Evidence Based Library and Information Practice

Research Article

Assessment of Online Information Literacy Learning Objects For First Year Community College English Composition

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Received: 15 July 2015 **Accepted**: 8 Apr. 2016

Abstract

Objective – The main objective was to determine whether information literacy (IL) learning objects (LOs) impact student IL competency, specifically in a foundational first year English composition course. The primary research question was: What is the effectiveness of IL LOs compared to face-to-face instruction in terms of students' skill acquisition?

Methods – The methods involved testing student IL competency through a multiple-choice test given pre- and post-IL intervention. Effectiveness was measured by assessing whether IL competency improves after exposure to one of two interventions: online IL LOs or face-to-face librarian-led workshop. Over two semesters, equal sections of the course were tested for each of these interventions. For the IL LOs group, students first completed a pre-test, then they worked independently through three online IL LOs. The three IL LOs were videos comprised of animation, screen casting, and video capture on these topics: *Finding Articles at Seneca Libraries* (hereafter referred to as *Finding Articles*), *Finding Articles on Current Issues*, and *Popular and Scholarly Sources*. The students were then given the same test again. For the face-to-face group, the pre- and post-tests were also required for the same number of sections. This study was conducted under institutional ethics approval.

Results – Descriptive analysis revealed student test scores increased for both interventions, IL LOs and face-to-face. Test scores increased, on average, between 14 to 37%. In comparing post-tests, results revealed a statistically significant difference only with the first topic, *Finding Articles*. In this case, the IL LOs (video) group outperformed the face-to-face group by at least 10%. No significance, in terms of performance from pre- and post-test scores, was found for the other two topics.

Conclusion – Both IL LO and face-to-face library led workshop interventions had a positive impact on students' IL skill acquisition as evidenced by an overall increase in average test

scores. One IL LO on *Finding Articles* significantly outperformed the face-to-face class equivalent. Further study is needed to track individual student performance.

Introduction

Seneca Libraries has been an innovator in creating learning objects (LOs) to teach students information literacy (IL) skills. We realized early the need to integrate online learning into our instruction strategy. The Seneca Libraries IL team collects statistics and analyzes data to inform strategic planning and assure quality and continuous improvement. We analyzed two sets of statistics in Fall 2010 and Winter 2011. The first set of statistics considered the total number of one-shot IL classes in foundational English composition courses. One in five, or approximately 20%, of all IL classes taught by the library were for foundational English composition courses, either *English & Communication* EAC149 (non-credit developmental course in reading, writing, and oral expression that prepares students for EAC150), or *College English* EAC150 (compulsory, introductory college writing and reading course fundamental to successful college studies). This represented a significant amount of staff time spent on instruction.

Approximately 80% of other IL classes were taught in the program disciplines within which students major. There is currently an initiative to embed and integrate IL within the program-specific curriculum. Allocating staff to increase the number of classes taught for English composition would come at the expense of work already underway embedding IL skills directly into the program specific courses. Even if more staff could be allocated to English composition, there would still be scheduling challenges making it nearly impossible for staff to reach every section face-to-face.

The second set of statistics looked at the number of EAC149 and EAC150 sections taught over these two semesters, as a percentage of the total number of sections (Table 1). We discovered that library instructional staff taught approximately 24-27% of all sections of EAC150, and approximately 13-17% of all sections of EAC149. This indicated that the majority of sections for both courses received no form of IL instruction.

In addition to these statistics, we also had to take into consideration that while EAC150 is

Table 1
Information Literacy Classes Taught for Seneca College English Composition Courses

Semester	Total number of EAC150 sections	Total number of EAC150 sections taught by library	Percentage (%) of EAC150 IL sections taught by library	Total number of EAC149 sections	Total number of EAC149 sections taught by library	Percentage (%) of EAC149 IL classes taught by library
Fall 2010	132	36	27	105	18	17
Winter 2011	111	27	24	67	9	13

compulsory, students are not obligated to take it in their first semester. Therefore, it could not be certain that every first year student was receiving IL instruction. If a student took the course in their last semester before graduating, they would not have had the opportunity to practice these skills in other courses, or benefit from the library's strategic scaffolding of IL skills throughout their programs.

In the late 1990s, Seneca Libraries, in collaboration with professors, developed an online tutorial, *Library Research Success,* for the Business Management program at Seneca College. This tutorial addressed basic business information literacy skills for first year students deemed foundational. Students would work through the tutorial either in class or on their own time allowing flexibility in terms of when and where they learned. Students were also required to complete a low-weighted, graded research assignment. As reviewing the IL LO was a requirement of the course, we reached every student. When delivering face-to-face this is not always the case, given the staffing limitations and scheduling conflicts in the high-enrollment program. Donaldson (2000), a Seneca librarian and co-creator of the tutorial, published a qualitative, anecdotal techniques study that collected data in the form of reviewing completed student assignments for the tutorial and comments (which were optional) that revealed students' perceptions. Business professors were also asked to provide informal feedback through personal interviews. Overall, students performed well on the assignments, and feedback from students and faculty was positive. The adoption and success of this tutorial allowed for adaption and customization in other programs, primarily for use by first year students. However, as over a decade had passed since this tutorial was created, new technologies and software had rendered the tutorial outdated.

There were several issues to be taken into consideration about the English Composition course at Seneca College. Limited staffing and increasing enrollment meant an inability to reach every course section. Librarians also wanted to make sure students received IL instruction early in their studies. Finally, the outdated tutorial needed a significant upgrade. How could these problems be solved? The answer was a strategic approach to the development of online learning objects.

In a survey of best practices in developing online IL tutorials, Holland et al. (2013) found that nearly all librarians felt it was important for the library to create its own tutorials in order to showcase their institution and its materials.

Seneca Libraries recognized that the development of online IL LOs as a strategic initiative should be aligned with the institution's goals, whereby "every Seneca graduate will demonstrate competency in the Seneca Core Literacies" (Seneca College, 2012, p. 10), of which IL is identified as one of the core literacies, and "faculty will model digital literacy through use of a variety of media and/or mobile technologies to engage students as partners in learning" (Seneca College, 2012, p. 13).

The IL team adopted the following process in order to reach Seneca Libraries' strategic goal in developing online IL learning objects:

1. Needs analysis. Surveys were sent to library teaching staff and English faculty to determine which IL topics were most commonly taught in class, and which were perceived to be the most challenging or difficult for students. These results helped identify and prioritize the IL topics to be developed into LOs. The following were identified as priority, in order of preference: database searching, academic honesty, evaluating information, analysis and application, library website, and library catalogue searching.

2. Analysis of current best practices in the field. National and international electronic mail lists were queried and responses were taken into consideration. Seneca librarians' lesson plans

and teaching materials were also reviewed. These internal documents included learning outcomes based on the ACRL's *Information Literacy Competency Standards for Higher Education* (ACRL, 2000). A literature search on the development of IL learning objects was conducted. From these sources, the most common IL topics developed into online learning objects were:

- using online library tools (book catalogue, databases, LibGuides, etc.);
- evaluating material and selecting resources;
- defining a research topic;
- searching skills for the Internet (including Google Scholar);
- documenting your research;
- locating a known journal article.

Instructional design and development best practices were incorporated into creating our own set of design principles to optimize student engagement and learning.

3. Inventory of LOs already developed by Seneca Libraries. Comparing the list of recommended topics to be developed to the list of existing LOs, identifying gaps, and prioritizing objects for development.

4. Development of LOs. Allocation of library resources (e.g., staffing, software), collaborating with English faculty to design objects, building prototypes, testing prototypes with small user groups, modifying and reviewing prototypes and launching beta objects.

An LO is "a reusable instructional resource, usually digital and web-based, that is developed to support learning" (Mestre, 2012b, p. 261). Examples of learning objects can include tutorials, videos, games, and quizzes. A series of IL LOs were developed over the 2012 spring and summer semesters, and were released in September 2012 for the start of the fall semester. A Learning Objects Committee, under the Seneca Library's Information Literacy (SLIL) Team, was tasked with this project. The committee was made up of several librarians and library technicians. The committee chair, the library's eLearning Technologies Librarian, was both project manager and technical support. Once the initial process was completed (needs analysis, best practices, and inventory), the committee broke into smaller groups responsible for developing individual LOs by topic. These groups consisted of one to two librarians delegated as content leads whose main responsibilities were scripting, storyboarding, and quiz creation. They were partnered with at least one library technician who provided support for filming, animations, and editing. Each group was further supported by the committee lead and a library media technician, both of whom helped with filming, animation, screen casting, audio capture, and software support. Each group was given permission to proceed with filming and production only after their scripts were reviewed and approved by the entire committee.

The IL LOs consist of short, one to three minute videos that include live action recordings, screen casting, and animations. The main software used was Camtasia. The videos are all closed-captioned and include a text-based transcript. For introductory IL videos there is a PDF summary, and for demonstration videos there are PDF step-by-step instructions with screenshots. By offering the lessons in both video and text-based formats we hope to offer flexible options for learning. All LOs have learning outcomes tied to assessments, typically multiple-choice questions. LOs, accompanying assessments, and documentation are also bundled into *library cartridges*, which are zip files that can be imported as one unit into Blackboard, the institution's course management system. For consistency, IL LOs will be herein referred to as videos.

While usability and design were tested throughout the development process, what remained to be assessed was the impact the newly created videos had on student IL

competency. Considering the time and effort invested and the goal to teach more students online, it was vital that these videos contributed positively to student learning. We determined that the videos needed to be assessed for their effectiveness in terms of student IL skill acquisition. In early 2013, we were granted ethics approval from our institution to conduct a research study to investigate this issue.

Literature Review

Evaluation and Assessment of Online Learning Objects

It was clear we needed to update Seneca's first generation of tutorials, and developing a strategy to evaluate and assess them was paramount. The abundant amount of literature on learning object development and creation indicates interest and activity in this area, especially studies which review and survey best practices (Blummer & Kritskaya, 2009; Mestre, 2012a; Somoza-Fernández & Abadal, 2009; Su & Kuo, 2010; Yang, 2009; Zhang, 2006). These studies also identified the importance of building in evaluation and assessment as part of the development process in order to measure success and effectiveness.

Mestre (2012a) noted the importance of assessment as a way of measuring success. Mestre (2012a) also stated that assessment should focus on students' learning, as well as outcomes and opinions and lists various ways to document evidence as to whether the goals of the learning object were accomplished: checkpoints, statistical tracking, log file analysis, Web page analytics, tracking new accounts, evaluation of student work pre- and post-tests, student debriefing, and surveys.

Measuring Success: Usability, Student Learning, Student Perceptions or All of the Above?

The issue on what aspect to evaluate or assess was evident in several studies. Lindsay, Cummings, Johnson, and Scales (2006) grappled with this dilemma when they asked "is it more important to measure student learning or to study how well the tool can be navigated and utilized?" (p. 431). They settled on capturing both areas, but without one-on-one usability testing, instead designing "the assessment modules to gather data from the students about their use of resources, attitudes towards the libraries, and perceptions of the utility of the online tutorials" (Lindsay et al., 2006, p. 432). Befus and Byrne (2011, as cited in Thornes, 2012), found that the success of a tutorial can be difficult to quantify. They found that despite students obtaining lower than anticipated scores in the associated test, the tutorial was still successful because it reached more students with greater flexibility.

Comparisons in Library Instructional Delivery Methods

Other studies investigated whether online learning modules were as effective as more traditional modes of instruction, such as librarian-led, face-to-face classroom sessions, and most found that the modules were equally effective. Bracke and Dickenson (2002) found that "using an assignment-specific Web tutorial in conjunction with an instructor-led, in-class preparatory exercise is an effective method of delivering library instruction to large classes" (p. 335). Silver and Nickel (2005) developed and embedded a multiple module tutorial for a psychology course, which was animated and interactive. Post-tests on material covered, including questions on confidence level and preferred mode of instruction, showed that there was no difference between the tutorial and classroom instruction in terms of quiz results (Silver & Nickel, 2005). Koufogiannakis and Wiebe's (2006) systematic review of 122 unique studies found that instruction provided electronically was just as effective as more traditional instruction. Specifically, "fourteen studies compared [Computer Assisted Instruction] CAI with traditional instruction (TI), and 9 of these showed a neutral result. Meta-analysis of 8 of these studies agreed with

this neutral result" (Koufogiannakis & Wiebe, 2006, p. 4). Kraemer et al. (2007) compared three instructional methods: online instruction only, live instruction, and a hybrid combination in a first-year writing course. They concluded with a "high degree of confidence that significant improvement in test performance occurred for all subjects following library instruction, regardless of the format of that instruction" (Kraemer et. al., 2007, p. 336). Similarly, as part of the curriculum for a general education course, Anderson and May (2010) tested the following IL topics across three conditions: library catalog, academic databases, Boolean searching, and evaluation of sources materials. Their results indicated that the way in which instruction is delivered does not affect the students' ability to retain the information taught (Anderson & May, 2010). Sachs et al. (2013) also found that Millennial students learned equally well from both HTML-based tutorials and dynamic, interactive audio/video tutorials. However, they also found that "students expressed a much higher level of satisfaction from the tutorial designed to be 'Millennial friendly'" (Sachs et. al., 2013, p. 1).

Instructional Effectiveness of Online Learning Objects

While previous studies point out that online tutorials can be just as effective as face-to-face classroom instruction and in effect, compare modes of delivery, another branch of literature compares different types of online tutorials for their instructional effectiveness. Mestre (2012b) found "that a screencast tutorial with images can be more effective than a screencast video tutorial" (p. 273) for 16 out of 21 students tested. In contrast, Mery et al. (2014) found that there was no impact on student performance between two types of instruction, one form of receiving information from passively watching a screencast, and the other form rooted in active learning, the *Guide on the Side*. Despite limitations to the study, Mery et al. (2014) still asserted that "database instruction can successfully be taught online in a number of ways from static tutorials to highly interactive ones" (p. 78).

Mixed Methodology Studies

As mentioned earlier, most studies invariably have some form of usability testing, along with some measure on student learning through testing content, pedagogical approaches, or student learning styles or preferences. Johnston (2010) investigated first year social work students' opinions on IL, while also gathering feedback on the tutorial, and assessing students' skills. They employed a mixed methods approach with quantitative and qualitative research methods that included a survey, focus groups, empirical data from task results, and observations (Johnston, 2010, p. 211). The majority of students were given tasks to complete and researchers evaluated if those tasks were completed efficiently; however, an exact measurement was not specified or elaborated on. Findings indicate that students efficiently completed their tasks involving evaluating websites and finding cited and relevant information using Google, while they struggled with tasks involving databases, including search techniques, and differentiating between databases and other sources of information (Johnston, 2010). An observational study by Bowles-Terry et al. (2010) "examined the usability of brief instructional videos but also investigated whether watching a video tutorial enabled a student to complete the task described in the tutorial" (p. 21). Their findings informed best practices in the following categories: pace, length, content, look and feel, video vs. text, findability, and interest in using video tutorials (Bowles-Terry et al., 2010). They also pointed out that future research is needed, particularly performance-based assessments as they "would give great insight into how well videos can be used to teach and whether their effectiveness is restricted to students with particular learning styles and/or specific content, for example, procedural, rather than conceptual" (Bowles-Terry et al., 2010, p. 27). Adapting these models of evaluation or assessment with a focus

on measuring student learning, particularly through quantitative methods, seemed to make the most sense for our learning objects. Taking into consideration that usability studies have been done throughout the development and prototype cycle of our project, measuring how our learning objects impact student learning seemed to be the most pressing issue to investigate.

Aims

The aim of this preliminary quantitative study is to ascertain whether library-developed IL LOs impact student IL competency in comparison to traditional face-to-face instruction in a first year English composition foundation course. If the LOs impact student IL competency in the same way, or to a greater degree as face-to-face instruction, then this evidence can be used to inform the use, development, and assessment of IL LOs in the library's IL program. No previous research of this kind has been carried out by Seneca Libraries. The secondary aim was to measure, through pre- and post-testing, if there is a statistically significant difference in student performance for any one of the three pre-selected IL topics as a success indicator for one method of instruction, e.g. online or traditional face-to-face. Results of this study can help inform the LO development process, in addition to future assessment studies of IL LOs. It can also be used to add to the wider discussion of the use and development of IL LOs in secondary education.

Methods

Type of Assessment

The literature distinguishes between two different types of evaluation and assessment: 1. Measurement throughout the development and prototype cycle in order to inform design or structural changes in the form of usability testing, and; 2. Measurement of student learning by testing different pedagogical approaches and student learning behaviour. Most studies invariably have some form of usability testing, along with some type of measurement on student learning.

In our case, adoption of best practices meant that informal usability testing occurred throughout the development and prototype cycle for learning object development, albeit informally and therefore inconsistently. In specific, two methods of assessment, as identified by Mestre (2012a) were used, and would fall under the first type of assessment mentioned above:

- Pilot (beta) testing. During script and storyboard development, student library workers, individually or in small groups of two or three, were sporadically recruited and asked for input.
- Student feedback. Informal feedback was obtained either individually during reference interviews, or as small groups, during in-class IL sessions. General, open-ended questions were asked and responses recorded by a library technician or librarian. Questions were not standardized.

In this way, design could be continually improved to meet the needs of the users. With a reasonable amount of confidence, we felt that the second generation of modules we were building had solid design principles based on the best practices and experiences set by other academic libraries. The main variation with our modules was the customization to the local context so that Seneca Libraries' resources, students, and course-specific research challenges were represented. Recommendations from usability studies helped guide our learning object development (Bury & Oud, 2005; Lund & Pors, 2012; Mestre, 2012b).

This preliminary study focused instead on the second type of assessment, measuring student learning. While building on earlier similar studies (Anderson & May, 2010; Gunn & Miree, 2012; Johnston, 2010; Kraemer et. al., 2007; Mery

et al., 2014; Zhang, Goodman, & Xie, 2015), the departure lies mainly with a focused or narrow method by testing only student performance. Quantitative student test results were analyzed through determining statistical significance for each of three information literacy topics.

Data Collection

To measure the effectiveness of the videos in terms of students' skill acquisition, a preliminary quantitative study was initiated. Ethics approval was obtained from the institution and all students consented to take part in the study. Participation was optional and students could choose to exit the study at any time. Results were anonymous and did not impact student grades.

We decided to conduct our study in the foundational English composition course, College English EAC150. This is a compulsory course for students and so an ideal student population to test for basic IL skills. More importantly, librarians had been partnering with English faculty for several years, delivering face-to-face one-shot instructional sessions tailored to the learning outcome in the course syllabus. Students were required to produce effective research writing through the completion of a research project. Students had incentive to participate as the information learned through the study would help them complete the research project in the course.

The study was carried out over two semesters; 75 students participated in the Winter (January to April) 2013 semester (herein referred to as Group 1), and 35 students participated in the Fall (September to December) 2013 semester (herein referred to as Group 2). A librarian and a library technician led each group. In each, the students were first assessed for their IL skills competency through completing an online pre-test of multiple-choice questions. The students were then exposed to one of two interventions: online videos or face-to-face, librarian-led instruction. After the intervention, the students were given the same test again. For the videos intervention, these consisted of three newly created online videos that were produced in house: Finding Articles, Finding Articles on Current Issues, and Popular and Scholarly Sources.

The learning outcomes were standardized across the two interventions so that the face-to-face classes taught to the same learning outcomes as the videos. The learning outcomes for Finding Articles were (The learner will be able to…): 1. Select appropriate database(s) by subject or discipline as related to their research topic; 2. Perform a basic search in a database; and 3. Understand various mechanisms for retrieving articles (printing, emailing, saving). The learning outcomes match the lower-order skills of Bloom's Taxonomy which fall under knowledge or remembering (Krathwohl, 2002). The learning outcomes for Finding Articles on Current Issues were (The learner will be able to…): 1. Select social sciences, news and current events databases; 2. Perform searches based on research topic; and 3. Evaluate results for relevancy. The learning outcomes for Popular and Scholarly Sources were (The learner will be able to…): 1. Differentiate between popular and scholarly literature; 2. Identify characteristics of a scholarly article; and 3. Select the appropriate type of article for their research needs. The learning outcomes for these last two videos match higher-order skills under analysis according to Bloom's Taxonomy (Krathwohl, 2002).

For the video intervention, students were asked to view the videos independently using their own headphones, or headphones were made available and distributed. Students then completed the online test and results were gathered through the online tool, SurveyMonkey. All questions were multiple choice and were based on the content in the videos. The questions were written by librarians who developed the videos and were the main assessment tools used to test student understanding of the content found in each

video. The questions were independently reviewed by a library technician who matched each question against the script (content) in the video as a measure for quality control. For the face-to-face, librarian-led instruction intervention, students were presented with the same content (and learning outcomes) as the three videos. The same library staff moderated both interventions, for the same campus location, to ensure consistency in pacing and content. If students had technical issues with the online test, library staff provided support. If students had any additional questions in regards to the content, e.g. seeking help with question clarification, library staff would provide guidance but were mindful of not providing overt clues that could inadvertently point to the correct answers.

In Group 1, 40 students were exposed to the online videos intervention, and 35 were exposed to the face-to-face, librarian-led instruction. The online test consisted of fifteen multiple-choice questions (Appendix A), in which there were five questions for each of the three videos.

In Group 2, 18 students were exposed to the online videos intervention, and 17 were exposed to the face-to-face, librarian-led instruction. The online test consisted of 14 multiple-choice questions, in which there were 5 questions for 2 videos, and 4 questions were given for the video Finding Articles on Current Issues (Appendix A). Unfortunately, one question had to be withdrawn from the test because it no longer made sense in light of a significant structural change to the homepage of the library's website. We decided to delete the question, rather than replace it, since the answers were not likely to be comparable when analyzing results.

The main research question was: What is the effectiveness of videos, in comparison to face-to-face instruction, in terms of students' skill acquisition?

Statistical Analysis

General descriptive statistics were run for the individual pre and post-tests for each of the groups. Considering that the current research project was preliminary in nature, comparisons were only made between the pre-tests of the videos and face-to-face groups for each of the topics as well as the post-tests of the videos and face-to-face groups for each of the topics through independent samples t-tests. Unfortunately, repeated measures could not be used to compare pre-tests and post-tests for each topic due to the fact that the tests were anonymous and it was not possible to match the pre-test and post-test for each participant.

Results

Pre-test measurement of students, in each of the three topic areas, was done to determine pre-existing skill level. We anticipated that the post-test measurement would be affected after applying an intervention, either exposure to an online module or a face-to-face class. In either case, we hoped that an increase in test scores would indicate learning.

Findings showed that test scores improved regardless of intervention. The lowest test score increase, averaged across a group of 35 students, was 14.6% for face-to-face (Figure 1). The highest test score increase, averaged across a group of 18 students, was 37.5% for videos (Figure 1).

When pooling results for both groups, and running a t-test between the video group pre-test and face-to-face group pre-test for each of the topics, results indicated that both groups were not significantly different in their knowledge of the three topics.

Similarly, a t-test was used in comparing post-tests results for video to the face-to-face across both groups for each of the topics. Independent samples test results revealed a statistically

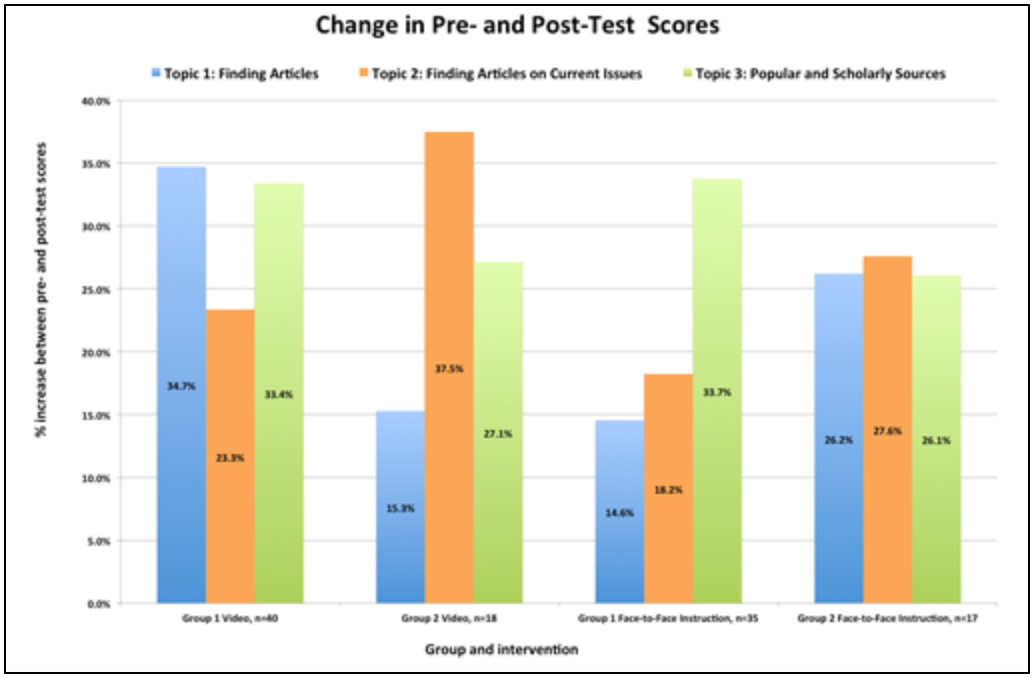

Figure 1
Change in pre- and post-test scores amongst Group 1 and Group 2 for both interventions, online videos and face-to-face instruction.

significant difference with the first topic, Finding Articles, $t(110) = 2.25$ and $p = 0.026$. The videos group outperformed the face-to-face group by at least 10%. No significance, in terms of performance from pre- and post-test scores, was found for the other two topics: Finding Articles on Current Events, $t(110) = -1.11$ and $p = 0.2688$, and Popular & Scholarly $t(110) = -0.009$ and $p = 0.993$.

For the first topic, Finding Articles, scores for both Groups 1 and 2 increased on average 34.7% and 15.3% respectively for the video group (Figure 1). In comparison, scores increased on average 14.6% and 26.2% respectively for the face-to-face group. The highest average post-test scores were found for the video group (Figure 1). On average, the mean test scores were higher in the post-test for both groups (Figure 2).

For the second topic, Finding Articles on Current Issues, scores for both Groups 1 and 2 increased on average 23.3% and 37.5% respectively for the video group (Figure 1). In comparison, scores increased on average 18.2% and 27.6% respectively for the face-to-face group. In this case, pre- and post-test scores were consistently the lowest (Figure 2).

For the third topic, Scholarly & Popular Sources, scores for both Groups 1 and 2 increased on average 33.4% and 27.1% respectively for the video group (Figure 1). In comparison, scores increased on average 33.7% and 26.1% respectively for the face-to-face group. Similar to the first topic, this topic also had the highest post-test scores in the video group (Figure 2).

Discussion

Similar to previous studies (Anderson & May, 2010; Kraemer et. al., 2007; Koufogiannakis & Wiebe, 2006; Silver & Nickel, 2005) this preliminary study reaffirmed that exposure to IL instruction, regardless of method of delivery—either through online modules or face-to-face librarian instruction—increases IL skills of students. Overall, for both groups there was an

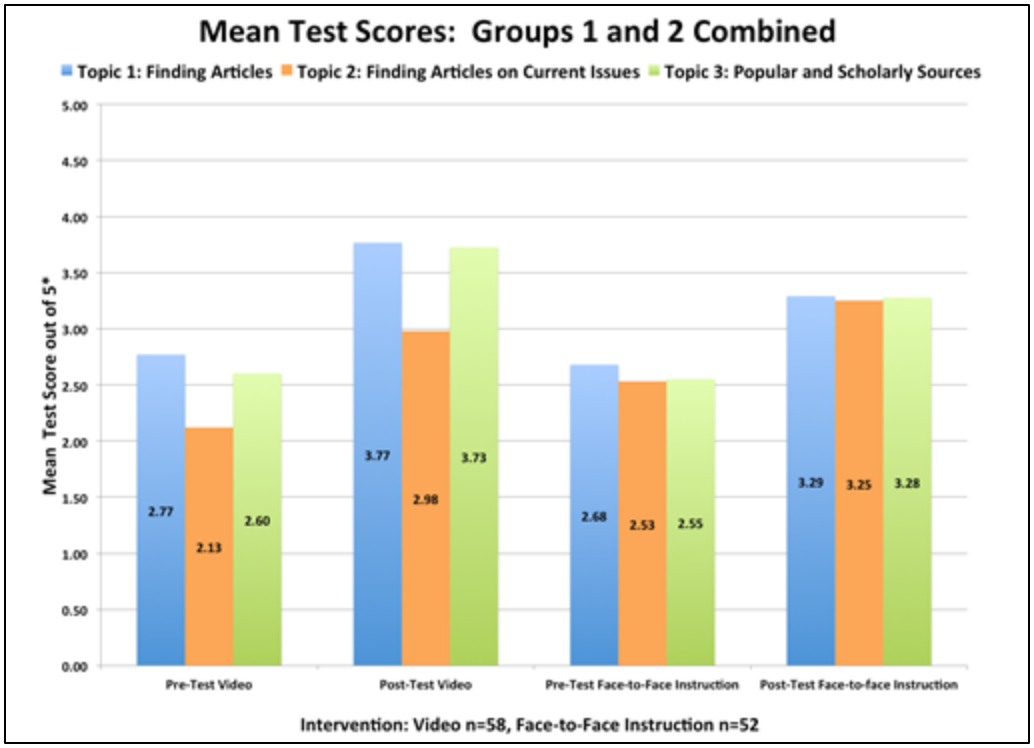

Figure 2
Mean Test Scores: Groups 1 and 2 combined. *Please note that for Topic 2, data set for Group 2 normalized to 5 from 4.

increase in test scores after online and face-to-face instruction. On average, test scores increased between 14 to 37% where the lowest test score increase, averaged across a group of 35 students, was 14.6% for face-to-face and the highest test score increase, averaged across a group of 18 students, was 37.5% for videos. However, as this analysis was descriptive in nature, we also sought to determine if there was real statistical significance to these increases.

When comparing online modules to face-to-face instruction, we found one instance in which online modules outperformed face-to-face library instruction. For both groups, the difference in post-test scores for students exposed to online videos compared to those exposed to face-to-face instruction, was statistically significant only for one topic, Finding Articles. In this instance, we can say with a reasonable amount of confidence, that the video outperformed face-to-face instruction. For this topic, students exposed to the videos outperformed those students exposed to face-to-face instruction by at least 10%. Perhaps this topic was better suited for online learning because the learning outcomes for this particular LO were task-based, and required lower-order thinking. Perhaps these simple step-by-step tasks and instructions were better demonstrated through an online, video-based environment. Further observation would be needed to understand why this may be the case.

There was no statistical significance in results for the other two topics, Finding Articles on Current Issues, and Popular and Scholarly Sources. For these two topics, whether instruction is delivered online or face-to-face had no impact on student performance, unlike the Finding Articles topic. One reason for this may be that the learning outcomes for these topics required higher-order thinking, thus

making it more difficult to learn, regardless of whether it was taught online or face-to-face.

We can therefore conclude that a video, built following best practices and customized to a program's curriculum and student body, can have the same, if not better, impact on students' uptake of IL skills in comparison to live, face-to-face librarian-led led classes. In addition, because our findings showed statistical significance with one topic (Finding Articles), it indicates particular IL topics are better suited for delivery in an online environment. This area of study, applying statistical significance through t-tests as it relates to specific IL topics, is less represented in the literature than the overall usability and effectiveness of IL tutorials or modules.

Another point of discussion is whether or not the text-based transcripts of each video had an impact on student learning. This was not studied separately, but could be considered another method of instruction in addition to online video and face-to-face instruction that would need further investigation. The proven efficacy of the IL LOs have encouraged further usage of the text-based transcripts and summaries in subsequent LOs.

This preliminary study had limitations. Firstly, while we did perform an independent t-test to show differences in group averages, we could not perform a paired, or dependent, t-test which would have been possible had we tracked the identity of each individual participant. A paired, or dependent, t-test analysis would have looked at the sampling distribution of the differences between scores, not the scores themselves. Thus, we would have been able to track differences in test scores, for each individual student, rather than looking at pooled averages.

Secondly, a mixed methodology approach would have been useful. More data would be captured for interpretation through combining quantitative and qualitative methods. Measuring the differences in student performance for teaching method (online vs. face-to-face) and IL topic (three different topics) was the quantitative measurements. We combined this with the measurements of collecting demographic data on students, focus groups, and observational user testing. We would not only have the ability to analyze test scores, but would also have the ability to see correlations.

Thirdly, while the sample size was reasonable, at 110 participant students we did not obtain the total number of students enrolled in all sections of College English, EAC150 for those two semesters. We cannot assume that our sample size accurately represents the average or normal behaviour of all students enrolled in this course. We would need to obtain this figure, and compare our smaller sample size as a percentage.

Conclusions

This preliminary quantitative study gathered evidence in helping to determine whether library developed IL LOs impact student IL competency in comparison to traditional face-to-face instruction in a first year foundational English composition course. This study found that both IL LOs (videos) and face-to-face instruction have a positive impact by increasing students' IL test scores. Only one video on the topic Finding Articles outperformed face-to-face instruction. Further work, in the form of a mixed methodology study, would be beneficial in identifying how specific characteristics, for both online modules and face-to-face instruction, impact student acquisition of IL skills.

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Appendix A
Pre and Post Test Questions (please note *italicized* indicates correct answer)

Topic: Finding Articles

1. Where do you go on the library website to find databases?
   a) Library catalogue
   b) Articles Tab
   c) Repositories
   d) All of the above

2. To find a database with articles about Canadian politics, you should try:
   a) Browsing the alphabetical list of databases
   b) Any database will have the articles on your topic
   c) Select the subject that best matches your topic from the drop down list of subjects
   d) All of the above

3. Where in an article record will you find article information like journal title, date of publication, and page number?
   a) Abstract
   b) Source
   c) Subject Terms
   d) Author

4. What should you do if the database you are searching doesn't have enough articles on your topic?
   a) Try a different database
   b) Go to Google
   c) Use the library Catalogue
   d) Give up

5. What are your options for saving articles?
   a) Print
   b) Bookmark
   c) Email
   d) All of the above

TOPIC: Finding Articles on Current Issues

1. You are doing a research assignment and need information on a topic that was recently covered in the news. Where is the best place to start?
    a) Google
    b) A specific database for current events
    c) Wikipedia
    d) The library catalogue

2. Which category of databases is the best to use to find articles on current issues?*
    a) General
    b) Science and Technology
    c) Business
    d) News and Current Events

*[Please note that this question was withdrawn from the test for Group 2 only as it no longer was relevant in light of a significant structural change to the homepage of the library's website. It was decided it was best to delete the question, rather than replace it since the answers were not likely to be comparable when analyzing results.]

3. Of the following list, which database offers a concise list of current events?
    a) AdForum
    b) Academic OneFile
    c) Opposing Viewpoints
    d) Canadian Newsstand

4. What information can be found about a current issue in the database Opposing Viewpoints?
    a) Statistics
    b) Journal articles
    c) Viewpoints
    d) All of the above

5. How can you search for current issues in the database Opposing Viewpoints?
    a) Click Browse Issues or type in an issue of your own
    b) Click Latest News and choose from a list
    c) Click Resources and choose a category
    d) Click Search History to see what issues other people have searched

Topic: Popular and Scholarly Sources

1. When searching for information, the best place to start is…
    a) Google
    b) iTunes U
    c) Twitter
    d) Seneca Libraries Website

2. Popular articles can be…
    a) News stories
    b) Reviews

c) Topic overviews
d) All of the above

3. Scholarly articles usually come from...
a) Journals
b) Newspapers
c) Magazines
d) Blogs

4. It is sometimes difficult to determine whether or not an article comes from a journal. Which statement does NOT apply to scholarly articles?
a) are usually several pages long
b) does not need to contain a list of references
c) are divided into sections, the first section of which is usually an abstract or synopsis.
d) are written by a scholar or expert within the subject discipline

5. In order to ensure quality, journals are often…
a) Board reviewed
b) Peer reviewed
c) Panel reviewed
d) Technically reviewed