TEACHING REPORT

Using Community-Engaged Research to Teach Information Literacy

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Abstract

Through a librarian-faculty partnership, we endeavored to teach information literacy through a large-scale applied learning project. We argue that a benefit of community-engaged research could be to teach information literacy, specifically dispositions that are difficult to teach in a traditional classroom context. We found that we were successful in helping students learn to consider contextual authority and to be more critical consumers of information as evidenced through both quantitative and qualitative data. We had mixed results on encouraging students to move away from defaulting to reliance on those sources they learned about as authoritative earlier in their education, though they were aware in most cases that these sources could also be biased and/or not the most appropriate source for the question.

Keywords

Information literacy, community-engaged research, applied learning, authority

Teaching information literacy—a nuanced, ethical, and participatory interaction with information discovery and creation—in a way that students can thoroughly understand and apply is challenging for several reasons, including the fact that we are attempting to introduce nuance after years of learning a very specific and straightforward type of information literacy throughout K-12 and early higher education, because it is complicated and cannot be done with a single acronym or shortcut, and because we are using a university environment to teach about information literacy beyond the classroom. Students' interpretation of information literacy can be limited to its perceived value within the walls of the university (e.g., I need to use peer-reviewed sources when looking up information). Using applied learning, such as community-engaged experiences, may be a method of teaching information literacy in a way that resonates with students.

Applied learning as a pedagogical tool includes student learning through community-engaged research (also called community-based research), internships, study abroad, service-learning, and other strategies, with considerable overlap across these categories. Applied learning allows students to learn and develop skills outside of the classroom (Ash & Clayton, 2009). We define community-engaged research as research done with the community on an issue of local relevance. While the degree of community partner/organization involvement varies across projects, we place importance on a shared understanding of the problem and a focus on collaboration to better understand the issue and serve the community. Community-engaged research is particularly well suited to teaching information literacy because of its emphasis on being mutually beneficial and reciprocal. Through respecting the authority of the community and

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community members, we introduce sources of authority beyond traditional texts or the academy.

In this paper we present a project that incorporates information literacy into community-engaged research projects and highlights the potential of faculty-librarian collaborations. The three goals of our project were to (1) provide students the information literacy skills, knowledge, and resources to be better consumers and producers of information, (2) help students to understand that traditional academic sources are not always authoritative, and (3) enable students to apply information literacy concepts beyond the classroom. Our findings were mixed, with some evidence of students learning information literacy dispositions in the post-test and reflections, but not as much of a change in their overall information literacy knowledge as we were hoping, especially related to goal 2. We hypothesize that this is likely due to how engrained other approaches to information literacy are, and perhaps how we are assessing student learning.

Information literacy

Information literacy is a broad term, encompassing "the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (*Framework for information literacy for higher education*, 2015, p.8). Research has identified the importance of information literacy (IL) as an essential component of a university education, though opinions differ on the method of delivery and extent of material covered related to IL (Bury, 2016).

Many students are introduced to information literacy as a concept before entering college, though issues of equity are inherent to the information literacy education that students receive in their high school environments (Valenza et al., 2022). While crosswalks between Common Core standards, the American Association of School Librarian Standards, and higher education information literacy outcomes (the *Framework for information literacy for higher education*, 2015 discussed in detail below) have been developed (Fuchs & Ball, 2021), there can often be gaps between the way information literacy is taught in high school and the way

it is taught in higher education. For example, Saunders et al. (2017) found that some high school librarians may not be clear as to the information literacy knowledge and skills emphasized at the college level, leading some high school librarians to focus on skills that are viewed as less important in college-level information literacy education. Their survey of high school librarians indicated that the three most commonly taught information literacy skills were proper citation methods, plagiarism avoidance, and research question definition. In addition, some school districts have eliminated or have stopped filling school librarian positions entirely, which decreases the likelihood that students graduating from these districts will have received information literacy education that translates to the higher education environment (Ahlfeld, 2019; Valenza et al., 2022). Students entering college are often therefore ill-prepared for the way information literacy will be taught in their college careers.

From 2000 to 2016, the accepted model for teaching information literacy in higher education was to apply the *Information Literacy Competency Standards for Higher Education* (Information literacy competency standards for higher education, 2000). The *Standards* were the first attempt at establishing a set of national guidelines for information literacy and focused on the idea of the student as critical consumer: an information literate student should, for example, "evaluate…information and its sources critically and incorporate…selected information into his or her knowledge base and value system" (Information literacy competency standards for higher education, 2000, p.11).

In 2016, the Association of College and Research Libraries replaced these *Standards* with the *Framework for Information Literacy for Higher Education* (*Framework for information literacy for higher education*, 2015). This change was prompted by the growing realization that in a more modern information ecosystem, students can no longer simply be information consumers. Rather, students are an integral part of this ecosystem: they have "a greater role and responsibility in creating new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and scholarship ethically" (*Framework for information literacy for higher education*, 2015, p.7). The goal of further integrating students into this ecosystem clearly maps on to using community-

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engaged research projects as a mechanism to teach information literacy.

The *Framework* incorporates six interconnected core concepts: "Authority is constructed and contextual", "Information creation as a process", "Information has value", "Research as inquiry", "Scholarship as conversation", and "Searching as strategic exploration." Within each of these concepts are sets of "knowledge practices" (loosely, skills and abilities) and "dispositions" (essentially, mindsets and mental approaches) that together involve students in all facets of information gathering, assessment, ethics, and production.

Examples of dispositions in the "Authority is Constructed and Contextual" frame (discussed in more detail in the next section) include "develop and maintain an open mind when encountering varied and sometimes conflicting perspectives," "develop awareness of the importance of assessing content with a skeptical stance and with a self-awareness of their own biases and worldview," "question traditional notions of granting authority and recognize the value of diverse ideas and worldviews," and "are conscious that maintaining these attitudes and actions requires frequent self-evaluation" (*Framework for information literacy for higher education*, 2015). While knowledge practices are generally more concrete skills and abilities (for example, "define different types of authority, such as subject expertise, societal position, or special experience") and thus are relatively straightforward to assess, research shows that there are challenges in assessing and evaluating the impact of information literacy education on students' mindsets and affective outcomes. For example, Mabee and Fancher (2020) examine ways that external stress and anxiety are barriers to students' abilities to engage with the affective dimensions of information literacy in a meaningful way, and Lenker (2022) discusses the difficulties inherent in attempting to pin down or define what these affective traits mean in practice, examining the concept of "open-mindedness" as an example.

Authority is Constructed and Contextual

In this community-engaged research project, we focused on the *Framework for Information Literacy for Higher Education* concept "Authority is Constructed and Contextual." In the *Framework*, this concept is further defined as "Information resources reflect their creators' expertise and credibility and are evaluated based on the information need and the context in which the information will be used. Authority is constructed in that various communities may recognize different types of authority. It is contextual in that the information need may help to determine the level of authority required" (*Framework for information literacy for higher education*, 2015).

Since the publication of the *Framework* in 2015, there has been an extensive amount of research into ways this concept might be applied most effectively. A main thrust of the scholarship has been to challenge a previously widely-used model for the evaluation of sources, known as *CRAAP* (for currency, relevance, authority, accuracy, and purpose). According to recent research, the *CRAAP* test, due to an increasingly complex and sophisticated digital information environment, is no longer particularly effective in helping students to accurately evaluate information they find online. In their working paper "Educating for Misunderstanding," more commonly known as the "Stanford study," Wineburg et al. (2020) demonstrated that the *CRAAP* test and similar methods that teach students to evaluate an information source in a vacuum, by trusting the content that the source supplies about itself, no longer help students become critical consumers of information and may actively hurt these efforts.

While a number of academic libraries do still seem to rely on this model based on its fairly frequent appearance on library websites, an increasing number of libraries have discarded it in favor of various lateral reading or fact-checking models. Lateral reading is a multi-step process in which, rather than simply analyzing one source in great depth, students fact check a source based on an investigation into what other sources say on that same topic. Lateral reading allows students to research, understand, and investigate where information is coming from rather than taking one piece at face value (Baer & Kipnis, 2020; Caulfield, 2020; Fielding, 2019; Seeber, 2018).

Other research has focused on the ways in which the *Authority* frame encourages librarians and teaching faculty to move away from reflexively situating expertise and cognitive authority within traditional academic scholarship. Researchers have noted that this frame

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makes room for nontraditional authorities. For example, White (2019) discusses the value of using the online community Reddit in teaching students about cognitive authority outside the typical scholarly world; Watkins (2017) describes how this frame encourages students, teaching faculty, and librarians to look at authority cross-culturally rather than focusing exclusively on a Western system of knowledge; and Waity and Crowe (2019) describe a project helping students to learn to differentiate the authority situated within a community versus the authority given to a professor or scholar.

Collaborations Between Faculty and Librarians

Historically, in higher education, information literacy has been taught through the one-time demonstration model (colloquially known as a "one-shot") by a librarian. This model, in which a librarian is invited by a faculty member into the classroom for one class session to provide information on research, search strategies, and even Framework-based information literacy concepts, contains several inherent assumptions: 1) information literacy can be bounded by a 50-minute class session, rather than systematically integrated across the curriculum, 2) information literacy skills should be taught directly by a librarian, but 3) the content and timing of this session should depend upon the individual faculty member and what they view as necessary for that specific course. In recent years, studies have explored the potential drawbacks to this model, such as its role in librarian burnout, its emphasis on the transactional rather than the relational; its disempowerment of the librarian as expert; its focus on the individual rather than on solving systemic issues; and the lack of space and time it provides for deeper and more thoughtful conversations about issues inherent to the Framework and to information literacy writ large (Bowles-Terry & Donovan, 2016; Leung, 2022; Nataraj & Siqueiros, 2022; Nicholson, 2016; Pagowsky, 2020, 2021, 2022; Pho, et al., 2022). The Framework appendix itself indicates both that information literacy "is intended to be developmentally and systematically integrated into the student's academic program at a variety of levels" and that librarians should work with others on campus to "design information literacy programs in a holistic way" (*Framework for information literacy for higher education*, 2015). One alternative model to relying on the one-shot approach is to develop and sustain deep collaborations between teaching faculty and librarians.

Through collaborating with librarians, faculty members can integrate and enhance information literacy skills throughout the curriculum, allowing students to incorporate the material and knowledge into other courses (Bartow & Mann, 2020; Caravello et al., 2008). Faculty-librarian collaborations on information literacy have been well-documented in the literature and can take a number of different forms, all of which focus on maximizing positive information literacy outcomes for students. Lindstrom and Shonrock (2006) discuss formats such as collaborating on course integration beyond the one-shot model, integrating information literacy into learning communities, and working to build information literacy into general education curricula. One common approach to information literacy collaborations in the academy is through communities of practice, commonly facilitated by librarians, through which teaching faculty gain a fuller understanding of information literacy and can then apply those concepts to their classes (Crowe et al., 2019; Saines et al., 2019). All collaborators must share a vision for goals and best practices for teaching information literacy as well as learning outcomes and assessment of information literacy knowledge and skills attained (Brasley, 2008).

Using Applied Learning to Teach Information Literacy

Applied learning allows students to extend their learning and educational experiences beyond the traditional classroom or teaching style and apply their skills to real world problems (Acharya et al., 2018). Literature on applied learning has discussed the benefits of applied learning projects as such projects allow students opportunities to reflect on their learning, gained skills, experiences, and how to be engaged in various ways through non-traditional teaching pedagogies. Applied learning merges a variety of instructional models, such as experiences, classroom material, lectures, and readings (Ash & Clayton, 2009). Integrating applied learning into student learning outcomes reinforces to students the educational goals of the material and allows for them to reflect on a deeper, more in-depth understanding of their work (Sipos et al., 2008).

Research on the incorporation of information literacy into other areas of applied learning, like service learning, cites benefits to students including improved problem solving and critical thinking skills (Kennedy

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& Gruber, 2020) and acquisition and application of research related information literacy skills (Janke et al., 2012). Information literacy combined with community-engaged research allows students to research and critically examine real-world examples and information relating to the topic and use appropriate information literacy processes to explore and evaluate existing research (Ross & Hurlbert, 2004). Students taking part in an applied learning project have the opportunity to practice critical thinking and information literacy skills by applying academic content to a "real-world" situation (Waity & Crowe, 2019; Worosz, 2009).

Library intervention (the teaching of information literacy skills) can aid students in looking past a surface-level problem and digging deeper into structural/systematic explanations (Caravello et al., 2008). Previous research has shown a combination of service learning and information literacy can positively impact students' perceptions and knowledge of their community and reduce associated biases (Kennedy & Gruber, 2020).

While there is a great deal of potential in aligning information literacy with applied learning, there is limited research exploring the benefits of community-engaged research in helping students understand higher-order information literacy concepts. In this paper, we will discuss how we collaborated with our local police department on a research project to teach students about different sources of authority. As we will discuss, the mixed success of this endeavor may have been due to several factors, including the COVID-19 pandemic, the way we assessed their knowledge of the topics we were trying to teach them, and the way that students have learned information literacy previously.

Project

This project involved using community-engaged research across several courses in the sociology curriculum at a mid-sized public university in the Southeast US as an opportunity for students to consider how they know what they know and how they gather information. The courses included in this model were Introduction to Applied Social Research, Methods of Social Research, Data Analysis, and then a senior seminar capstone course, either the General Sociology senior capstone or the two-semester Public Sociology/Criminology capstone. Ideally, students take the courses in this sequence so they

can build on their knowledge of information literacy across these courses. We matched specific information literacy learning dispositions to the course learning outcomes, with one common outcome across all five courses. In all courses, we wanted students to be able to "question traditional notions of granting authority and recognize the value of diverse ideas and worldviews" (*Framework for information literacy for higher education*, 2015) and we included an additional disposition for each of the courses to align with the content and type of project for that course. Each of the information literacy dispositions are listed in Table 1. Our goal was to help students understand an overarching concept concerning the social construction and contextual nature of cognitive authority and to have a more nuanced understanding of information literacy in general.

The courses were all part of a larger strategic initiative to embed community-engaged research across the sociology curriculum. In these courses, students worked on components of a research project on social determinants of crime while working through course material. We partnered with the local police department to determine why rates of crime varied across districts within our city. In addition to the overall research project that students worked on, students also completed a specific activity related to information literacy, such as reading articles with different perspectives related to their research topic. Prior to that, students viewed a prepared lecture by the librarian about information literacy, specifically focusing on the concept of authority and the learning outcome that spanned the courses (to question traditional notions of granting authority and recognize the value of diverse ideas and worldviews). Providing opportunities for students to apply their knowledge and skills beyond the classroom is a well identified strength of community-engaged research. We argue that a less well-established benefit of community-engaged research could be to teach information literacy, specifically dispositions that are difficult to teach in a traditional classroom context.

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Table 1: Authority is Constructed and Contextual Dispositions By Course

All courses: Question traditional notions of granting authority and recognize the value of diverse ideas and worldviews.
292: Intro to Applied Social Research: Develop and maintain an open mind when encountering varied and sometimes conflicting perspectives.
300: Research Methods: Motivate themselves to find authoritative sources, recognizing that authority may be conferred or manifested in unexpected ways.
301: Data Analysis: Develop awareness of the importance of assessing content with a skeptical stance and with a self-awareness of their own biases and worldview.
391 and 496: Senior Seminar in Public Sociology and Criminology: Are conscious that maintaining these attitudes and actions requires frequent self-evaluation.
495: Senior Seminar (capstone) in Sociology: Are conscious that maintaining these attitudes and actions requires frequent self-evaluation.

Methods

At the beginning of each course, students were given a pre-test and were required to write an intention paper. The pre-test asked about their familiarity with these information literacy concepts using a knowledge survey. A knowledge survey asks students to indicate how confident they are in answering the question (from 1=not at all confident to 3=very confident) but not to answer the question itself. Students also wrote an intention paper that described their knowledge of community-engaged research, their expectations for the course, and how they choose what sources of information to trust as authoritative (to get them to think about the constructed nature of information authority). In addition, we included a question specific to the information literacy concept the course was focused on (see Table 1 for the specific focus of each course). For each information literacy-specific activity in the course, students wrote reflections at the beginning and end of the activities as well. At the end of the semester, students were given a post-test and required to write an ending reflection (mirroring the start of the semester). The post-test was in a similar format to the pre-test with knowledge survey questions in addition to content questions.

We used a mixed methods approach for assessment of the information literacy components of this model, including quantitative data from pre- and post-tests and qualitative data from intention and reflection assignments. We conducted two-sample t-tests to determine if there was any significant change from pre-test to post-test on students' confidence in answering questions related to information literacy. The total number of students who consented to have their course materials included in this research was 106, with 13 students enrolled in more than one course (11 students were enrolled in two courses and 2 students were enrolled in 3 courses). Given the potential for having students included in the data several times, we ran the analyses for the question that overlapped across courses with and without duplicate cases by including only those with complete data (pre and post) and then the most recent course in the cases of complete data. The results of the analysis with duplicates excluded yielded the same results.

Next, we used the qualitative data analysis software ATLAS.ti to facilitate the analysis of the written reflections from students across the two years that we ran this model. We began by coding for emergent themes related to the information literacy frame "Authority is Constructed and Contextual" in the intention and reflection assignments that students wrote both at the beginning and end of the course, as well as before and after they completed the specific information literacy activity. Overall, we wanted to determine if students were using traditional methods of information literacy evaluation (ensuring an article was peer reviewed, for example) or taking new concepts into account from the "Authority is Constructed and Contextual" frame (such as recognizing that authority can come from both academic and community sources), and also if the work they did in the course, especially related to community engagement, facilitated any changes in their concepts of information literacy. These included who or what the students considered as sources of authority, how they made that decision as to what counts as an authority, and if there was a change from the intention to the reflection. For this last concept, we looked at students' ending reflections to determine if what they wrote at the end of the course was similar to or different from what they wrote at the beginning of the course.

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Results

Analysis of quantitative data, including pre and post-tests

Looking at the knowledge survey questions that asked about information literacy topics, students scored higher on the post-test than the pre-test in all measures, with one exception where the scores were the same. However, when examined separately by measure and class not all differences were statistically significant. Table 2 shows the results from the t-tests. Due to the low number of students in individual sections, we determined it would be beneficial to look at overall significance of pre- and post-test information literacy questions by course.

Table 2: **t-tests comparing pre and post test results for IL knowledge survey questions (N=106 students)**

Class	IL knowledge survey question	Pre	Post	Sig	N
292	Critically assess the value of various sources of information regarding a social problem to determine how they would be useful in providing evidence on a research topic.	1.75	2.57	.026	7
300		1.78	2.63	.002	8
301		1.99	2.63	.000	64
391		2.57	2.00	.580	6
495/496[1]		2.36	2.86	.017	14
292	Review conflicting sources of information on a social problem with an open mind.	2.67	2.75	.728	8
300	When conducting research on a social problem, describe what sources of information you consult to learn more about the issue(s)?	1.71	2.77	.000	13

Class	IL knowledge survey question	Pre	Post	Sig	N
301	Overcome your preconceptions of social problems when taking in information rather than using selected information to confirm your pre-conceptions	2.31	2.81	.000	69
391/496[2]	Find authoritative sources by keeping an open mind and recognizing biases through frequent self-evaluation	2.80	2.80	1.00	5
495		2.85	2.85	1.00	13

Notes. [1]Capstone course data is presented together for this measure, [2] 391/496 is a yearlong two course sequence, so the pre-test was given at the start of fall semester and the post-test was given at the end of Spring semester. In all other courses, pre was given at the start of the semester and post at the conclusion of the semester long course.

In Table 2, we can see that students seem to have made more gains in the lower-level courses (292) and those courses where the course topic directly aligned with the information literacy component (e.g. 300- Research Methods students on "When conducting research on a social problem, describe what sources of information you consult to learn more about the issue(s)?"), though students in these courses also scored the lowest on the pre-test questions overall so they had more room for gains relative to students in the higher-level courses in the model. Students in the 391 course were part of a two-course sequence and did not see any significant gains, in fact reported slightly lower on the post-test. Students in the capstone courses (495/496) started quite confident and ended very confident (2.86). Given that these students started with a high score on the pre-test, they had less room to make gains on this question.

Analysis of qualitative data, including intention and reflection papers

Changes to traditional notions of information literacy. To determine if students were changing their

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perceptions of information literacy, we first looked at who or what they considered to be a source of authority in their intention papers. The main sources of authority that students wrote about were academic researchers (sometimes referred to as authors) who wrote journal articles. One student wrote in their intention before they completed the information literacy activity:

> For an author to be an authority on their topic, the author should have some sort of focus directly correlating to their degree on the topic they are in. They should be active in the community where their research takes place, whether that be physically or mentally, and most of the information they pull from should be recent sources that have equal acclaim to the author.[1]

We then delved into how students made the decision about whether a source was authoritative or reliable. In their intentions, we saw students recognize that inaccurate information was present, which factored into how they judged whether something was a source of authority or not. One student wrote, "In all honesty, much of the information I consume I do so without doubting the credibility of it. This has to change because many of the information found on the internet is not reliable…". At the same time, students did not necessarily know where to find reliable information. Another student wrote:

> A way that I determine if a source is reliable is by looking at the domain name system… I honestly don't know if this is the most accurate way of determining if a source is reliable but I find that this works for me…

Many students continued to hold similar views in their ending reflections as well. While recognizing that evidence was needed, they did not all take the step to critically examine that evidence. Some students did seem to understand the importance of looking beyond traditional academic sources, demonstrating that some of the information literacy activities may have broadened their views on what counted as an authoritative source. One student wrote in their reflection after completing the information literacy activity about using governmental reports as a source of authority, writing, "I used google scholar to find a article written by the Department

of Justice. I think the source is qualified because it is a government agencies who's task is to handle crime." Students also began to see the community and community partner as sources of authority that they had not previously considered.

Most students, however, continued to turn towards standard sources like peer-reviewed articles from the library's databases. A student wrote in their reflection, "To determine of a source is reliable or not you need to make sure it is peer reviewed and that it is unbiased and backed up with evidence for the claims it is making." Even though they were mostly turning towards the same sources as before, students did show evidence of having more of an open mind to new information and understanding multiple viewpoints. One student wrote in their information literacy activity reflection, "It's also all about thinking critically and looking at all the facts and not just those that support your opinion." Another student summarized their experiences with what they learned related to information literacy throughout their college career as well as this particular course. They wrote:

> I would like to at least think I can critically assess a source, but at the same time, I am going to put weight on whatever academic source I am reading because it is what I've been socialized to do. The module on authority was helpful for this understanding this element of academia. Not all authors are created equal and lived experiences are often better producers of comprehension than text.

It is evident from the ending reflections that some students continued their traditional views of information literacy while others broadened them to include other sources that they learned about from the frame "Authority is Constructed and Contextual." The question then becomes: did the work in the community change the students' minds?

Impact of the activities and community-engaged work on information literacy. As described above, our goal was that the community-engaged activities would help students to understand information literacy concepts at a deeper and more nuanced level. In their intentions, students wrote about how on-the-ground knowledge from sources such as police departments

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[1] *Student quotations are presented exactly as written.*

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might differ from traditional sociological knowledge. One student wrote in their intention, "I anticipate learning about the police department's interpretation of data which will differ from what I learned in academic sources because of the differing perspectives. Sociologists tend to utilize the sociological imagination and other methods that differ from police departments."

In the student reflections, we found that information literacy activities encouraged students to consider different types of sources and feel confident critically assessing the content they are consuming. One student wrote in their information literacy reflection, "I feel like I was able to have a more open mind and was able to make my own judgement on the topic after I had read it from multiple perspectives and hearing some conflicting points of view." A second student wrote, "I already sought reliable sources for my research projects, but I feel that this project has made me more comfortable with taking initiative and gathering information beyond academic articles and preexisting studies." Finally, an additional student wrote, "I feel comfortable with my ability to critically assess the content I consume but I understand that there is always room for improvement." Despite their confidence in their ability to critically assess content, they recognized that they should continue to improve. This reflects that the student both became more comfortable with information literacy as a result of their experience and that they realized it would be an iterative lifelong learning process.

Capstone student gains in information literacy. Based on the findings described in the quantitative results section above, we conclude that capstone students made gains in information literacy, but they had less to gain. So, we turned to student intention and reflection assignments with a specific focus on capstone students' starting and ending levels of information literacy knowledge. Students learn about information literacy throughout their college careers. One student even wrote about this in their intention, saying:

> The ability to critically assess data is something I have been learning to do for the last four years of college and this is a chance to apply it to a real social problem and for my confidence to increase in my ability to do so.

In their intentions, some students already displayed behaviors that we would expect at the end of a semester, such as one student who wrote, "I make an effort to check myself and participate in evaluative thinking and behaviors, especially in an academic environment." This was not the case for all students, however, with one writing, "When looking at research for classes, however, I don't feel like I have as good as an eye and may miss crucial evidence." Students were also asked in their intention assignments to describe how they kept an open mind. One student wrote that they felt prepared to critically assess content with an open mind but recognized that "it can be challenging to keep an open mind when deeply rooted in your own experiences and ways of thinking." Being able to recognize this demonstrates some proficiency in the disposition "Are conscious that maintaining these attitudes and actions requires frequent self-evaluation," which was the disposition we focused on in the capstone classes.

When describing what might be beneficial working with a community partner, one student wrote, "While objectivity is important in sociological studies, when studying human experience I wonder if a certain level of subjectivity might be helpful." This comment demonstrated that the student recognized the subjectivity of research and that our community partner had knowledge that might be different from academic sources.

After completing the reflection assignments at the end of the capstone course, it seemed like the process of collecting data themselves enabled students to understand more fully how methodology can determine the authority of a source. One student wrote, "To evaluate data, you will need to determine how and by whom the data was initially collected." This student recognized that researchers can have an influence on how data is collected. Another student who was collecting their own data as part of their internship pointed out the importance of nonprofit organizations in collecting local data about issues, thus becoming a source of authority as well. This student wrote, "Traditional institutions may not encourage study into local issues, preferring that large-scale projects be taken place for more generalizable information."

Overall, capstone students started with a relatively

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high level of understanding these information literacy concepts, so we did not see as much improvement over the courses like we did for lower-level courses. We were able to see that by working directly with community data, students gained knowledge of how to interpret data instead of just reading interpretations that had already been done. One student wrote in her reflection:

> Working directly with the [community data] allowed me to form my own thoughts and opinions without the influence of someone's interpretation, something that I could not do with academic sources… Approaching data with a kind of "blank slate" was something that I hadn't done previously. It changed the way I approach academic papers and challenged me to more critically assess data.

Another student shared a similar view about how conducting this community-engaged research increased their information literacy knowledge. They wrote:

> After all it's *said* and done, my ability to critically assess data has been substantially increased due to the research we had to conduct in the course. Obtaining information literacy via the project is helpful not only within academia, but also in the real world.

Not all students felt like they had the information skills at the beginning of the class, but believed that working on the project helped to develop them further. One student wrote:

> As far as my ability to critically assess information, I was not very confident before taking this class, but I do feel that working on this project, as well as all our discussions in class and hearing [the professor's] perspective on things has helped me improve on this.

Overall, there was mixed evidence from all the student reflections about how impactful these information literacy activities were in the context of our original three goals. Students began thinking more critically about the authority of information and were aware that there are limitations to how they often consume information, both in academic and non-academic contexts, which reflects success with goals 1 and 3. However, students seemed to still rely on those early learned ideas of authority (e.g., peer-reviewed research), which reflects less success on

goal 2. While the evidence from the reflections provides insight into why students conceptualized information literacy in certain ways, especially sources of authority and the community, the reflections also make it clear that not all of their information literacy preconceptions (e.g.edu is always an authoritative source) changed.

Discussion

Community-engaged research is one way to teach students information literacy that challenges them to think in a broader and more nuanced way about sources of informational authority. Students made gains on goals 1 (becoming better consumers and producers of information) and 3 (applying information literacy beyond the classroom). Students did not make as much progress on goal 2 (understanding different sources of authority). This method of teaching information literacy challenges students to dig more deeply and think more critically about information than students have typically been taught up to this point (even sometimes in their first classes at college). If we hope to help students move beyond what they have been taught in middle and high school to succeed at goal 2, we need to disrupt the script, but doing so requires regular reinforcement, opportunities for application, and collaboration between faculty and librarian experts.

Students receive information from a variety of sources such as peers, professors, family members, and the internet. This information overload can create challenges in sorting or filtering through the meanings and reliability, which can lead to them rarely questioning or challenging that information (Saunders, 2012). Students are also looking for shortcuts to understand these information literacy concepts, which we cannot provide because critical consumption of information cannot be boiled down into a checklist approach (such as CRAAP) (Wineburg et al. 2020). As instructors, we give students the information literacy knowledge and resources to be able to determine if something is a reliable source of authority, but the students still have to put in the work to figure out if it meets their information need.

Learning about information literacy is not a linear process (Mazella & Grob, 2011). Throughout these community-engaged experiences, students slowly learned how to incorporate these information literacy concepts into their toolkit, in some cases disrupting

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what they learned in K-12 and earlier in college. Embedding community-engaged experiences into the classroom allowed for weekly reinforcement of the information literacy concepts, which extends beyond the traditional information literacy "one-shot" guest lecture from a librarian and instead aligns with a curriculum integration approach (Lindstrom & Shonrock, 2006). Consistent with existing research, collaborating in a relational manner with other faculty and librarians, and incorporating various information literacy modules into the course curriculum throughout the semester allowed for higher growth and retention of information literacy skills than with the one-time lesson (Black et al., 2001). This non-linear path may help explain why the efficacy of our activities were not as clear cut as we predicted.

The knowledge survey responses become even more meaningful when considering changes over the different courses in the model. We see that the pre-test scores in 300 are lower than in 301 and both 300 and 301 are lower than the capstone courses. This demonstrates how the students are making gains as they go through the sequenced courses. Students who start out as confident in their knowledge, which is common in the upper-level courses, cannot possibly have significant gains on the three-point scale. Students getting to the upper-level courses and already being very confident in their knowledge is a great outcome. In future semesters we will try two additional ways of measuring information literacy gains: focus groups, where students can have an open discussion of what they learned; and lower-stakes ungraded assignments that still get at the information we are trying to measure. It may be that students did better on the knowledge survey questions since those were not graded as right or wrong; they got credit just by completing the post-test. Students may feel pressured to have the "right" answer as a result of being socialized to be afraid of giving the wrong answer and/or to want to increase the probability of a high score on the assignment, which explains some of our findings.

Limitations

Due to the COVID-19 global pandemic, the students were not able to work as closely with our community partner as we had hoped. This may have limited the value that they could have gotten from this work. Stress related to the pandemic could have also inhibited students' ability to engage with the dimensions of information literacy, as suggested in Mabee & Fancher (2020). In addition, because of COVID, some of the classes were delivered in an online asynchronous format, in which there was less room for conversations that reinforced learning because everything was prepared in advance.

Additionally, in the knowledge survey questions for the pre- and post-test, we asked only how comfortable students were answering these questions, not if they actually knew the correct answer. We can see that this might have caused an issue with measurement because students may already have been confident, so their gains may not have shown up as significant even if they learned additional important information. In addition, the scale ranged from 1=not at all confident, 2=somewhat confident, to 3=very confident. Students may have preferred "confident" as an answer. However, we based the scale on Nilson (2013) (although we did not include the "not sure" response), on whose work we modeled this assignment. Students may also have overestimated their skill level, selecting that they were very confident when in fact their knowledge may have been more limited, especially among poor performing students (Bell & Volckmann, 2011; Miller & Geraci, 2011).

Conclusions

Community-engaged learning is a valuable way to teach information literacy dispositions and is a strategy that can be used in a wide range of disciplines. Whenever students are able to go out into the field and engage in the community, no matter the discipline, this engagement can strengthen understanding of information literacy.

It is important to remember here that the terminology that we use to talk about these experiences can be siloing. By referring to the work we are doing as community-engaged research, we may not be addressing similar experiences referred to as service learning. Future work should explore definitions of key concepts to ensure all disciplinary perspectives are included. In our case, the applied learning experience enabled our students to achieve two out of the three goals we set. The lack of achievement of the third goal (help students to understand that traditional academic sources are not always authoritative) has led us to conclude that a big challenge is de-socializing knowledge. We would need to re-socialize students around a new way of thinking about information literacy. This is a big ask so it is unsurprising that we didn't accomplish all three of our goals in our pilot attempt. Since this work is part of a larger project

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that involves scaffolding learning, we hope that the information literacy values and mindsets with we have engaged students will take root later in their college careers and contribute to their lifelong learning.

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