Measuring the application of information literacy skills after students completed a Certificate in Information Literacy

by J Lockhart

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Abstract

Much has been done to integrate Information Literacy (IL) into the curriculum at CPUT. To take it a step further, we also need to focus on the assessment of IL skills, our assessment methods and a continuous evaluation of the validity and reliability of the IL assessment instruments being used. This is important as we need to show the value we are adding and that we are contributing to the development of our students. The current assessment method used by CPUT Libraries for the summative assessment as part of the short course, Certificate in Information Literacy (CIL), is by multiple-choice questions through the Learning Management System (LMS) Blackboard. It is also requested that the CIL be taught with a subject-specific essay assignment so that the learning experience is real for the students and they can apply what they have learned, therefore adding more value to the academic programme. The first part of this study was to do an item analysis on the test data of students who completed the test during 2013 and the results were used to improve the test. This article reports on the second part of the study, therefore focusing on how students applied their newly taught information literacy skills when doing a subject-specific essay assignment and how that related to their score in the multiple-choice test.

Keywords: Information Literacy, assessment, academic libraries, Cape Peninsula University of Technology

1. Introduction and problem statement

Much has been done to integrate Information Literacy (IL) into the curriculum at CPUT. An institutional Information Literacy policy was approved in 2009; a university Information Literacy Committee (ILC) was formed to oversee and monitor all information literacy activities at CPUT; IL curriculum was developed; a short course called Certificate of Information Literacy (CIL) was registered and the teaching skills of librarians are continually being developed. But, to take it a step further, we need to also focus on the assessment of IL skills, our assessment methods and a continuous evaluation of the validity and reliability of the IL assessment instruments being used. This is important as we need to show the value we are adding and that we are contributing to the development of our students. The current assessment method used by CPUT Libraries for the summative assessment as part of the short course CIL is by multiple-choice questions through the Learning Management System (LMS), Blackboard. It is also requested that the CIL be taught with a subject-specific essay assignment so that the students understand how to apply what they have learned and therefore adding more value to the academic programme.

The CIL short course was registered at the end of 2012 by the Cape Peninsula University of Technology (CPUT) Libraries at CPUT's short course department called Centre of Professional and Personal Development (CPPD). This short course was offered to mostly first year and Extended Curriculum Programme (ECP) students from 2013 and arranged between the lecturer and their librarian. The ECP is for students who need extra support and more time to complete their qualification and therefore the first year subjects are offered over two years (Cape Peninsula University of Technology, 2015). The CIL offers 5 modules over 5 weeks and students complete an online Information Literacy (IL) multiple-choice assessment which they access via a Learning Management System (LMS). The assessment consists of 100 multiple-choice questions of which students receive a random selection of 50, to complete in one hour. Students who pass the assessment receive a formal CPUT short course certificate (Lockhart, 2015). The assessment was an open-book test and students were allowed to consult their notes and hand-outs. It is hoped that further learning could take place while students do the test.

During 2014 the first part of this study was completed by doing item analysis on assessment data of students who did the assessment during 2013. It was to evaluate the validity and reliability of the existing online information literacy skills assessment instrument being used at the CPUT Libraries to assess the CIL (Lockhart, 2014). According to Nunnally (1972: 186) the item analysis test will indicate "which items should be chosen for new tests and which items need to be either revised or discarded". The item analysis study highlighted "weaknesses and problematic areas in the test" as it looked at each of the questions which was then "re-evaluated, adjusted or even discarded in some cases" to improve the assessment instrument (Lockhart, 2014: 41). Twenty-three questions were replaced, eighteen images were added and the updated version of the test was introduced in 2015. It is planned to do the item analysis on a regular basis to ensure the assessment instrument is continually updated and improved.

Further to the online multiple-choice assessment, it was also important to measure how students applied their newly taught IL skills by doing a subject-specific essay assignment. Therefore two assessment instruments were used, a multiple-choice test and an essay assignment. The research questions are therefore the following: Does the current information literacy multiple-choice summative assessment show improvement in the IL knowledge of a student? Are students applying their information literacy skills in essay assignments after attending an IL course? In the case of this research, it is hoped that the library would be able to demonstrate that it adds value to the academic programme and improves the IL skills of students.

2. Review of the literature

In higher education institutions, assessing of student learning is a top focus area and therefore academic librarians also need to provide evidence that "students acquire information literacy skills" (Belanger et al., 2015: 623). Academic libraries increasingly need to add value to their universities and its strategic goals. As stated by Berendt and Otero-Boisvert (2012: 78), "it is no longer sufficient, as it was in the past, to prepare monthly and annual reports that indicate gate counts, circulation statistics, and instruction sessions". They explained that although that kind of

information will assist library managers in their planning, "they do not begin to paint a compelling picture of institutional impact and value". MacAyeal (2014:312) also confirms this and indicates further that traditional library assessment data does not demonstrate the impact that the library has on student learning or even faculty research. Staley and Malenfant (2010: 57) indicated the importance of "futures thinking" for academic librarians and that "we must also know what will be valued in the future so that we can begin to take appropriate action now". Oakleaf (2010: 141) stated that "one way to work toward a positive vision of the future is to engage in the demonstration of library value, recognizing that the process is not one of proving value, but rather continuously increasing value". Policy development is an important part of the process to successfully integrate IL into the curriculum at a university. As indicated by Grafstein (2002: 198) libraries have been teaching IL for many years with minimal success because it has mostly been initiated by librarians. She argued that these programmes could only succeed if they are developed and supported within an "explicit statement of philosophy from the highest levels of academic administration" and that it should form "part of the educational mandate of the institution". In another study (Gullikson, 2006: 588–590) it indicates that faculty appreciates the value of IL skills and that students should acquire it in their first year. In his book, Race (2015) describes 7 factors that underpin successful learning, these are wanting, needing, doing, making sense, feedback, verbalising and assessing. These factors need to be explored within each training intervention.

Retention and skills transfer

An important area to consider is retention and skills transfer. Cook and Michael (2015: 35) define retention as when students remember concepts and skills we teach them and transfer as when students "take what they have learned and apply it to new, unrelated contexts". What would be a reasonable time for a student to become information literate? Therefore retaining the knowledge and skills they were taught and be able to transfer those skills to various information challenges. In these studies (Selegean et al., 1983: 477; Wang, 2006: 80) it was indicated that pre-test/post-test assessment evaluation is limited to short-term information retention, often not long-term retention. Werking (1980: 161) mentions that students are often assessed immediately after receiving instruction and that short-term gains are likely

not to be significant. What is therefore needed by the academic programme to support and improve information literacy skills transfer of students and ensure long-term retention? We offer the CIL mostly in the first year for students, but that is only the start to becoming information literate, not the end. It is very important that the academic programme continually tests and builds the information literacy skills of students. This is supported in a study by Dubicki (2013: 107) where she found that students' abilities in information literacy improved by year of education. In a study by Singh (2005: 302) she asked faculty how they would categorise the research skills of their students and only 1.7% rated their students' research skills as excellent and 33,8% as poor. Saunders (2012: 227) mentioned that engineering professors indicated that their students' information literacy skills improved by their senior year. Research by Perkins (1986: 9) around "thinking frames" and how human beings organise their thinking indicates that "since transfer cannot be relied upon to happen by itself, we must teach for transfer". According to Wong (2010: 118), Perkins explained a three stage learning process which includes "acquiring skills, making the skills automatic, and transferring the skills to other contexts of application". Applying skills that were taught in one subject to another is also an important issue to consider. In this study (Lappalainen & Rosqvist, 2014: 414) it was reported that the "first step required for transferring skills to a new situation is seeing a possible connection", the success also depends on the proficiency of skills the students have. Therefore, they asked teachers whether "their students appear to learn and carry skills well from one course to another", and if not, what they think the possible problems and underlying reasons might be. This area needs further exploration and research.

Assessing IL skills application

Few studies have been done on faculty members' assessment of students' information literacy skills (Dubicki, 2013: 98). In a study by Hoffman and LaBonte (2012: 76-77) it was found that IL proficiency levels in students can be shown by assessing writing assignments with a targeted rubric and that IL instruction has a positive correlation to the application of IL in their written work. A rubric, as described by Stevens and Levi (2005: 3), divides an assignment into components and "provide[s] a detailed description of what constitutes acceptable or unacceptable

levels of performance for each of those parts". It therefore communicates to students what is expected of them with the assignment. Another study (Daugherty & Russo, 2011: 324) reports that students who enrolled for an IL stand-alone course used the IL skills learned and applied those skills in other courses as well.

Assessment methods

Various assessment methods have been used by faculty and librarians, some more than others. According to Hurst and Leonard (2007) "citation analysis of student term papers has become a popular means of determining what sources students are utilizing to support their research". She also states the importance of assignments that are developed to take advantage of the various library resources that are provided together with information literacy teaching interventions. This would be beneficial to both the students and the faculty. Walsh (2009: 21) reviewed the literature around information literacy assessment to see which assessment methods were used by librarians. He identified the following categories: analysis of bibliographies, essay, final grades, multiple choice, questionnaire, observation, portfolio, quiz/test, self-assessment and simulation. After multiple-choice, the analysis of bibliographies was the second most popular method used. He found that this method was more subjective and time consuming and the literature showed very little information around reliability and validity as an assessment method. Essays are another assessment method discussed as part of his study. Students could, for example, be asked to describe the information seeking process they would use for a particular topic. This will also be explored as a further assessment instrument at CPUT. Observation as an assessment tool is mostly done in very small studies and not really suitable for mass assessment. This assessment tool would however provide valuable information in the information seeking behaviour of students although there is always a danger in that people who are observed might not act how they normally would. Simulations could assess how students would seek information and respond to a real problem, but this method does not seem to be sufficiently practical for regular use. Portfolio as an assessment tool is a time consuming method and could not really be used for large number of students. As indicated by Lindauer (2004: 122) "learning is complex and multidimensional and any serious attempt to assess learning must take a multi-methods approach". In the case of the

CIL with the students as part of this research study, two assessment methods were used, multiple-choice assessment and subject-specific essay writing assessment. Students also did various practical exercises during class time. The work from the previous week was used in the next week, for example, the development of a search strategy around the topic of the subject-specific essay assignment (post-essay - *result 4*), was used the next week in class for the searching of information on various tools, such as the catalogue and databases. It is important that what we teach the students is real and needed by them, using an abstract topic to demonstrate IL concepts has not proven to be very effective. This is also confirmed by Cook and Michael (2015: 35) where they share five principles for structuring information literacy instruction, one of which is that the teaching should be done around a "concrete intellectual problem" and therefore teaching with a real assignment is critical. It will increase the motivation levels of the students and the sessions will become relevant to them.

3. Methodology

The researcher used a positivist approach and a quantitative method. The sample of students consisted of two groups of first year students from a single class in the Faculty of Business, Cape Town campus, which enrolled for the short course CIL during 2014. The two groups together were 42 students. These students attended the CIL classes during term 3 of that year and were taught by the researcher who covered the five modules over five weeks. Each module was taught over a 90 minute period. The students completed a pre-essay in term 2 as given by their lecturer and the rubric for this essay had a 40% weighting for information literacy, 20% for in-text referencing and 20% for the reference list. These marks were used for the pre-essay (*result 1*) mark as indicated in figure 1.

The researcher gave the students an online multiple-choice pre-test before the teaching intervention. This mark is the pre-test (*result 2*) as indicated in figure 1. After the training intervention over five weeks, the students completed the online multiple-choice summative assessment in week six, which is the post-test (*result 3*), as indicated in figure 1. This pre-test was the same as the post-test, but students did not know this beforehand. For the sake of this study, the pre- and post-test

consisted of 50 randomized questions that were selected after the item analysis tests were done (Lockhart, 2014). The reason for using the same questions for both tests were because it would be "very difficult to make accurate comparisons between students" (Nunnally, 1972:184) if they do not answer the same questions. At this time, the randomized selection of questions from a large bank of questions will continue to form part of the standard assessment for this short course.

In an attempt to explore the validity of the online summative assessment further, the researcher needed to measure how students applied their newly taught IL knowledge and skills with an actual essay assignment. The researcher worked together with the lecturer of this group to ensure the development of a subject-specific essay assignment, the post-essay (*result 4*) and that was used as the basis for teaching the CIL. This assignment was in the form of an essay and was developed by the lecturer in such a way as to ensure that their information literacy skills were tested, together with their subject-knowledge. The researcher shared examples of IL rubrics found on Rubric Assessment of Information Literacy Skills (RAILS) with the lecturer who then developed the rubric for the essay assignment and allocated a 30% weighting for IL. Rubrics are used to "guide analysis of student work" and are "descriptive scoring schemes" (Oakleaf, 2008: 244). The lecturer assessed the assignment and shared the marks with the researcher.

Out of the 42 students, 34 students had results for three of the assessments (pre-test (*result 2)*, post-test (*result 3)*, post-essay (*result 4)* and out of this group 25 students also had a result for the pre-essay (*result 1)*. Therefore, not all 42 students completed or submitted all four assessments.

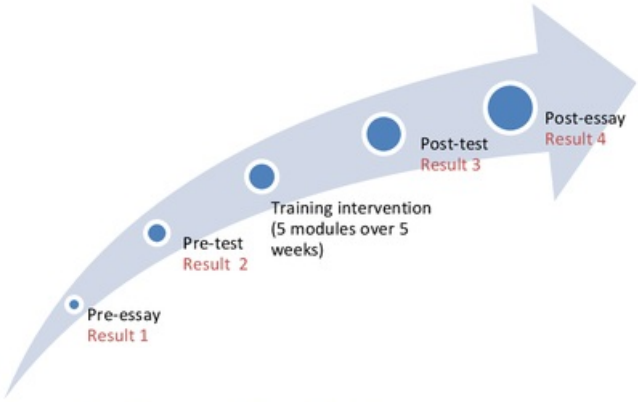


Figure 1: Diagram showing the results used as part of the methodology

The data will be analysed as follows:

The descriptive statistics will be determined for all four results (number, minimum, maximum, mean and standard deviation). Then paired sample tests will be done between:

Pair 1	Post-test - Pre-test (*result 3 – result 2*)
Pair 2	Post-essay - Pre-essay (*result 4 – result 1*)

A paired sample t-test is to determine "whether the means of two samples that come from the same or similar cases are significantly different from each other" (Cramer & Howitt, 2004: 168).

A Wilcoxon Signed Rank test will be done between the post-test (*result 3*) and the post-essay (*result 4*). According to Kremelberg (2011) "this test is the non-parametric equivalent of the paired t-test", it does not assume distribution. This is therefore to see how many students performed better in the post-essay than the multiple-choice post-test.

4. Results and discussion

The descriptive statistics for the four results (pre-essay, pre-test, post-test and post-essay) are indicated in table 1:

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-essay (*result 1*)	25	30	88	62.24	15.07
Pre-test (*result 2*)	34	26	78	57.88	10.55
Post-test (*result 3*)	34	58	88	74.41	8.03
Post-essay (*result 4*)	34	40	88	63.97	12.61

Table 1: Descriptive statistics

Table 2 indicates the analysis of the paired sample tests. The differences are calculated for all the students and then the average difference is determined.

		Paired Differences					t	df	p-value (2-tailed)
		Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Post-test - Pre-test (*result 3 – result 2*)	16.53	10.11	1.73	13.002	20.06	9.54	33	0.000
Pair 2	Post-essay - Pre-essay (*result 4 – result 1*)	3.16	6.08	1.22	0.65	5.67	2.60	24	0.016

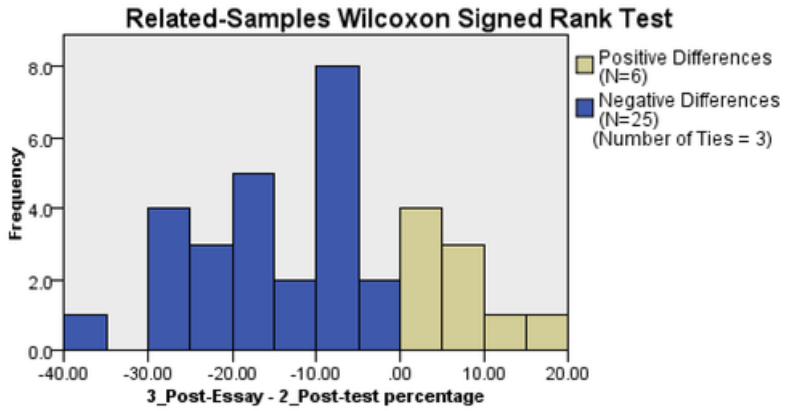
Table 2: Paired samples test

Pair 1 (pre-test and post-test) showed an increase of 16% in the average. The p-value was much less than .001 and therefore there is a statistically significant increase from the pre-test to the post-test. It is therefore proven that the students did much better in the post-test that was given after the training intervention than in the pre-test that was given before the training intervention.

Pair 2 (pre-essay and post-essay) showed a 3% increase from the pre-essay to the post-essay, even though it is a very small increase, the p-value was less than .05 and therefore a statistically significant increase. It is therefore proven that the students did show a small improvement from the pre-essay to the post-essay in applying their IL knowledge and skills that they were taught during the CIL classes. This, however, poses the question about skills transfer and what would be a reasonable expectation? In other studies (Dubicki, 2013; Saunders, 2012) it was shown that students' IL skills mostly improved by year of education and were much better by their senior year. The students who formed part of this study were in their first year and therefore a small improvement should possibly have been expected. Becoming information literate is a process and skills transfer takes time, it will not happen immediately. It is also important to note that skills transfer will continue only if the academic programme continues to test IL skills. If a person keeps on

practising a skill, he/she should get better at it. If there is no continuous academic assessment for IL after an IL training intervention such as the CIL, students will probably lose the skills they were taught and not necessarily apply them in future essays or across subjects, therefore short-term retention. To ensure that continuous assessment takes place and that IL is embedded within the full curriculum of an academic programme, a departmental approach should be considered. A departmental approach would be where the entire faculty involved in an academic programme (all subjects and level of study years) work together with the librarian to ensure that all essay writing assignments are developed to test IL skills and that rubrics will include heavy weightings for IL. The librarians could play a very important role to get this conversation started within an academic department.

The Wilcoxon Signed Rank test, as seen in figure 2, compared the multiple-choice post-test (*result 3*) and the post-essay (*result 4*) to see how many students performed better in the post-essay than the post-test. It is important to note that we are comparing two different assessment instruments, a multiple-choice online assessment and a subject-specific essay assignment. Six of the students did better in the post-essay, 25 students did better in the post-test and 3 students did the same in both. There was a statistically significant difference in the results that students did overall much better in the multiple-choice post-test (*result 3*) than in the post-essay (*result 4*). This confirms that applying the IL skills in an essay assignment is much harder than answering multiple-choice questions that mostly test knowledge. We should take note that it is possibly better to use a multi-method assessment approach when assessing IL, therefore not just relying on a multiple-choice online assessment only. This could be in partnership between the lecturer and the librarian.



Total N	34
Test Statistic	55.500
Standard Error	50.996
Standardized Test Statistic	-3.775
Asymptotic Sig. (2-sided test)	.000

Figure 2: Wilcoxon Signed Rank Test

Therefore, based on the results, both research questions for this study have been answered and found to be positive, the current information literacy multiple-choice summative assessment improves the IL knowledge of a student and students are applying their information literacy skills in essay assignments after attending an IL course. Therefore, this study proved that the students applied their information literacy skills in their essay assignments after attending an IL short course.

5. Conclusion

It is clear that academic libraries need to demonstrate their value and it needs to link to the strategic plans of the university. There has to be explicit buy-in from top management for any process to be successfully implemented. In this study it has been proven that offering a short course in IL, such as the CIL, improved the information literacy skills of students. It showed improvement in the knowledge

gained by students in the multiple-choice assessment as well as the application of IL skills in their essay assignments. It also highlighted that skills transfer is a process and that it takes time. Librarians should teach for long-term transfer by working closely with faculty and ensuring that assessment of IL skills would continue for the full duration of the academic programme, therefore a department approach to IL. Academic libraries should be partners in the academic process, which includes assessment methods and measuring the application of IL skills.

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