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SAILS, Take 2: An Exploration of the "Build Your Own Test" Standardized IL Testing Option for Canadian Institution

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Abstract

Several standardized and validated information literacy (IL) tests have been developed for use in U.S. post-secondary contexts, but fewer choices exist for schools outside of the U.S. In an earlier study (Cowan, Graham, & Eva, 2016) the authors explored IL testing at a Canadian university using the international version of the SAILS Cohort test. This article describes a second study that used the Build Your Own Test (BYOT)—a customizable version of the SAILS Individual Scores test—to evaluate undergraduate students' IL learning. Pros and cons of using the Cohort and BYOT versions of SAILS are discussed, with the aim of providing guidance for other schools interested in pursuing such testing. The authors found the BYOT allowed them to better gauge the extent to which individual students' IL ability levels changed over the course of one term.

Keywords: information literacy, standardized tests, SAILS, Canadian institutions, liberal education, undergraduate students

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Introduction

Academic librarians commonly employ a variety of means to help students develop the abilities to seek and use information effectively and ethically throughout their academic studies, everyday lives, careers, and lifelong endeavors: abilities known collectively as information literacy (IL). Assessing the efficacy of IL instructional efforts, however, remains a challenging concern. The authors conducted a pre-test/post-test study of mainly first-year students' IL abilities in the fall of 2015 (Cowan, et al., 2016). The instrument used was the Standardized Assessment of Information Literacy Skills (SAILS), a multiple-choice, norm-referenced IL test modeled on item response theory (Salem & Radcliff, 2007).

As a Canadian institution, the only SAILS testing option in the fall of 2015 was the international version of the Cohort test. Although enlightening and worthwhile, the experience with the SAILS Cohort test seemed to generate more questions than answers. Since the Cohort test report only described comparative results of the institution's students as an aggregated group, it was not possible to learn the extent to which individual students' post-test scores reflected an improvement over pre-test scores. Additionally, because the questions in each test were automatically and randomly selected, it is probable that students who participated in the 2015 study received some questions in skill areas not covered in the IL instruction they received.

Just as University of Lethbridge students were writing the Cohort post-test in December 2015, Carrick Enterprises announced a new SAILS "Build Your Own Test" (BYOT) option that would available to all institutions as of January 2016. The BYOT is more flexible than the two pre-existing SAILS tests, as it offers the ability to hand-pick questions for inclusion from the SAILS question bank and does not impose a minimum on the number of test questions used (Project SAILS, 2016a). Coincidentally, a colleague at the University of Lethbridge who teaches two IL credit courses had been thinking about exploring ways to formally assess the quality of IL learning in her courses, and offered to provide class time for students in her courses to write the test in the Fall 2016 term. This unanticipated expression of interest in trying out the BYOT essentially jump-started the authors' decision to run a SAILS study a second time using the new option.

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Literature Review

The importance and challenges of developing useful, reliable, and validated IL assessment are well recognized in the literature. Declaring "national attention on assessment in education is here to stay," Mark (2004) described a wide variety of IL assessment resources and projects. More recently, Boh Podgornik, Dolničar, Šorgo, and Bartol (2016) compared the features of several IL tests developed over the past 15 years that have been designed for a variety of target groups and learning environments, and they summarized the IL models on which these instruments are based.

If a free SAILS testing opportunity had not presented itself, the authors of the present study are unsure whether the SAILS Cohort test would have been their preferred choice in 2015, although standardized, validated instruments suitable for Canadian institutions were scarce (Cowan, et al., 2016). The Information Literacy Assessment & Advocacy Project (ILAAP) is the only assessment tool developed by Canadian librarians for post-secondary students (Goebel, Knoch, Thomson, Willson, & Sharun, 2013). Despite the validation of its item-level reliability, ILAAP is not validated as a standardized tool (Information Literacy Assessment & Advocacy Project, n.d.).

Standardized IL testing may not be the type of assessment needed in all situations. Concerns about standardized testing include perceived inability to track differences in IL attainment levels within individual students, lack of immediate feedback, and affordability of commercially available tests (Fain, 2011). Others note that standardized tests may not be directly relevant to local testing populations and may receive less buy-in from local faculty (Sharun, Thomson, Goebel, & Knoch, 2014). In their adaptation of Kirkpatrick's four levels of evaluation, Turnbow and Zeidman-Karpinski (2016) suggested program-level assessment such as standardized IL tests and gauging what learners apply in practice are appropriate for end-of-term evaluations, whereas gathering learner feedback and quizzing students on what they have learned may be more appropriate for one-shot instruction sessions.

Besides SAILS, in 2015 there were few reliable, validated tests broadly relevant to undergraduate students that were mapped in some fashion to the *ACRL Information Literacy Competency Standards* (*Standards*). The possibilities included the *iSkills*™ assessment from ETS (Katz & Macklin, 2007), the Information Literacy Test (ILT) developed at James Madison University (Swain, Sundre, & Clarke, 2014), the South Dakota Information Literacy Exam (Lebiger & Schweinle, 2008), the Information Competency Assessment Project (ICAP) undertaken by Bay Area community colleges (Gratch-Lindauer et al., 2004),

and the VOILA! test created by Hunter College librarians (Ondrusek, Dent, Bonadie-Joseph, & Williams, 2005).

All of these other tests were developed in the U.S., and accordingly, they may reflect U.S.-centric test questions. In contrast, SAILS was developed from 2002 to 2006 with participation from six Canadian academic libraries (Project SAILS, 2012), and in 2014 the Cohort test became available worldwide in an international version (Project SAILS, 2014). Subsequent to their 2015 study, the authors became aware of another validated, freely available IL test: the Information Literacy Test (ILT) developed in Slovenia that is also based on the ACRL competencies and intended to be applicable internationally (Boh Podgornik, et al., 2016).

The literature on libraries that have engaged in standardized IL testing is slim. Detlor, Julien, Willson, Serenko, and Lavallee (2011) reported on their use of the SAILS test in Canadian business schools in 2011, which did not involve a pre- and post-test research design. In earlier studies, Snow and Katz (2009) explored ways to validate the *iSkills*™ assessment, and Gross and Latham (2007) discussed their use of the Information Literacy Test. All of these researchers uncovered some inconsistencies or unexpected findings in their results.

Methods

The present study involved three participating courses. Taught by a librarian, Library Science 0520 (LBSC 0520) is a credit course within the First Nations Transition Program, which helps indigenous students make a smooth transition to university life when they return after an absence or when they do not meet all requirements for general admission. Also taught by a librarian, Library Science 2000 (LBSC 2000) is an Arts & Science credit course focusing on core IL concepts and skills applied in various disciplines and settings. Liberal Education 1000 (LBED 1000), an introduction to critical thinking, numeracy, and communication and research skills from a multi-disciplinary perspective, is the only repeat course from the 2015 study. LBED 1000 is a credit course taught by a team of non-librarian faculty that has a four-lab component taught by a librarian.

These three courses were chosen mainly because they consist of a large number of first-year students who represent the authors' target group for gauging IL attainment levels, and because the courses either focus on IL or include a substantial IL component.

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The authors reused the approach of the initial study with respect to pre-test/post-test study design, consent agreement protocol, data security, and confidentiality measures (Cowan, et al., 2016), which were approved by the University of Lethbridge ethics review committee. While the study intervention was IL instruction in all three courses, the delivery format differed. LBED 1000 students had four library labs taught by a member of the research team and were encouraged to complete a set of online IL modules on their own time. LBSC 0520 and LBSC 2000 students received in-class IL instruction by a librarian throughout the term with no online learning component. All students were offered bonus marks and a chance to win a gift certificate as participation incentives. In addition, LBSC 0520 and LBSC 2000 students were given in-class time to write both tests.

This investigation was guided by the same research questions identified for the 2015 study:

- What are the levels of IL possessed by incoming first-year students?
- What, if any, is the improvement in students' IL abilities after IL instruction?
- Are there correlations between students' IL attainment levels and their year of study?

By using the BYOT in this round of standardized IL testing, the authors hoped to obtain more reliable answers than those obtained via the 2015 Cohort test study. They also sought a means of identifying and comparing individual student scores to more accurately distinguish between pre- and post-test results.

Building the BYOT

The BYOT tests were assembled by members of our research team who had no responsibility for grading course assignments. First, the two librarians responsible for providing IL instruction in the participating courses reviewed a list of all items in the SAILS question bank and eliminated questions on topics that would not be covered. From the remaining items, the authors created two non-overlapping sets of questions. Each set contained the same number of questions, reflecting the same difficulty range within each skill area. The resulting pre- and post-tests, each containing 26 SAILS questions, were far shorter than the 45-question Cohort test. The intent of constructing a shorter test was to encourage a higher rate of participation than in the 2015 study.

As shown in Table 1, the tests contained between two and four questions in each of eight skill areas based on the *Standards* (Association of College and Research Libraries, 2000). In all but one area it was possible to include at least one question at each of three levels of

difficulty. These levels were developed by identifying difficulty ranges specific to each skill area based on the assigned difficulty score of each question in the SAILS question bank.

Table 1: BYOT question mix

Skill Area	# Questions	Easy	Moderate	Difficult
Developing Research Strategy	4	2	1	1
Selecting Finding Tools	3	1	1	1
Searching	4	1	2	1
Using Finding Tool Features	3	1	1	1
Retrieving Sources	3	1	1	1
Evaluating Sources	4	1	2	1
Documenting Sources	3	1	1	1
Economic, Legal, Social Issues	2	1	1	
Totals	**26**	**9**	**10**	**7**

On the authors' request, Carrick Enterprises incorporated the difficulty level of each question into the BYOT question bank. The authors balanced the overall difficulty level so that both the pre- and post-test had between seven and ten questions rated easy, moderate, and difficult; this was done to ensure that they were of equal difficulty, and to measure a range of skill levels. The chief concern was to reduce the likelihood that any observed differences between students' pre- and post-test results were due to differences in the difficulty level of test questions.

Study Participants

At the start of the fall 2016 term, a total of 157 students were enrolled in the three participating courses. Eight students withdrew from two of the courses by December. The proportion of students who chose to participate in the study was highest in the post-test (84.6% versus 77.7% writing the pre-test). The overall participation rate was very good, as almost 90% of the 157 students wrote at least one of the two tests. In contrast, the much longer test used in 2015 drew an overall participation rate of only 25%, although other factors were also likely at play (Cowan, et al., 2016).

Figure 1 shows that the distribution of study participants was quite similar for the pre- and post-tests. In the pre-test, about 70% of students were in first year, with the remainder divided roughly evenly between second year and third year and above. In the post-test, the

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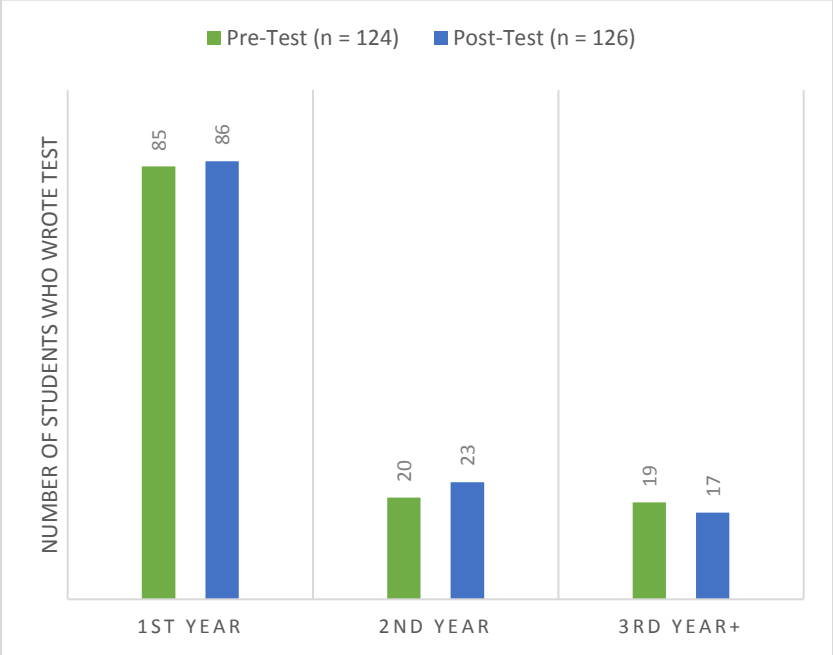
participation rate for second year students rose slightly but decreased slightly for students in third year and above.

A custom demographic question included in the pre-test asked whether students had received library or research instruction in a previous class. The responses summarized in Figure 2 show that, as one might expect, most first-year students reported they had not received prior instruction, whereas almost 60% of students in third year or above said they had received IL instruction.

Figure 1: Study participation rates by class standing



Results

The central question explored in this study is whether students' information literacy levels improved by the end of term. Table 2 presents the lowest, highest, and mean scores for the pre- and post-tests broken down by class standing. For first and second year students, post-test means were higher than pre-test means, which was the desired outcome; the largest increase occurred among first year students. It was surprising, however, to find that for the more experienced students—those in third year and above—the post-test mean was four percentage points lower than the pre-test mean.

Figure 2: Responses to pre-test question on prior IL instruction (n=124)

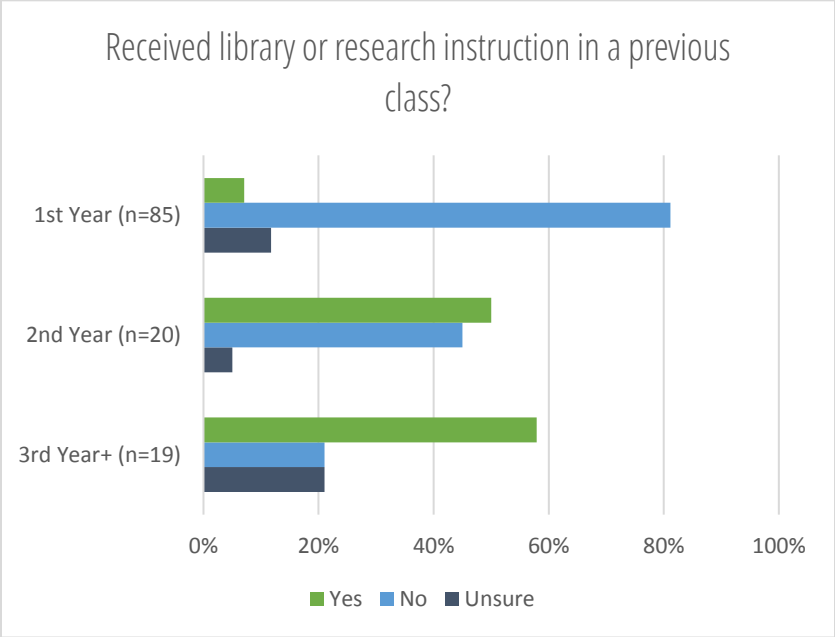


Table 2: All participants, comparison of pre-test and post-test scores by class standing

Test	Score Category	1st Year	2nd Year	3rd Year+
Pre-test (n=124)	Lowest	23.1%	15.4%	30.8%
	Highest	80.8%	80.8%	80.8%
	Mean	*51.8%*	*56.5%*	*59.3%*
Post-test (n=126)	Lowest	15.4%	26.9%	23.1%
	Highest	84.6%	84.6%	80.8%
	Mean	*57.5%*	*58.9%*	*55.2%*

Simple comparisons of mean scores do not necessarily indicate whether real learning took place; among other reasons, some students wrote only the pre-test and others wrote only the post-test. The comparisons of pre- and post-test mean scores were therefore narrowed to include only the 107 students who wrote both. Table 3 presents the results of this more focused analysis. While the largest overall mean score increase of 6.9% occurred among first year students, the -5.8% mean score difference for students in third year or above was counterintuitive.

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DOI: 10.15760/comminfolit.2018.12.1.3

Table 3: Completed both tests, comparison of pre-test and post-test scores by class standing

Test	Score Category	1st Year	2nd Year	3rd Year+
Pre-test (n=107)	Lowest	26.9%	15.4%	30.8%
	Highest	76.9%	80.8%	80.8%
	Mean	*52.3%*	*55.7%*	*59.4%*
Post-test (n=107)				
	Lowest	15.4%	26.9%	23.1%
	Highest	84.6%	84.6%	80.8%
	Mean	*59.2%*	*57.9%*	*53.6%*

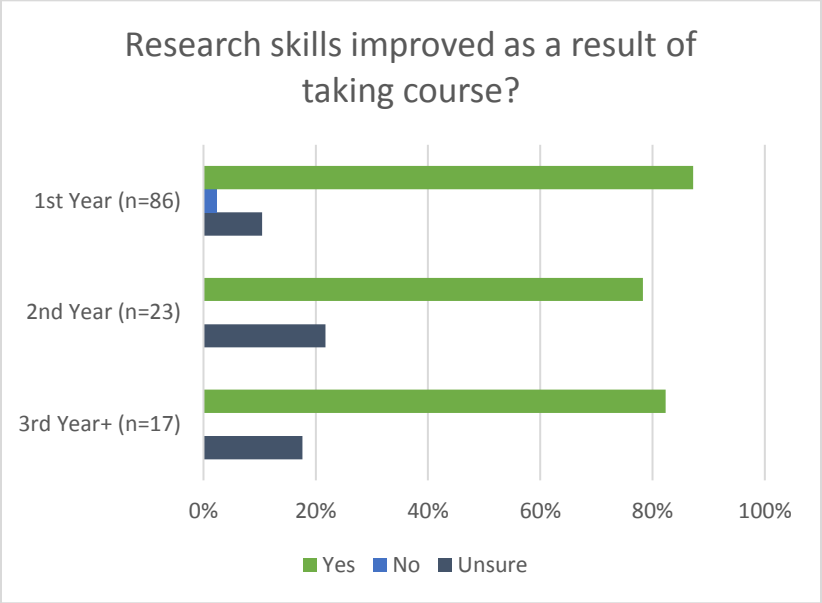
A paired samples t-test was conducted to determine whether the differences in mean scores are significant for students who wrote both tests. As the obtained p value (.005) was less than .05, the positive difference of 4.21 percentage points between the overall mean scores for the pre-test (53.95%) and post-test (58.16%) most likely indicates a true difference, the margin of error being ± 2.89 percentage points at a 95% confidence interval. This suggests that, on average, a modest amount of information literacy learning took place within the group of students who wrote both tests.

Table 4: Paired samples T-test by class standing (n=107)

	1st Year	2nd Year	3rd Year+
Difference between pre- and post-test means	6.30%	4.26%	-5.28%
Significance (2-tailed)	.001	.129	.143
Margin of error	± 3.65	n/a	n/a
Confidence interval	95%	n/a	n/a

As shown in Table 4, a paired samples t-test that split the 107 students who wrote both tests by class standing revealed positive differences between pre- and post-test mean scores for students in first and second year. For students in third year or above, a negative difference was observed. Nonetheless, only the difference in pre- and post-test mean scores for first year students was statistically significant.

Figure 3: Post-test question on whether IL skills improved (n=126)



Finally, a post-test custom demographic question asked if students felt their library research skills had improved as a result of taking their course. Figure 3 shows that a majority felt their skills had improved, and roughly 10% to 20% at each class standing level indicated they were unsure. Two first-year students felt their skills had not improved, which is contradictory given that first year students are the only group for which there is reasonable certainty that some IL learning did occur.

Discussion

Lessons learned

The authors learned from their 2016 study that the size of participating classes is important for this type of research. Small classes are more likely to yield wide ranges of study results. The results from the investigation confirm that larger classes increase likelihood of achieving reliable and statistically significant results. The only statistically significant results of the paired samples t-tests were those involving students in first year, who comprised the majority of the participating class with the largest enrolment.

Another lesson learned relates to the levels of IL attained by participating students. According to Project SAILS developers, a score of 70% or better indicates proficiency, and 85% or better indicates mastery levels (Project SAILS, 2016b). Findings summarized in the results section indicate that all mean scores by enrolled course and by class standing were

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well below 70%. On an individual scores basis, however, 31 students scored at the proficiency level and three students scored at the mastery level in the post-test. As only 15 students scored at the proficiency level and no student reached the mastery level in the pre-test, it is reassuring that the number of students who scored at the proficiency level more than doubled from pre-test to post-test.

The authors learned that in-class time may be the most effective participation incentive. Bonus marks for completing the pre-test and post-test likely incentivized participation in all three courses, but the participation rates for both tests were highest in the two courses that were given in-class time to write both tests. Although more than half of LBSC 2000 students had received IL instruction prior to this study, there was no statistically significant difference between pre- and post-test mean scores for LBSC 2000 students who wrote both tests. This finding led the authors to wonder whether bonus marks were viewed by more experienced students – who perhaps have learned to be more pragmatic – as an easy way to raise their grades without expending much effort to apply their actual IL knowledge and abilities.

The 26-question BYOT did not appear to impose too great a burden on students who chose to participate in the study. Technical difficulty prevented the authors from gauging the length of time taken by LBSC students to write the pre-test, but the issue was resolved in time for the post-test. On average, students needed between 12 and 15 minutes to complete the post-test. One objective of the present examination was to reduce the number of test questions in order to encourage wide participation. The 90% of students in the three participating courses who wrote at least one of the two tests suggests the relatively short BYOT test was successful in that regard.

The authors acknowledge the study's findings could be due, at least in part, to factors other than the IL instruction interventions. The comparatively lower mean scores observed in LBSC 0520 could be a reflection of their lack of IL instruction prior to entering university studies via a first-year transition program (without having to meet the University's regular admission requirements). The pre- and post-test mean score differences for only the students who completed both tests indicate the IL skill levels of first-year students showed the greatest improvement (Tables 3 and 4). This may suggest these students, most of whom were enrolled in LBSC 0520 or LBED 1000, had the most room for IL skills improvement at the start of the study. This finding also suggests that IL instruction efforts are perhaps of most benefit to students in their first year of entering or transitioning to university studies.

The lack of improvement between pre- and post-test mean scores for students in third year and above (Table 4) might suggest that at the start of the study, these students had benefited from more IL instruction opportunities in prior terms or may have acquired more library research experience than the rest of the participating students. Furthermore, as noted earlier, the surprising absence of significant differences between pre- and post-test results for students in their third year and above could be due to pragmatic decisions to spend little effort on a non-marked test, or because they had previously learned the skills being taught.

The findings from this study will inform future teaching of the investigators and the participating instructors. Skill areas in which students did not show marked improvement appear ripe for greater or more refined IL instructional efforts and emphasis. Skill levels shown to be strong in the pre-test may require less instructional time and effort.

Cohort test vs. BYOT

The authors offer the following observations based on their experiences with testing two versions of SAILS.

BYOT:

- The BYOT offers control over the test length by allowing test questions to be hand-picked from the entire SAILS question bank. This feature affords flexibility in scheduling in-class testing and potentially increases participation if the overall test length is relatively short.
- The ability to choose which test questions are used ensures testers can exclude questions on material they know will not be covered in the class. This is not possible when using the Cohort test.
- The BYOT permits an institution to focus exclusively on the testing performance of its own students. This can be advantageous if there is little interest in comparing the testing results with those of other institutions.
- Unlike the Cohort test, the BYOT permits an institution to track the scores of individual students over time.
- The BYOT affords a wide range of statistical analyses since an institution receives the raw test scores of all students who submit a completed test.

Cohort test:

- Compared to the BYOT, the Cohort test is much easier to prepare for; no decision-making is necessary to select or balance the questions included in a test.

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DOI: 10.15760/comminfolit.2018.12.1.3

- The "plug and play" nature of the Cohort test may make it useful for institutions committed to large-scale, longitudinal IL testing.
- Data analysis is much easier because none is required. After a test administration is closed and paid for, an institution can download an automatically prepared cohort report. However, interpreting the report in the context of the local institution's testing goals, curriculum and student population is the responsibility of each participating institution.
- The Cohort test is slightly less expensive. In 2017, it cost $5.00 USD per student, as compared to $6.00 USD for the BYOT.

Further Study

The authors may not have considered additional IL testing in the immediate future had they not been aware of efforts to develop a new kind of IL test. As planning commenced for the present study, Carrick Enterprises, the company that offers the SAILS test, began to advertise opportunities to assist with field testing for TATIL, the Threshold Achievement Test for Information Literacy. Currently in development, TATIL is based on the new *ACRL Framework for Information Literacy* (Association of College and Research Libraries, 2015), which replaces the *Standards* released 15 years earlier (Association of College and Research Libraries, 2000).

The 2015 *Framework* takes a qualitatively different approach to articulating information literacy. At the core of the *Framework* is a cluster of intertwined threshold concepts that are portals to enlarged ways of thinking and practicing in a given discipline. The idea of IL as an overlapping set of threshold concepts aligns well with the view of the Liberal Education Revitalization proposal adopted by the authors' institution in 2014 (University of Lethbridge, 2017). Due to the affinity between the *Framework's* conception of IL and the foundations of liberal education, and in light of efforts by University of Lethbridge librarians to organize IL instruction around threshold concepts, the authors are interested in learning more about TATIL. The plan is therefore to participate in TATIL field-testing during the fall of 2017 term.

In its finalized form, TATIL will comprise four separate test modules, each focusing on one or two of the *Framework's* six threshold concepts (Carrick Enterprises, 2017). By the fall of 2017, two modules will have finished Phase II field testing and will go into production, and the remaining two modules will undergo Phase II field testing, with SAILS tests continuing

to be available once TATIL goes into full production. Table 5 outlines some of the similarities and differences between SAILS and TATIL.

Table 5: SAILS and TATIL, a brief comparison

	Conceptual Guide	Test Type	Test Length	Customizable?	Test Format
SAILS	2000 Information Literacy Competency Standards (ACRL)	Norm-referenced	variable (max. 50 min.)	Yes	3 versions (Individual Scores, Cohort, BYOT) in full production
TATIL	2015 Framework for Information Literacy (ACRL)	Criterion-referenced	50 min.	No	4 modules (tests); 2 in full production + 2 in Phase II field testing, Fall 2017

Conclusion

The SAILS BYOT testing in Fall 2016 at the University of Lethbridge yielded more concrete answers than did our similarly designed Fall 2015 study which used the SAILS International Cohort test. On average, a modest but statistically significant amount of IL learning appeared to take place among students who wrote both the pre- and post-test. It is also noteworthy that the number of students who scored at the proficiency level doubled between the pre- and post-tests.

The largest proportion of participating students were in first year, and it was only this group that saw a statistically significant change in a pre-test/post-test mean score. This suggests these students had improved their overall level of IL abilities by the end of term.

The SAILS tests are based on the *Standards*, which may be a drawback. Information literacy instructional content at the University of Lethbridge is now guided principally by the ACRL's newer *Framework* and threshold concepts. In this regard, the development of the TATIL standardized test is promising, as it may be helpful in future efforts to better understand students' areas of IL comprehension and mastery as well as areas in which further instruction and learning may be needed.

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