Title: Does Course Guide Design Impact Student Learning?

Running Head: Course Guide Design

Abstract

Course and research guides are a common tool of teaching librarians, expanding the reach of instruction sessions. Traditionally these guides were designed in a pathfinder-style with lists of resources by type (e.g., websites, books, etc.). Guides can also be designed pedagogically, where the guide walks a student through the research process. This paper reports the results of a pilot Scholarship of Teaching and Learning (SoTL) A/B study that examined whether guide type had an impact on student learning. Results indicate students using the pedagogical guide may learn and retain Information Literacy concepts better than students using the pathfinder guide.

Keywords: instruction, LibGuides, course guides, research guides, first-year students

Introduction

What is the purpose of research and course guides? Presenting preliminary results of this study at LOEX 2017 (Lee et al. 2017), the authors did a brief, interactive poll, asking attendees this question. Fourteen of n=50 respondents (28%) mentioned a pedagogical or teaching purpose. Thirty-five (70%) mentioned concepts related to expanding the reach of

librarians and/or library instruction. This informal poll highlights that while guides are used to expand the reach of instruction, they have changed little over the decades, despite rather large changes in Information Literacy (IL). Existing first in print and migrating to an electronic, online environment, guides have existed since the 1950s (Smith 2008; Vileno 2007). Traditionally called pathfinders, these guides are primarily intended as lists of resources to help researchers find sources to support a thesis or project, a starting place for research. The nature of these pathfinders is not necessarily intended to be pedagogical. However, if librarians are using them as an extension of instruction, this type of guide might lead students to believe that research is easy, the answer just one click away.

The release of the ACRL *Framework for Information Literacy for Higher Education* (Association of College and Research Libraries 2016) and its emphasis on broader IL theory and concepts signals a move away from the more checklist approach of the *Information Literacy Competency Standards for Higher Education* (Association of College and Research Libraries 2000). It should be emphasized, however, that use of the Standards does not preclude teaching higher level concepts. If librarians are teaching students complex, higher level concepts, should course guides reflect this shift? If guides are an extension of the class session, serving as an aid for students to conduct research and develop critical thinking and IL competencies, does a pedagogical design, where the guide walks a student through the complexities and nuances of the research process (selection and refinement of a topic, searching for, accessing, using and citing resources), aid in that dynamic process better than a traditional pathfinder guide?

Teaching to course-specific research guides in a pilot A/B study (n=43), the authors tested whether guide design had an impact on student learning. Specifically, would students

who used the pedagogical-style guide demonstrate better learning than students using the pathfinder-style guide? A Scholarship of Teaching and Learning (SoTL) study seeks evidence of whether or not the style of guide contributes to student learning. SoTL studies are defined as research conducted on teaching and learning by academics within their own discipline (Kanuka 2011). Most importantly, the findings are made public, so that fellow academics can learn from the research and improve their teaching practice.

Literature Review

Relatively few studies have been done on the impact of research guide design on student learning. Research is primarily focused in three broad areas: best practices and design; student use of guides; and using guides in instruction.

Guide design and best practices (for example, number of tabs, tab wording, white space, uniform fonts and colors) make up a large part of the literature (Gonzalez and Westbrock 2010; Hintz et al. 2010; Little 2010; Mattson 2013; Pittsley and Memmott 2012; Sonsteby and DeJonghe 2013). Usability – how easily students are able to navigate online guides – is another large area of study. Studies have shown students often do not find online research guides to be helpful in their research (Martin, Higgins, and Kapur 2005). Bielat, Befus, and Arnold (2013) provide a good overview of how research guides can be used in instruction, delving into design, content, and the weightier issues of metacognition and cognitive load. Little (2010) also addresses cognitive load and suggests ways to lessen it by developing guides in smaller subject

areas, breaking large topics down into smaller chunks, creating guides for individual courses, and avoiding formal language and jargon.

Several articles have examined pathfinder guides in various subjects, for example, psychology (Pendell and Armstrong 2014), and forestry (Brazzeal 2006). Studies have also examined the use of research guides in instruction, but not necessarily with a focus on direct measures of student learning (Brazzeal 2006). Multiple scholars discuss designing guides to align with a course or individual assignments as a best practice (Gibbons 2003; Ladner et al. 2004; Leighton and May 2013; Mann, Arnold, and Rawson 2012; Reeb and Gibbons 2004; Somerville and Vuotto 2005). Staley (2007) investigated student use of subject guides and found students who receive library instruction use subject guides more frequently and find them useful. Scull (2014) describes a class where students created a research guide as part of their assignment but does not discuss if or how it contributed to student learning. Distance education is an area where guides have been studied as alternatives to face-to-face library instruction with most articles describing the development of the guides (Roberts and Hunter 2011; Robinson and Kim 2010). When effectiveness was assessed, it was realized through indirect methods such as focus groups (Grays, Del Bosque, and Costello 2008), not direct measures of student learning such as assignments or papers.

While students benefit by the incorporation of best practices of web design into guides, that does not indicate if, or how, students learn by using research and course guides. Hicks (2015) posited that guide design might have learning ramifications depending on the design. For example, when guides are designed in a pathfinder style around key search tools in a field, research becomes isolated from larger writing and reading processes while presenting research

as “one-stop shopping” (Hicks 2015). One study that comes close to the present study is Baker (2014) who assessed student learning via guide design, finding students gave more positive feedback to tutorial-type rather than pathfinder-style guides. Students reported a more positive learning experience and indicated they were able to complete assignments more quickly. However, this is an indirect, not a direct measure, of learning. Greenwell (2016) also completed an A/B study comparable to the present study. One class received instruction and a guide based on the I-LEARN model (similar to the present study’s pedagogical guide) while the control group received instruction and a guide based on a systems model (similar to the pathfinder guide). Results of the pre- and post-tests, as well as citation analysis scores, showed no significant difference between the two groups. However, the I-LEARN class used their research guide more often than the control group and reported more benefits from using the I-LEARN research guide. Using a different pedagogical framework, the present study assesses both indirect (usability survey) and direct (quizzes, annotated bibliographies) measures of student learning between two sections of the same class.

Methodology

In the Fall of 2016, both a pathfinder and pedagogical-style guide were tested in two first year seminars of Dental Hygiene students in study marked except by institutional IRB. The first-year seminar was chosen in part because students would not have encountered library research guides previously in their college experience and would not have pre-existing expectations about what a guide should contain. The librarian created separate LibGuides for

each section (Figures 1, pedagogical, and 2, pathfinder). It should be noted that while this study used LibGuides (a SpringShare product) to create guides, research has shown students perform equally well regardless of the online medium. Bowen (2014) found that LibGuides and webpages were both effective at delivering online IL content and achieved learning outcomes almost equally well. Content between the two guide types was identical, in that both contained the same resources. The pathfinder guide was organized around resource lists and links with tabs for major categories of resources such as "Reference Materials" and "Find Books." There was no supplementary language in these tabs beyond database descriptions and instructions for using the online catalog.

The pedagogical guide was organized around an established information literacy "research process" approach with an infographic of the process and numbered tabs for each step in the process (Figure 3). Steps in the research process are: 1: Your Question; 2: Find Background Information; 3: Find Materials; 4: Read & Evaluate; 5: Organize, Write, and Cite. Tabs included links to specific resources, which were also found on the pathfinder guide; however, the pedagogical guide included "narrative tutorials" on various aspects of the research process such as evaluating sources using the six journalistic question words (who, what, where, when, why, and how). In short, the pedagogical guide added the "why" and "how" to what is contained in a traditional pathfinder guide. Note that Figure 3 is slightly different from that on the home page of the pedagogical guide used in this study (Figure 1). This is because usability testing in a separate study demonstrated students performed better with fewer steps in the research process (Lee and Lowe 2016). In the separate study, the research process was reduced from eight to five steps after the study was completed. Both

guides included an end-of-class evaluation and were integrated into their respective class sites in Canvas, the learning management system (LMS). Integration into the LMS eliminated the risk that a student would find the other guide accidentally.

Figure 1: Revised Research Process Infographic

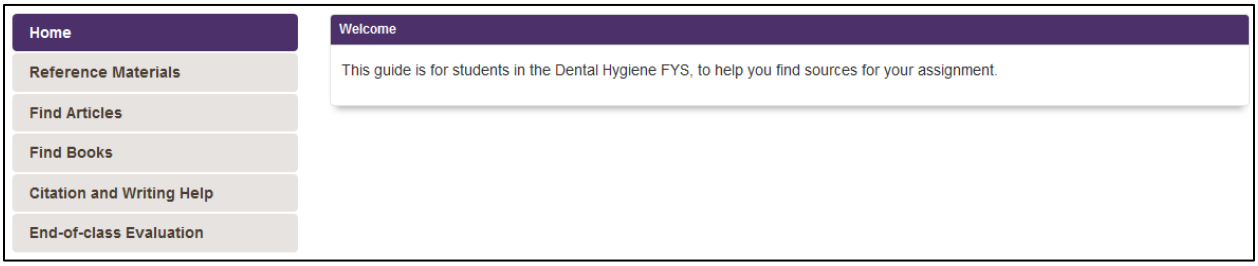


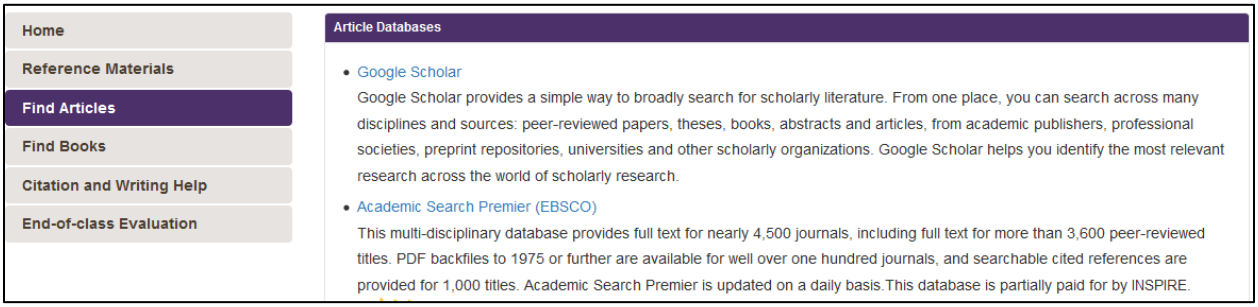
Figure 2 : Pedagogical Dental Hygiene FYS Guide (example of “welcome” and “find materials” pages).





Figure 3: Pathfinder guide for Dental Hygiene FYS (example of “home” and “find articles” pages).





The two Dental Hygiene sections were as equivalent as possible with similar numbers of students (pathfinder class N=19, pedagogical class N=24), the same instructors and librarian, and the same curriculum, assignments, and assessments. The only difference was that the pathfinder class participated in a voluntary two-week pre-fall semester program that provided student orientation and team building and stressed basic skills such as mathematics and public speaking. Participation by one of the class sections in the pre-semester program is one limitation of the study, although the program did not contain a research component or IL research content.

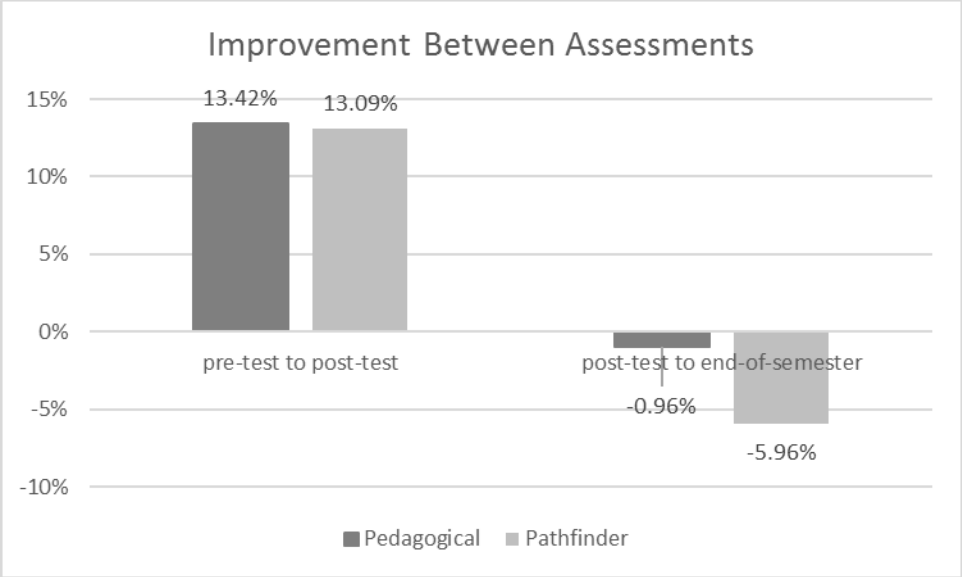
Each class was given the same IL instruction on the same day, in the same classroom. The fifty-minute instruction session focused on completing a worksheet (See Appendix A) that took students through the process of defining a topic, choosing search terms, searching in Google Scholar, identifying evaluative criteria for scholarly articles, and writing proper citations.

The worksheets were the same for both classes. The librarian led students through each step of the exercise with time to work following a brief discussion. The librarian taught each classes' course guide during the session and students used them throughout the exercise. Although the pathfinder guide did not contain information about the research process, the librarian taught the process to both students. The overall goal of the session was to prepare students to begin writing an annotated bibliography which would then lead to a final paper and, in theory, students would leave the session with at least one appropriate, scholarly article on the topic of their choice. The learning outcomes for the session were: formulating a research question of an appropriate scope, evaluating sources (i.e., popular v. scholarly), and citing sources.

Students had their information literacy learning assessed at a number of points throughout the semester. A test with identical question structure but different questions was administered to students: (1) before the class to establish a baseline for each sections' IL skills, (2) two weeks after the library session, and (3) at the end of the semester. The timing was chosen in order to determine how well concepts taught during the IL session were retained. The test questions ranged from concepts to mechanics so there would not be a pedagogical advantage to the questions. In other words, the questions would not solely address higher order concepts which might bias it against the pathfinder students (See Appendix B). A usability survey was also administered two weeks after the IL session. It contained questions related to IL concepts addressed in class, such as developing a research question, choosing databases, searching for sources, and citing. All quizzes and surveys were integrated into the LMS. Final annotated bibliographies were scored by both the librarian and instructor using an IL rubric developed for the assignment (See Figure 4). The librarian and course instructor normed

the rubric by scoring an example annotated bibliography, conferring, comparing, and normalizing (coming to an agreement on) their scores. The initial assessment of the example annotated bibliographies was blind with strong inter-rater reliability. Total numbers of annotated bibliographies were smaller than the initial Ns of the classes due to dropouts and failure to complete the assignments. The final number of annotated bibliographies included in this study was N=40.

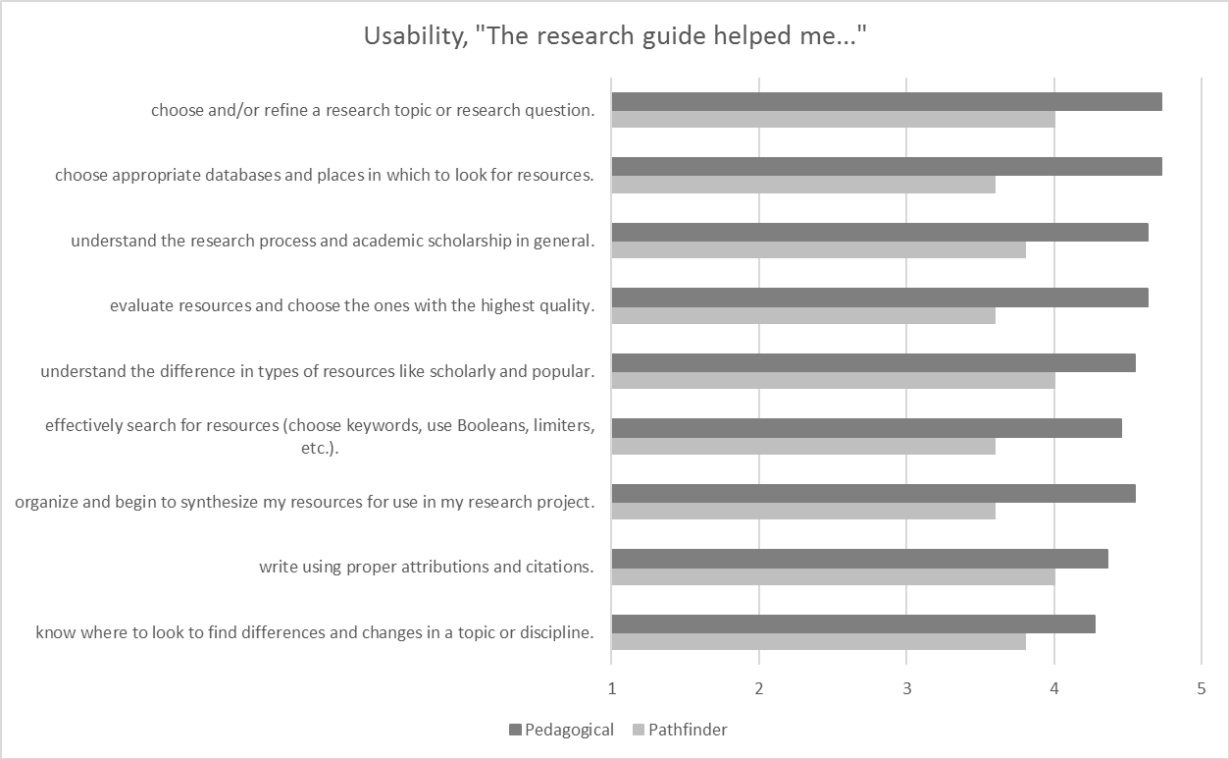
Figure 4: Improvement Between Assessments



Results

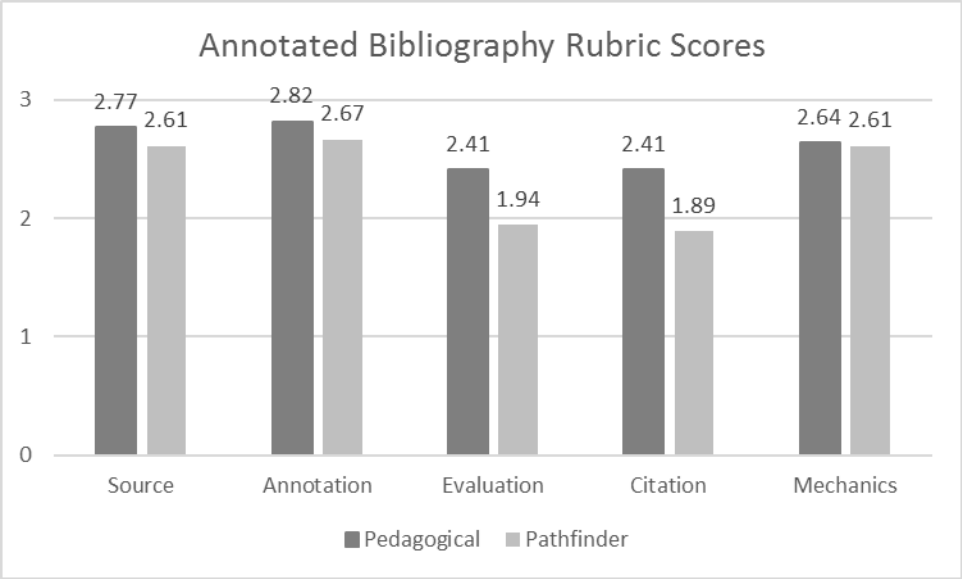
There were three primary areas this study sought to evaluate: evidence of retention of learning; student perceptions of the effectiveness of the guide; and evidence of student learning. Participation varied by class and by test instrument (see Figure 5).

Figure 5: Usability Survey Results



Retention of learning was measured by student performance on the pre-, post-, and end-of-semester tests. From the baseline established in the pre-test, while both sections saw a comparable percentage gain in correct scores between the pre-test and post-test, the pedagogical section saw less of a decline (by 5%) than the pathfinder section between the post-test and the end-of-semester test (see Figure 6).

Figure 6: Annotated Bibliography Rubric Scores



Student perceptions of the guides were assessed through the usability survey, administered at the same time as the post-test. The survey asked students to indicate their level of agreement on a 5-point Likert scale (*1-strongly disagree* to *5-strongly agree*) to a series of statements about the guides with the prompt "The research guide helped me…". As mentioned above, it contained statements related to IL concepts addressed during the library IL class session. The pedagogical guide received more favorable student responses than the pathfinder guide on every statement (see Figure 7). In other words, students' perceived the pedagogical guide as more helpful than the pathfinder guide in navigating the information literacy research process: choosing a topic, finding sources, evaluating sources, and citing. An independent samples t-test was conducted to compare pedagogical and pathfinder results. There was a significant difference ($p<.05$) in 6 of the 8 responses (see Figure 8) demonstrating a student preference for the pedagogical guide.

Figure 7: Usability Survey Results

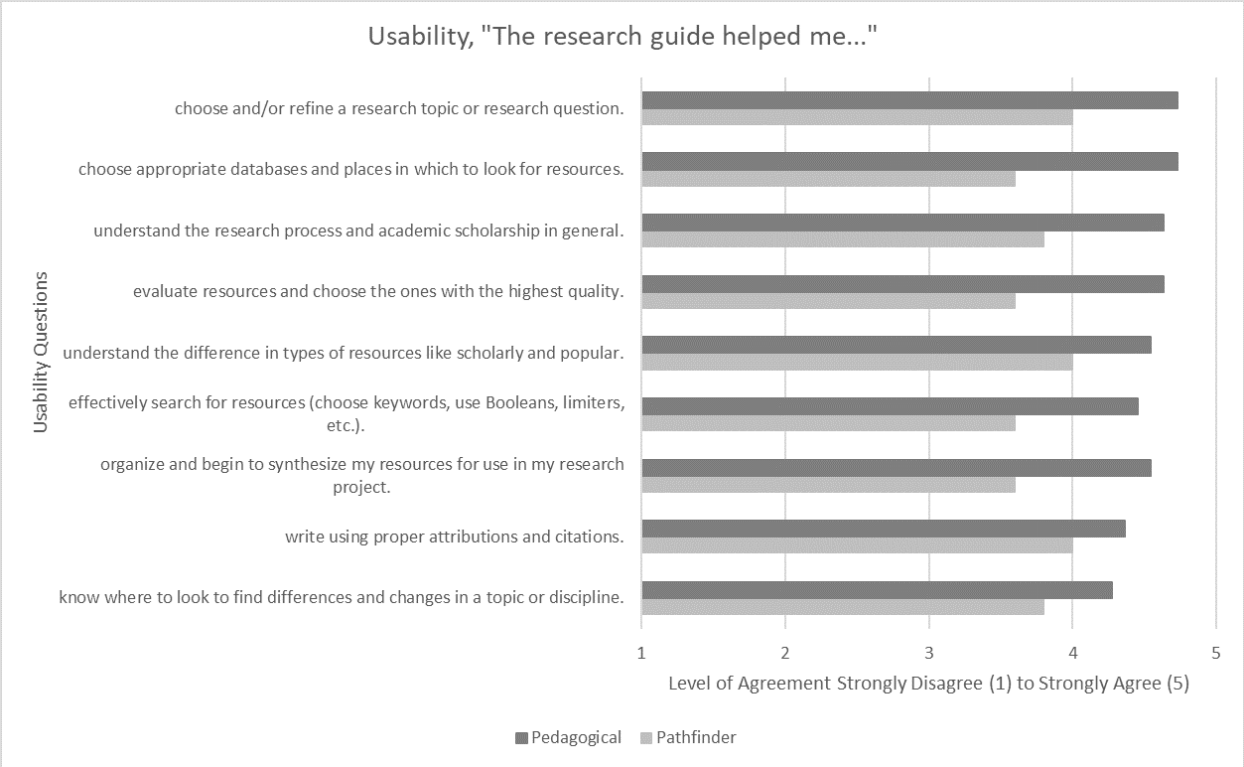
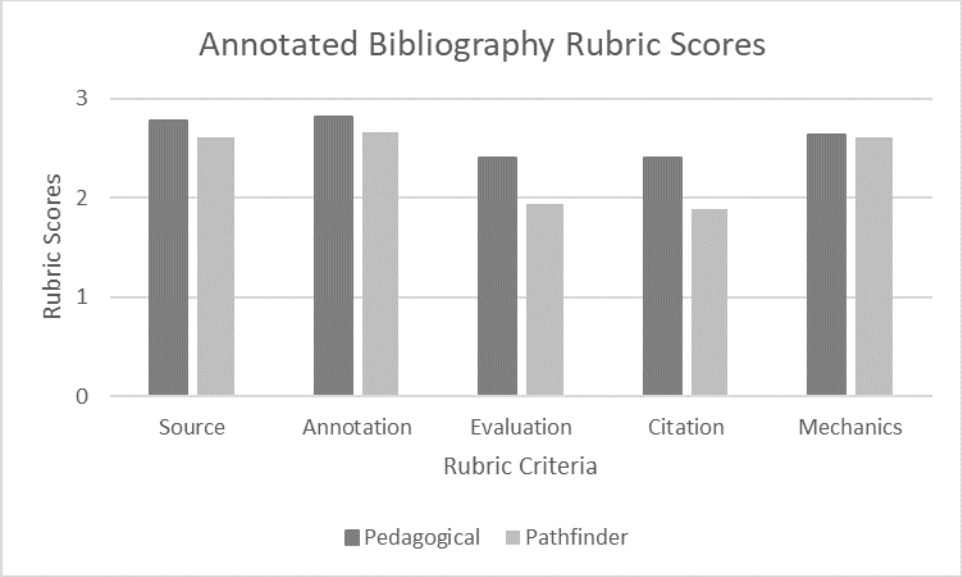


Figure 8: Usability questions where the difference between pedagogical and pathfinder was p<.05

The research guide helped me…	Pedagogical		Pathfinder	
	Mean	Standard Deviation	Mean	Standard Deviation
understand the research process and academic scholarship in general.	4.6	0.50	3.8	0.45
choose and/or refine a research topic or research question.	4.7	0.47	4.0	0.70
effectively search for resources (choose keywords, use Booleans, limiters, etc.	4.5	0.52	3.6	0.55
choose appropriate databases and places in which to look for resources.	4.7	0.47	3.6	0.89
evaluate resources and choose the ones with the highest quality.	4.6	0.50	3.6	0.89
organize and begin to synthesize my resources for use in my research project.	4.5	0.52	3.6	0.55

Final annotated bibliographies were scored using a rubric to assess student learning. Pedagogical students outperformed their pathfinder peers in every rubric category (see Figure 9). An independent samples t-test was conducted to compare pedagogical and pathfinder results. While there was a not a significant difference for four categories (source selection, annotation, evaluation, and mechanics), there was a significant difference ($p<.05$) for citation and evaluation was close to significant ($p=0.08$).

Figure 9: Annotated Bibliography Rubric Scores



Discussion

This study suggests that students using the pedagogical-style guide perceive it to be more effective and may be learning and retaining more information literacy concepts than those using the pathfinder-style guide. Students using the pedagogical-guide scored it higher in every category of the usability study than pathfinder students (in some cases statistically significantly so). Additionally, course guide usage statistics were higher for the pedagogical

section, which received 317 hits between August and December 2016; the pathfinder guide received 253 hits during that same period. From the pre-test baseline, pedagogical students demonstrated higher retention of concepts from the post-test to the end-of-semester test than pathfinder students. Although the difference was statistically significant (p-value < 0.5) only in citation, pedagogical students outperformed their pathfinder counterparts in every category of the rubric analysis of their final annotated bibliographies. Reproducing this study with a larger sample size would help determine if the difference in rubric results indicates a statistically significant difference in other areas or not.

While research on course and research guides is robust, further research needs to be done to assess their impact on student learning. The present study attempts to go beyond student perceptions (through indirect measures such as surveys), by assessing student learning through authentic assessment of student work. One limitation of the present study is that there are multiple factors at work in a semester-length course. While the present study tried carefully to control all IL variables except for the course research guide, there is the possibility that factors unknown to the authors contributed to student learning beyond the course guide. Another limitation is the small sample size of the pilot study. Repeating the study with more course sections would allow for a more robust data set. However, it is challenging to identify true A/B courses where all factors (e.g., instructor, course content, librarian) are similar except for the variable being measured. Literature on SoTL recognizes this common limitation (Bartsch 2013). This is why the current study attempted to amplify the statistical power of the small population through the pre-post-test methodology, which allows for detecting how students

change from before the study to after the study, rather than only comparing the pathfinder group to the pedagogical group.

The pathfinder-style guide, which involves listing resources by type or category (e.g., websites, databases, etc.) has been a fixture, and in some cases the standard style, of online guides for decades. This study does not argue that the pathfinder style has no value, and it may have its place, especially in listing resources for advanced, upper-level or graduate students who are already comfortable with the research process. This study also does not argue against evidence-based aspects of guide design and best practices for institutional guide production. Indeed, both the pedagogical and pathfinder guides in this study tried to follow best practices as established in the literature such as limited jargon, chunking material, and uniform appearance (for example, Bielat, Befus, and Arnold, 2013; Little 2010). From the perspective of student learning, however, the results of this study would seem to indicate that a pedagogical guide design, organizing resources around the information literacy research process and explaining the "why" and "how" of the process, leads to better student learning than the pathfinder design. The data presented here supports the idea that students benefit from using a pedagogical guide, even when already paired with IL instruction. This is significant for library instruction and student research needs.

Conclusion

Librarians have been teaching students how to conduct research for decades. The effectiveness of teaching IL — as was done in this study by focusing on the deep structure of

how and why people research as well as active learning — is supported by research in cognitive psychology (Cook and Klipfel 2015). If librarians follow best practices in instruction, then it is imperative we examine the learning objects used in teaching to ensure they support and complement these best practices.

Pedagogical guides make an excellent tool for in-class, active learning and can provide the framework for an instruction session that goes beyond didactic lecture and demonstrations. Used in class, pedagogical guides are useful for in-class learning and teaching as the hub of an information literacy exercise. A question for future research and discussion is how much students used the guides outside of class in doing their research. Some students may never have returned to their guide, but for those that did, a pedagogical guide would logically provide a more robust asynchronous teaching device as opposed to the pathfinder list of resources with little or no direction in the research process. Beyond that, pedagogical guides have the potential to be used as a replacement for in-class instruction when that sort of instruction is difficult, for example, in distance education and online, asynchronous classes. The self-directed "narrative tutorial" nature of the pedagogical guide could also benefit independent students conducting research that is not tied to a class with an IL instruction component.

Anchored by "The Research Process" infographic, the pedagogical guides are intended to lead students through the research process and are infused with tips and guidance (where appropriate for the course and student level). Traditional pathfinder guides present a list of static resources offered without context and without much guidance. Though guides are not a substitute for IL instruction or research consultations, the pedagogical style is meant to give students the ability to navigate the research process at their own pace with some

pedagogically-influenced guidance. In the end, the pedagogical guides result in a new approach to more self-guided and user-friendly designs. It is important that librarians' tools, such as course and research guides, stay up-to-date and meet students' learning needs. Designing course and research guides pedagogically is one concrete way to do this. Data presented in this study argues for the production of guides that go beyond being standardized and functional to become dynamic instructional learning objects that support and further student IL competencies both in and outside of the classroom.

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APPENDIX A – Worksheet

Start Your Research! 2016 DH FYS

Throughout college and in your profession you'll be asked to come up with answers to questions. This process helps you find information to answer those questions.

1 : Define your question or topic.

Before you start it is important to have a **question** or **topic** in mind. This focuses your research and saves wasted time reviewing irrelevant material. Write down a question related to oral public health. If you can't think of one, you can base it on one of the topics discussed in the *Dimensions of Oral Hygiene* article: Alcohol, Smoking, Piercings, Nutrition, Sleep, or Stress.

Question or Topic:

2 : Break it down.

A **researchable question** or **topic** has **core concepts** (usually nouns or noun phrases) that can be broken into different **keywords**. Identify up to three core concepts for your topic and **list two 1-2 synonyms or related ideas for each concept**.

	Keywords	***Synonyms***	***Synonyms***
Concept A		=	**or**
Concept B		=	**or**
Concept C		=	**or**

3 : Find scholarly articles.

Search **Google Scholar** (scholar.google.com) to identify a **scholarly article** on your topic. *(See **Research Guide > Evaluate** for tips on how to identify a scholarly article and other evaluation questions.)*

Article Title _____ Year

Author(s) _____ Pages_____ Vol/Issue

Journal Title

How did you determine this was a scholarly article?

4 : Cite the article.

It is important to give credit to the ideas of others. You do this by citing your sources. Which style you use depends on the discipline. *(See **Canvas** > **Library Research Guide > Citation Help** for more information on citation.)*

Cite the article you found using APA style (which is commonly used to cite sources in the social sciences).

ARTICLE EXAMPLE: Scruton, R. (1996). The eclipse of listening. *The New Criterion, 15*(3), 5-13.

5 : Annotated Bibliographies

For next week you need to begin writing an annotated bibliography and it can begin with this article. The skills we learned today will help you find items to put in your bibliography. See your assignment and the **Annotated Bibliography Information Sheet** in Canvas.

6 : Librarians = **free research help**.

Ask me:

Course Research Guide: See Canvas

Ask someone else:

*Worksheet adapted with permission from an original by Char Booth (*charbooth@gmail.com*).*

APPENDIX B – Pre-Test Questions

1. If you want to find scholarly journal articles for a paper, where should you search?
    a. IUCAT
    b. A database
    c. Google
2. In order to become familiar with a subject about which I know very little, I should first consult:
    a. A journal
    b. A friend
    c. My professor
    d. An encyclopedia, Wikipedia, or reference database
    e. A database
    f. Google
    g. A book
3. You want to find sources for your topic: The effect of family relations on the academic results of primary school students. Which words will you use to search?
    a. Family relations, academic results, primary school
    b. Family relations, academic results
    c. Effect, family relations, academic results
    d. Effect, family relations, academic results, primary school
4. You are writing a paper on the "treatment of depression." Which search strategy will find the least number of results?
    a. depression AND psychotherapy
    b. depression OR psychotherapy OR antidepressants
    c. depression AND psychotherapy AND antidepressants
    d. depression
5. Which of the following citations refers to a journal article?
    a. Miller, A. W. (1997). Clinical disorders and stressful life events. Madison, CT, International University Press.
    b. Anderson, K. H. (1999). Ethical dilemmas and radioactive waste: A survey of the issues. Environmental Ethics, 2(3):37- 42.
    c. Hartley, J. T. & D. A. Walsh. (2000). Contemporary issues and new directions in adult development of learning and memory, in L. W. Poon (ed.), Aging in the 1980s: Psychological issues, Washington, D.C., American Psychological Association, pp. 239-252.
6. Which of the following best describes articles published in a peer-reviewed scholarly journal? [Choose all that apply]
    a. The information is written for the general public
    b. It includes a list of references
    c. The research method used is described
    d. It has been evaluated by an editorial board or other experts in the same field as the author

7. Would you use the following source in a paper you are writing about the current environmental state of Yosemite National Park?

   Hall, Ansell F. Handbook of Yosemite National Park. New York and London: The Knickerbocker Press, 1921.

   a. Yes
   b. No
8. Why did you choose your previous answer?
   a. The author
   b. It is a book
   c. It is a scholarly source
   d. The publication date
   e. The topic or subject
9. Which factors affect the quality of an article or resource? [Choose all that apply]
   a. Author's credentials and expertise
   b. Date of publication
   c. Publisher
   d. Presence or absence of peer review editing
10. Which piece of information is not usually needed for a citation?
    a. Author name(s)
    b. Author institution(s)
    c. Journal Title
    d. Article Title
    e. Year of publication
11. Which of these is a "bad" resource?
    a. A newspaper article
    b. The website of the company you are currently researching
    c. An article from the New England Journal of Medicine
    d. A documentary of Pluto from NASA you found on YouTube
    e. A series of blogs from a researcher in Medieval History at the University of Michigan
    f. B, D, and E
    g. There are no "bad" sources, it all depends on the context of one's research project
12. The best place to find scholarly books on a subject is:
    a. JSTOR
    b. An EBSCO Database
    c. IUCAT
    d. Google Scholar
    e. Google
13. What basic information is missing from this citation:

    Hansen, W. (2010). Examining prewar Tôgô worship in Hawaii: toward rethinking Hawaiian Shinto as a new religion in America. Nova Religio, 14(1).

a. Publication Year
b. Page Numbers
c. Volume
d. Issue Number

14. Which search will give the fewest results?
    a. hero AND worship
    b. hero worship
    c. her* AND worship*
    d. “hero worship”
    e. hero OR worship