
INFORMATION LITERACY: PAST SUCCESS AND FUTURE NEEDS FOR UNDERGRADUATE HEALTH PRACTITIONERS

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ABSTRACT

This paper outlines three research projects that explore information literacy (IL). Two projects reveal successful improvements in the IL skills and behaviours of students from undergraduate health programs, whilst the third project exploring the accessibility of professionally relevant information resources to the same group of graduate health practitioners reveals a complex web of levels of access and IL skills, elucidating current and future needs at the undergraduate and graduate health practitioner level.

KEYWORDS

Information literacy – lifelong learning – access – evaluation

INTRODUCTION

Lifelong learning (LLL) and Evidence-Based Practice (EBP) are widely recognised as essential components of practice within the health professions (Gopee, 2001; Jarvis, 1987; Madewell, 2004; Wong & Venness, 2005). Information literacy (IL) has been described as an enabler of LLL (Candy, 1991) and EBP (Brettell & Grant, 2004; Kaplan & Whelan, 2002; Snowball, 2005). In Australia and internationally, strategies and activities have been implemented to support student IL development. RMIT University is amongst many who aim for their graduates to have well developed information literacy and be able to 'effectively access, manage and utilize information in their professional and personal capacities, as well as actively engage in lifelong learning'. (RMIT, 2005)

The information explosion in the fields of health and medicine resulting from new knowledge and technological developments continues at an exponential rate (Kaplan & Whelan, 2002; Lefebvre & Clarke, 2003). The implications for change and development of practice is clear; graduate practitioners in these fields must have the skills and understandings to develop as independent lifelong learners to advance their personal and professional practice in the increasingly evidence based environments they will encounter (Dawes, 2005; Kaplan Jacobs, Rosenfeld, & Haber, 2003).

Three projects that were progressed or finalised by the authors during tenure of an RMIT Teaching and Learning Fellowship in 2007 are discussed in this paper. Two projects (Projects 1 and 2) were focussed at supporting the development of undergraduate (UG) student IL skills and behaviours. The third project

investigated the accessibility of professionally relevant information sources to graduate health practitioners. All students in Project 2 and students from one of the six undergraduate program teams studied in Project 1 become Medical Radiation Science¹⁵ (MRS) practitioners upon graduation. Participants in Project 3 were current MRS practitioners. This three-pronged approach provides evidence of the IL skills within the MRS profession at both the undergraduate and graduate practitioner level as well as illuminating issues of accessibility to professionally relevant information resources for these practicing health practitioners.

Project 1: IL Development of First Year Medical Science Undergraduate students

The information literacy (IL) development that occurred following a common five week compulsory Foundation Tertiary Learning Module across six UG programs was evaluated. The Foundation Module sat within each of six courses aimed to introduce the student to their chosen discipline, and varied in teaching and assessment approaches in the remaining 8 weeks. There were three scaffolded learning activities for IL development which were scheduled to provide optimal timing for the learning activities including due dates for assessment purposes. Evidence of the development of IL skills was specifically assessed as a learning outcome, and thus was considered to be integrated into the course (Lupton 2004).

Method and results

The evaluation tool used was updated and adapted for the Australian context from one used by Mittermeyer (2005) and Bernath & Jenkin (2006). The tool collects demographic data, and has 20 multiple choice questions grouped around

¹⁵ The health practitioners in this study are Medical Radiation Science (MRS) practitioners and consist of Nuclear Medicine Technologists, Radiation Therapists, Radiographers and Sonographers.

five themes which can be related to the ANZIIL Framework standards (2004). The maximum possible score is 20. The tool was used before the Foundation Module (Round 1; n = 274) and after (Round 2; n= 151) with 102 matched pairs occurring. Quantitative analysis was conducted

*Table 1: Analysis of Mean Scores of various groups. * Values of $p > 0.05$ indicate the value is not*

	Round 1 (Week 1)		Round 2 (Week 13)		p value
	Mean	SD	Mean	SD	
Whole Cohort	9.142	2.863	11.051	3.204	<.001 *
Matched Pairs	10.219	2.537	11.719	3.312	<.001*

statistically different from 0.

As is demonstrated in the table above while the mean scores of the incoming students was not high, (maximum score possible is 20), improvement across the semester did occur. When the differences in Mean scores were calculated for all students in both rounds (whole cohort) and for the Matched Pair group within the cohort, positive and statistically significant

using Microsoft Excel © and SPSS © V15 software using Paired Sample T tests and correlation (2-tailed) analysis. Mean scores and analysis of variance were calculated for both the Round 1 and Round 2 cohorts, as well as the Matched Pair group.

differences were demonstrated. When the data from the Matched Pair group is interrogated further by considering individual programs, it is revealed that students of Programs 1 and 6 have statistically significant differences in their mean scores between the two rounds, however the students from Programs 2, 3 and 4 do not. See Table 2 below.

Program	N = 102;n =	R1 Mean	R1 SD	R2 Mean	R2 SD	p value
1	28	10.879	2.747	13.336	2.689	<.001*
2	9	10.278	3.771	11.100	3.602	.108
3	23	10.169	1.981	10.926	3.946	.170
4	23	9.839	2.035	10.469	2.967	.186
6	19	9.737	2.740	12.100	2.822	.001 *

*Table 2: Matched Pair data analysis of Mean Differences by Program * Values of $p > 0.05$ indicate the value is not statistically different from 0.*

Project 2: IL development embedded in a 2nd year undergraduate project

This project (MS) embedded IL development within a group project. Purposefully designed collaborative learning activities were used to scaffold 2nd year UG radiography students as they undertook their project. The activities were aimed at supporting students to expand their information search process beyond 'Googling' to include database searching and to expand their process for evaluating the quality of information they retrieve. These focuses were chosen as the literature identifies they are not well developed in UG students. See Shanahan (2007) for a description of the intervention.

Methods and results

This course level intervention used a purposefully developed questionnaire to gather data on information searching and evaluation practices of students. A four-point scale described by Catts (2003) of usually, often (>½ time), sometimes (<½ time) and rarely was used to collect data on information search practice of students pre- and post-intervention. Open-ended questions were used to ascertain which databases

and search engines students were using and the criteria students used to evaluate information retrieved from the internet. Anonymous surveys were used for data collection and so it was not possible to pair data for analysis. Survey data was input into SPSS 15® and descriptive and inferential statistics were used to analyse this data. Percentages were used to describe survey findings. Differences between groups was examined using Fischer's Exact test, as SPSS warning for small cell size precluded chi-square (χ^2) analysis. Combined data from two years, 2006 and 2007 are discussed in this paper.

There was a positive increase in frequency of database searching post-intervention (Fisher's Exact Test = 25.738, $p = .000$) with 93% of students *often* or *usually* searching databases for university assignments or projects compared to 51% pre-intervention. At the pre-intervention survey 28% of student typically searched two or more databases and this increased to 92% post-intervention, with over two-thirds (69%) of students searching 3 or more databases. The databases students nominated as searching included general health and medical databases such as Medline® / PubMed®, ProQuest® as well as discipline specific databases including CINAHL®, Science Direct®, Expanded Academic ASAP™ and Informat plus text®. Change in search behaviour and knowledge is

demonstrated by a students comment about what they have learned from the intervention “It’s important to use wide range of databases and make changes to your search statement to find a wider range of information”. Internet searching was an important part of the students search behaviour pre- and post- IL activities. There was no significant difference in level of internet searching pre- and post- intervention ($p = .763$). An increase in use of Google™ Scholar was seen post-intervention with 40% of students using it compared to 9% pre-intervention.

Students were asked to name criteria they used to evaluate information retrieved from the internet. Pre-intervention nearly half (47%) of the students named a single criterion to evaluate information retrieved from the internet. Post-intervention 79% of students named 3 or more criteria (Fisher’s Exact Test = 33.608, $p = .000$). Criteria identified post-intervention included publishing organisation, credentials of author, date of publication or last-updated, domain, and review process such as peer-review.

Project 3: graduate practitioners

This project (MS) focussed at the graduate MRS practitioner explores the accessibility of information resources to practitioners in their workplace. MRS practitioners, like other health practitioners must stay up to date with the changing knowledge base of their profession (AIR, 2004; SOR, 2007). To successfully implement LLL and EBP practitioners must have access to professionally relevant information resources. Yet interestingly there has been no research to investigate how accessible professional relevant information is to MRS practitioners once they graduate from university.

Methods and results

In April-May 2007 a four-page questionnaire was sent to a random sample of 1067 MRS practitioners registered with the Queensland and Victorian Medical Radiation Technologists Boards. The questionnaire was developed following interviews with 28 academic and clinical practitioners to establish issues relevant to the MRS profession (Punch, 1998; Williams, 1997). Three hundred and twenty useable surveys were returned from clinical practitioners.

Respondent characteristics

All areas of specialisation were represented in the respondents with the spread across specialisations in proportion to available demographic data (AIHW, 2003). Practitioners were split fairly evenly between the public (53.1%) and private (46.9%) sector with over half (54.6%) employed in teaching hospitals. The majority of respondents (58.3%) were employed in metropolitan locations with 15.1% in rural & remote locations.

Accessibility to information resources in the workplace

Aspects of accessibility to information resources discussed here are access to the internet in their workplace, number of journals practitioners have access to and skill level of practitioner.

Access to the Internet in the workplace

Table 3 illustrates the variability of access to the internet that exist within the workplaces of clinical practitioners. The difference in computers with internet access was not significant for healthcare sector.

	Fisher’s Exact Test	P value	Access to the internet in their workplace
Metropolitan / non-metropolitan location	11.005	.025	Internet access on all computers: Metropolitan (42.3%), non-metropolitan (36.8%) No Internet access: Metropolitan (0.6%), non-metropolitan (7.4%)
Teaching / non-teaching environment	19.623	.000	Internet access on all computers: Teaching (48.2%), non-teaching (28.1%) Internet access only on computers in offices: Teaching (15.5%), non-teaching (31.7%)

Table 3 Variations in access to the internet across clinical workplaces

Internet access whilst available on computers did not necessarily mean that clinical practitioners could access it as lack of passwords or permission prevented access. Comments included “All computers have internet access but need password which staff rads [radiographers] are not given” and “all computers have internet

access but 2/100 staff have access”. Internet access was also limited to restricted sites for some practitioners for example “do not have access to web only government [health] site”.

Access to journals

Access to journal was assessed by the number of journals practitioners identified they had access to from a list of 96 professionally relevant journals. Ten percent of practitioners reported they did not have access to any journal on the list, with this rising to 17% for rural and remote practitioners. Nineteen percent of practitioners had access to a single journal (percentiles 25th = 1, 50th = 4 and 75th = 9).

Skill level of practitioners

Practitioners were asked to self assess their skill level for internet searching, database searching and evaluating the quality of information retrieved from the internet. It is evident from Table 4 that practitioners are confident in their ability to search the internet but their perceived skill level for evaluating the quality of information they have retrieved from the internet is lower. One quarter of practitioners rate their database searching skills as low or very low, with a further 13.8% having never searched a database.

	Very high	High	Moderate	Low	Very low	Never done it
Internet searching (n=319)	29.8%	32%	24.8%	7.2%	4.4%	1.9%
Evaluating quality (n=318)	11.6%	24.2%	40.9%	11.3%	6.3%	5.7%
Database searching (n=320)	8.1%	20%	33.1%	12.5%	12.5%	13.8%

Table 4 Practitioner self-assessment of skill level for searching the internet, evaluating quality of information retrieved from the internet and databases searching

DISCUSSION

IL skill development has been widely adopted in higher education (Johnston & Webber, 2003). It is established in the literature that IL education interventions can increase the skills and abilities of students, (Salisbury & Ellis 2003; Shanahan 2007; Andrews & Patil 2007) as research from these projects also supports. The results from projects 1 and 2 show that an increase in the Information Literacy skills does occur across a semester, when purposefully designed interventions embedded within or with associated independent learning activities are utilised. The changes in IL skills included improvements in basic search skills, expansion of their search behaviour to typically include database searching, and an increase in the number of criteria they use to evaluate information retrieved from the internet.

It is also evident from this research that following any one intervention there remains a range of skills and behaviours requiring further support and development, which supports the need for sustained development of information literacy skills throughout the undergraduate programme as supported in the literature (Harris & Rourke 2006; Haines & Horrocks 2006). In Project 1 for example the more advanced Search Strategies (Use of a Controlled Vocabulary for example) and the Use of Search Results (spanning across ANZIIL standards 3,4 & 6) were the areas that showed little improvement across the semester and indicate a future need for

additional support via dedicated learning activities. The applications of these skills are vital for the practitioner engaged in meaningful lifelong learning.

In Project 1 there were statistically significant differences across the semester in the mean scores of students from two of the five programs. Programs One and Six include an independent learning activity (a peer and tutor assessed Group Project and Presentation), while the remaining programs focus their assessment around tutorial activities and end of semester examinations. These results therefore appear to support the use of independent, peer reviewed learning activities to better suit current student learning styles (Manuel 2002, Sharkey 2006, Graffam 2007) and also to enable the students a repeated opportunity to engage with a contextual IL learning activity to help further develop their skills and understandings.

Project 2 demonstrates the expansion of student search process to routinely include searching of multiple databases. Database searching is an uncharacteristic part of the UG students search process (Callinan, 2005; Griffiths & Brophy, 2005; Urquhart et al., 2005) yet database searching is one of the positive outcomes of this project. Database searching is considered an important part of the information search process of health practitioners (Griffiths & Riddington, 2001; Masters, 2006) so by supporting UG students develop their information search process

we are helping to prepare them for graduate practice.

Graduate practitioners assessment of their skill levels for database searching and evaluating the quality of information retrieved from the internet is much lower than their skill level for internet searching. It is apparent that there is a current need for practitioners to engage in supportive education activities to develop their database searching and internet evaluation skills. These skills are being developed within undergraduate programs as shown here in Projects 1 and 2, which supports the long-term development of such skill and behaviours within the profession.

It is also evident from this research that access to information resources in clinical environment of the graduate practitioner work place is not homogenous. Internet access in the clinical environment varied from open access on all computers to no internet access due to there being no computers in the department with internet access or practitioners being denied access to it. Many clinical practitioners had access to a single journal, generally from their professional society. It is expected that MRS practitioners stay up to date with the changing knowledge base of their profession, implement EBP, and undertake research (AIR, 2004; SOR, 2007). To successfully undertake these activities, practitioners require access to a wide range of quality information resources. However, for many MRS practitioners, this research demonstrates this is not the case.

The individual project results as well as the conglomerate approach taken in this paper considering the IL needs of both student and graduate practitioners, whilst illuminating the workplace reality of access to professionally relevant information resources for graduate practitioners may be of interest to educators and librarians involved in delivering courses and services to students and practicing professionals in the health sciences and more broadly in other professional discipline areas.

CONCLUSION

The past successes are shown by the positive changes in IL development demonstrated at the UG level interventions which support students to more fully engage with quality health and medical information available to them within the information-rich university setting. At the level of the graduate practitioner there is current need for skill development in database searching and evaluation of information retrieved from the internet. The current and future need of many clinical practitioners, including our

undergraduate students upon graduation, is for an improvement in the physical access to health and medical information resources. Without this access and improved skills and understanding of Information Literacy, active engagement in lifelong learning and evidence-based practice will be compromised.

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