomes and long-term information seeking behaviour? Are our graduates information literate and ready for a complex information society?

At Latrobe University information literacy is situated as part of inquiry/research graduate capability. Librarians and academics invest much time and effort in teaching and learning partnerships at the institutional, course and subject level. The emphasis is on a coherent, consistent and coordinated approach to embedding information literacy into curriculum design across these three domains. This approach is supported by reusable online resources that have been developed by library staff at La Trobe and intended for use in a blended learning environment.

This paper describes the results of a longitudinal study that tracked the information literacy skills of a particular cohort of students from cornerstone to capstone (2009-2012), and reflects on how this evidence-base has informed collaborative practice and development of learning activities and assessment tasks. The study includes the outcome of international benchmarking for final year students at La Trobe University using a standardised information literacy assessment tool.

In conclusion, the paper returns to the importance of embedding information literacy into the curriculum design and measuring information literacy learning outcomes progressively during a course. Highlighting the advantages of collaborative practice in terms of student learning outcomes and graduate capabilities reinforces the impact of library and faculty partnerships in the university teaching and learning environment.

### **Keywords**

Information literacy; collaboration; library and faculty; learning outcomes; higher education

## 1. Introduction

In the past decade, the international importance of information literacy to learning in higher education has been characterised by national information literacy standards (Bundy 2004, ACRL 2000, SCONUL 2011) and local university policy alike. These documents make clear that information literacy forms the basis of lifelong learning and is essential to academic research, professional decision making and continuing education – all of which require students to have the information skills to effectively find, use, and evaluate information and data in an ethical manner.

In the higher education environment, information literacy skills are those skills associated with research and which enable students to participate in scholarly communication regardless of discipline or year level. Because information literacy transcends disciplines and levels of study, it is therefore best embedded into the curriculum design - as part of the subject learning outcomes, learning activities and assessment rather than treated as separate from them (Lupton, 2004; Ford & Hibberd, 2012; Salisbury et al., 2012). Such alignment builds students' information literacy capacity coherently and explicitly across a degree program. Students are more likely to develop skills that are second nature when information literacy is intertwined with their own subject content, and included in assessment. With the right scaffolds in place information literacy skills can be developed incrementally over the course of a degree.

Scaffolding information literacy through a whole degree program is contingent on the establishment of collaborative relationships between librarians, academics and the range of teaching and learning staff (Mackey & Jacobson, 2005; MacEachern, Townsend, Young, & Rana, 2012). And for those that invest in such collaborative partnerships, the value of this investment comes from incremental improvements and changes in students' knowledge, skill and understanding of information literacy skills and preparedness for a complex information society. Will students be ready to meet the information literacy demands of their chosen profession? Do students meet expected university information literacy outcomes by the end of their degree? How does their information seeking behaviour develop over the course of their degree? For both academics and librarians being able to answer these questions is linked to understanding the impact that our collaborative efforts have on student learning outcomes and long-term information seeking behaviour.

At La Trobe University, data has been collected to study the information literacy skills of a particular cohort of health sciences students from cornerstone to capstone. From first to final year, this cohort of students was surveyed four times (2009-2012). This tracking exercise (in itself a collaborative endeavour) has provided academics and librarians at La Trobe with a picture of the impact on student learning outcomes of our collaborative approach to embedding information literacy into curriculum design. Furthermore the data gathering has informed the development information literacy assessment tools and learning activities for all students, across the university, no matter the discipline. This paper presents the results of our longitudinal study as it relates to:

- students' achievement of information literacy learning outcomes in final year
- students' change in information seeking behaviour over the course of a degree
- the performance of La Trobe final year Health Science students compared to final year students internationally

## 2. Collaboration for embedding information literacy

At La Trobe University, information literacy is positioned as part of the inquiry/research graduate capability – which is one of six university-wide<sup>1</sup>. Librarians, academics and specialised teaching and learning staff work together to embed information literacy in subjects where the graduate capability of inquiry/research is assessed. In doing so, librarians and academics have invested much time and effort in cultivating teaching and learning partnerships at the course, degree and subject level to achieve institutional objectives related to information literacy (La Trobe, 2011).

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<sup>1</sup> There are six La Trobe graduate capabilities including; writing, speaking, teamwork, critical thinking, inquiry/research, and creative problem solving.

For La Trobe academics and librarians, collaborative partnerships are seen as an obvious and natural mechanism for embedding information literacy into the curriculum. This view is supported by Jarson (2010) who writes:

“to achieve a sustained and significant impact, information literacy cannot be addressed only by librarians or only in isolated experiences. Instead, we need a holistic approach through which invested campus partners come together and advocate for the importance of information literacy and accept shared responsibility in it.” (p.534)

Like Jarson (2010), many authors argue that information literacy initiatives must be pursued as a common concern of academics and librarians (Mackey & Jacobson, 2005; Jones, Evans, & Magierowski, 2007) and that it is only through collaboration at the institutional, course and subject level that university aspirations for information literate graduates can be achieved (Lindstrom & Shonrock, 2006). Each partner brings complementary expertise that ensures information literacy competencies are formally adopted as learning outcomes for an undergraduate curriculum (Fiegen, Cherry & Watson, 2002).

Derakhshan & Singh's (2011) meta-synthesis of 48 articles about embedding information literacy into the curriculum found that collaboration emerged as one of four major themes, and was commonly perceived as critical to the success of embedding information literacy into the curriculum. Authors that analyse this relationship through a student learning lens provide evidence that there are links between collaboration for embedding information literacy with improved learning outcomes for students (Miller, Jones, Graves, & Sievert, 2010; Bennett & Gilbert, 2009; Andrews & Patil, 2010).

### **3. Measuring information literacy experience, behaviours and learning outcomes**

While a large volume of literature has been published on the relationship between collaboration and embedding, many authors also draw attention to the importance of being able “to demonstrate that students are actually learning the skills and knowledge” (Fain, 2011). Over the past few decades, a considerable amount of literature has been published on methods to gain insight into students' entry level information literacy skills (Thirion & Pochet, 2009; Kingsley et. al., 2011; Conway, 2011), information experience, cognitive behaviours and self-efficacy (Walton & Hepworth, 2011; Thompson, Lewis, Brennan & Robinson, 2010), information usage (MacMillan, 2009) and learning outcomes (Li, 2012; Emmett & Emde, 2007; Fiegen et al., 2002; Shanahan, 2007; Samson, 2010). However, all methods are not equal (Schilling & Applegate, 2012; Steele & Mandernack, 2011). There is a difference between what students say about their learning in terms of their perception of their skills, and what they actually achieve in terms of observable improvement in learning outcome. Given this difference Abdullah (2010) argues that evidence-based data based on performance of learning outcomes is superior to student perception-based data. Furthermore evidence-based data is seen by Abdullah (2010) as the best way to measure the impact of information literacy collaborations.

The pre/post-test approach is commonly used to gather evidence that measures change in learning and behaviours (Meyer et al., 2008; Freeman & Lynd-Balta, 2010; Price, Becker, Clark, & Collins, 2011; Locknar, Mitchell, Rankin, & Sadoway, 2012), particularly for single interventions (Porter et al., 2010; Staley, Branch & Hewitt, 2010). The results from these studies are used to inform the development of learning resources, improving programs (Gustavson, 2012; Bruwer, 2012) and as an indicator of the value that collaboration between librarians and academics has for student learning. A collaborative partnership is the first important step in helping students' achieve information literacy (Gustavson, 2012; Bowers et al., 2009; DaCosta, 2010). Collaboration leads to embedding information literacy in the curriculum and paves the way for collaborative assessment. Assessment of learning outcomes provides evidence of the value of an embedded approach for the development of information-literacy skills (Shorten, Wallace, & Crookes, 2001; Freeman & Lynd-Balta, 2010; Moser, Heisel, Jacob, & McNeill, 2011).

### **4. The La Trobe model**

At La Trobe the educational theory of constructive alignment (Biggs & Tang, 2011) provides a basis for academics and librarians to collaborate on embedding information literacy learning outcomes, learning activities and assessment tasks, and ensuring all these elements are in place and are explicitly connected. The relationship between these elements is illustrated in Figure 1.

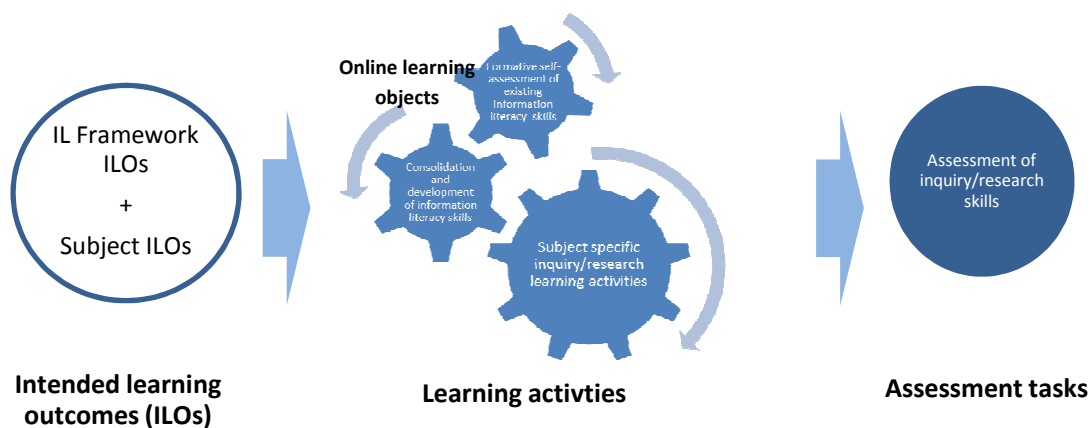


Figure 1 – Using constructive alignment to embed information literacy into subject design

Key resources that support the collaborative process of constructively aligning information literacy skill development with subject learning outcomes, activities and assessment, are available in the La Trobe Inquiry/Research Toolkit (La Trobe University Library, 2011). It is intended that resources in the toolkit are used by faculty librarians working in partnership with academics to embed information literacy into curriculum design. To support embedding information literacy learning outcomes the Toolkit includes the La Trobe *Information literacy framework* (La Trobe University 2011). This framework supports subject inquiry/research intended learning outcomes and is based on the *Australian and New Zealand information literacy framework, principles, standards and practice* (Bundy, 2004). To support the embedding of learning activities that are aligned with information literacy learning outcomes the Inquiry/Research Toolkit includes reusable online learning objects that have been developed by library staff in conjunction with academic staff. Learning objects specifically address intended learning outcomes (ILOs) in the La Trobe *Information literacy framework*. To support alignment of information literacy assessment with ILOs and learning activities the toolkit includes examples of assessment rubrics and subject case studies.

Learning objects accessible via the toolkit include online modules for building skills and a quiz for measuring information literacy learning outcomes early in a degree program. The 10 question Inquiry/Research Quiz (IRQ) is a multiple-choice quiz. It is auto marked and provides customised feedback via one minute animations, and directs students to appropriate additional information literacy online modules for further skill development. The IRQ is easy to embed in the curriculum as an early formative self-assessment where “the results are used for feedback during learning” (Biggs & Tang, 2011, p. 195). The IRQ was developed in 2009 from a 20 question pre-experience information literacy survey (adapted from Mittermeyer, 2005). In 2009, the survey was administered to first year health sciences students in the first week of first semester and then again near the end of semester two (Fisch, Karasmanis, Salisbury, & Corbin, 2009). In order to select the most relevant questions from this set for the IRQ, the questions were mapped to the foundation and consolidating levels of La Trobe *Information literacy framework*.

Since the IRQ was developed, it has been used across La Trobe’s five faculties, in first year subjects that assess inquiry/research. With the success of the IRQ the development team realised that the Inquiry/Research Toolkit lacked a resource to measure aspects of the inquiry/research graduate capability prior to graduation. This was needed to complete the diagnostic, feedback & assessment cycle for information literacy which begins with the IRQ, and is continued through a degree program via various information literacy learning activities and assessment. It would also mean adding a standard resource that aligns with consolidating and proficient levels of the La Trobe *Information literacy framework*.

While the development of the IRQ was informed by data from pre and post experience surveys of the 2009 health sciences first year cohort, we repeated this method to develop the new assessment tool

for the midpoint to capstone level by surveying the same cohort in 2010 (2<sup>nd</sup> year) and 2012 (final year). As was the case in 2009, we decided to trial an existing survey (Research Practices Survey) to collect data to inform development of resources for the Inquiry/Research Toolkit.

## 5. Research Practices Survey

There are numbers of standardised information literacy tests available (Jarson, 2010) and clearly many advantages in using these type of tests (Lym, Grossman, Yannotta, & Tali, 2010). They are easy to administer on a large scale, they can be used for both pre and post testing, and they can be made highly reliable (Oakleaf, 2008). Moreover, they also usually align to agreed standards, and data analysis is provided (Fain, 2011).

The Research Practices Survey (RPS) is an online survey managed by the Higher Education Data Sharing (HEDS) Consortium. It approaches information literacy holistically by assessing students' experiences with research, their attitudes and beliefs about research, and their skills to formulate research strategies and evaluate sources. The survey is available to be administered as a pre-test to gather baseline data about the information literacy of entering first-year students and as a post-test for senior students, to examine changes over time in students' research experiences, attitudes, and proficiencies. The RPS is an internationally validated instrument, and its administration and resulting reports are provided by HEDS.

## 6. Methodology

By trialling the RPS, we adopted a development phase similar to that used with the development of the IRQ. This methodology is also typical of that carried out at other university libraries - combining the use of standardised tests and development of additional questions related to information literacy standards by local content experts (Leibiger & Schweinle, 2008; Mulherrin & Abdul-Hamid, 2009). The RPS included 34 standard items plus 10 locally developed (i.e. La Trobe context) items that addressed specific elements of the proficient level of the La Trobe *Information literacy framework*.

Ethics approval to trial the RPS was granted by the Education Faculty Human Ethics Committee and the RPS was trialled online with final year health sciences students in April/May 2012.

## 7. Findings – Longitudinal highlights

This RPS survey is the fourth time the development of information literacy skills of the 2009 health sciences cohort has been measured. Some questions have been repeated longitudinally since 2009 or 2010. In 2009, there were over 1000 respondents. There were less in 2010, and in 2012 there were 80 respondents. All health sciences disciplines were represented at each point in the tracking from 2009-2010. In 2012, all disciplines were represented with the exception of Prosthetics and Orthotics.

Health sciences discipline	Time 1 : March 2009		Time 2 : Oct 2009		Time 3 : Sept 2010		Time 4 : May 2012	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Health Information Management	42	4.2	36	3.3	21	4.4	4	5.0
Nursing and Midwifery	320	32.0	377	34.8	61	12.7	19	23.75
Occupational Therapy	103	10.3	114	10.5	37	7.7	5	6.25
Orthoptics	45	4.5	42	3.9	35	7.3	4	5.0
Physiotherapy	93	9.3	99	9.1	88	18.3	13	16.25
Podiatry	43	4.3	70	6.5	68	14.1	1	1.25

<b>Prosthetics and Orthotics</b>	19	1.9	27	2.5	20	4.1	0	0.0
<b>Public Health (Health Sciences)</b>	31	3.1	56	5.2	46	9.5	6	7.5
<b>Social Work</b>	81	8.1	79	7.3	55	11.4	12	15.0
<b>Speech Pathology</b>	75	7.5	74	6.8	51	10.6	16	20.0
<b>Other (mostly noted as Health Sciences)</b>	143	14.3	102	9.4				
<b>Invalid</b>	5	.5	7	.6	1	.2		
<b>Total</b>	<b>1000</b>	<b>100.0</b>	<b>1083</b>	<b>100.0</b>	<b>483</b>	<b>100.0</b>	<b>80</b>	<b>100.0</b>

Table 1 - Respondents by discipline 2009-2012

The longitudinal data reveals incremental improvement over time in a number of skill areas critical to understanding and engaging with academic research. For example, understanding peer-reviewed journals and appropriate citing of scholarly information is critical to the inquiry/research process. These skills need to be developed over time and results in Table 2 indicate that with the right scaffolding in place, students do indeed build this knowledge. For example, in first year only 4.5% of students understood the concept of a peer-reviewed journal and by final year 92.5% understood the concept.

	<b>Time 1 Mar 2009</b>	<b>Time 2 Oct 2009</b>	<b>Time 3 Sept 2010</b>	<b>Time 4 Apr/May 2012</b>
<b>Correct response</b>	4.5%	14.6%	83.7%	92.5%

Table 2 - Conceptual understanding peer review 2009-2012

Likewise, understanding of when to include references to sources of information used improved over time. Table 3 indicates a steady increase in correct responses from 2009 – 2012 related to student understanding of when to cite sources.

	<b>Time 1 Mar 2009</b>	<b>Time 2 Oct 2009</b>	<b>Time 3 Sept 2010</b>	<b>Time 4 Apr/May 2012</b>
<b>Correct response</b>	28.3%	59.0%	74.6%	83.6%

Table 3 - Conceptual understanding of citing sources 2009-2012

Some searching skills also improved incrementally over time. A question about the importance of using synonyms in search strategies was present in 2010 and was repeated as a La Trobe additional question in the 2012 RPS survey. From the data in Table 4, it is evident that there was a marked increase in the percentage answering correctly from 2010-2012.

When constructing a search strategy why is it important to identify alternative terms and synonyms?	Time 3 (2010)		Time 4 (2012)	
	<b>Frequency</b>	<b>Percent</b>	<b>Frequency</b>	<b>Percent</b>
Identifies other words used to describe a single concept	<b>212</b>	<b>44.4</b>	<b>68</b>	<b>86.08</b>
Helps to reduce the number of hits in a search result	<b>68</b>	<b>14.2</b>	<b>5</b>	<b>6.33</b>
Provides help for comprehensive literature searching	<b>198</b>	<b>41.4</b>	<b>6</b>	<b>7.59</b>
Invalid	<b>5</b>			
<b>Total</b>	<b>483</b>	<b>100.0</b>	<b>79</b>	<b>100.0</b>

Table 4 - Constructing a search strategy 2010-2012

Similarly, correct responses to the question about selecting the best sources to search for a particular task, which was repeated in 2010 and 2012, also increased over time.

You need to find the highest level of evidence (using scholarly articles) on the most effective treatment for type II diabetes. Where would you find the BEST information to meet this need?	Time 3 (2010)		Time 4 (2012)	
	Frequency	Percent	Frequency	Percent
A book on diabetes	37	7.8	2	2.63
Medline or CINAHL	400	84.0	72	94.74
Google Scholar	39	8.2	2	2.63
Invalid	7			
Total	483	100.0	76	100.0

Table 5 - Selecting sources to search 2010-2012

The longitudinal data provides important indicators of student improvement related to key learning outcomes. It suggests that in certain critical areas by the time they reach final year, students are well prepared for their respective health sciences professions where keeping up with peer-reviewed journal literature and finding high level evidence is crucial for their continuing education and practice.

### 8. Findings – International benchmarking highlights

Because La Trobe students completed the RPS at the same time as 12 other international cohorts La Trobe senior health sciences students' results can be easily compared to other senior students. The benchmark analysis report provided by HEDS includes a mean score for questions related to a particular theme. This benchmark is another indicator of the learning outcomes of our collaborative approach to embedding information literacy.

The mean scores in Table 6 are based on the percentage of the total number of possible points each student received for their responses to the RPS questions related to the information literacy benchmark theme. One-hundred is the highest score, and higher scores indicate higher levels of information literacy. Table 6 compares the La Trobe students' mean score for each theme to the mean score of other senior cohorts.

Theme	RPS Questions	Spring Seniors 2009-2011*	All Other Spring Seniors 2012	All La Trobe Spring Students 2012**
		Mean	Mean	Mean
Utilization of sources	4, 5, 6, 7, 8	71.12	69.08	73.49
Competence in applying research skills	18 - 31	69.68	65.96	69.73
Time management in pacing research	11	60.24	61.92	65.43
Conceptual sophistication of beliefs about research	15	61.06	59.82	59.13
Enjoyment of research	16	46.85	44.26	46.50
Consultation with instructors and librarians	1, 9, 10	48.94	48.17	40.27
	100 is the highest score * La Trobe University did not participate in these years **All La Trobe participants were in the Spring survey			

Table 6 - Mean scores for RPS themes



### *Theme - Utilisation of sources:*

The mean score for the “utilisation of sources” theme was calculated from results of five questions that assessed use of academic sources like journal articles and databases and understanding of referencing. The results as shown in Table 6 reveal that La Trobe students had a high mean score for this theme when compared to international senior cohorts in 2012 and previous years. This may be explained by the requirement of health sciences degree programs to use peer-reviewed references in assignments (Q4), high use of library books (Q5) and online journals (Q6), and a requirement to use a referencing style (Q8).

### *Theme - Competence in applying research skills*

The mean score for the “competence in applying research skills” theme was calculated from results of 14 questions that assessed search techniques and strategies, familiarity with different types of sources and ability to distinguish between scholarly and non-scholarly sources. It seems possible that La Trobe’s high mean score for this theme is because more La Trobe students could demonstrate understanding of:

- using truncation (Q18)
- that subject headings lead to a comprehensive list for that topic in a library catalogue (Q19)
- how to identify the issue number in a journal reference (Q21)
- how to distinguish between references for journal articles, books, and portions of books (Q22)
- how to search an electronic index to find a comprehensive list of scholarly articles for a topic (Q24)
- how to best describe a peer-reviewed journal (Q25)
- when a citation is not required (Q27)
- some features that do or do not make a work scholarly (Q28)
- how to use scholarliness as the basis for source selection (Q30)

### *Theme - Consultation with instructors and librarians*

The mean score for the “consultation with instructors and librarians” theme was calculated from results of three questions that assessed the frequency with which students use the library and sought help or advice on their research projects from teachers, professors, or librarians. One of the most striking results to emerge from the international benchmarking data is that La Trobe students have a lower mean score than other cohorts when it comes to consultation with librarians. While the La Trobe students were regular users of the university library (Q1), the majority had not spoken to a librarian in the previous year (Q10). Interestingly a low level of consultation with librarians may suggest a high level of independence in their final year when it comes to information literacy.

## **9. Discussion**

The data from our longitudinal study produced results which corroborate the findings of a great deal of the previous work in this field. There is evidence in a number of studies that where incremental building of skills across a number of years happens, there are substantial improvements in the average student score for specified learning outcomes. (Emmett & Emde, 2007; Fain, 2011; Samson, 2010; Shanahan, 2007; Burkhardt, 2007). Commonly, first year students have trouble identifying and accessing academic information (Thompson et al., 2010) and not surprisingly the concept of a scholarly journal article is not well understood and therefore needs to be introduced and built on from first year (Shanahan, 2007). Our study clearly indicates improvement between first and final year for learning outcomes related to understanding peer-review articles, understanding citations, utilisation of academic sources and competence in applying information search skills. Added to this the majority of La Trobe senior students did not consult regularly with librarians. These results are an indicator of information literacy independence and hopefully mean our students are well equipped for inquiry/research in their future professions and for lifelong learning.

In some areas the majority of students did not demonstrate improvement from first to final year (e.g. using Boolean operators). In the areas where most students didn’t do well over time more forensic investigation is needed. However, finding that students show improvement against some learning outcomes more than others is also consistent with the literature. (Conway, 2011).

## 10. Next steps

As a result of the RPS trial, we decided that the RPS was not an appropriate tool for the mid-point-capstone measurement at the local level as it was too long, and some questions were inappropriate and could not be changed. However as a result of the data analysis combined with reliability analysis of how the questions were answered, a proposed set of 10-12 questions were identified. These questions will form a new addition to the toolkit, the Inquiry/Research Survey (IRS), to suit the midpoint-capstone levels of the La Trobe *Information literacy framework*.

## 11. Conclusion

The outcomes of the tracking of the Health Sciences cohort over four years has provided the building blocks to test and develop tools to measure in part the inquiry/research graduate capability for all students. The 2012 data collection also provided significant international benchmarking of La Trobe students' particular skills and gives an indication about what is distinctive about our final year students in terms of the information literacy skills they have developed over the course of their degree. These results could not have been achieved without a high degree of collaboration. A collaboration of this kind does not happen easily or effectively without ongoing dialogue between all the stakeholders involved in enhancing teaching and improving student learning outcomes. That librarians, academics and specialist teaching and learning staff have worked so well together to improve students' information literacy is a testament to a collective focus on that curriculum dialogue.

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