Honors Students and Thesis Research: A Study of Information Literacy Practices and Self-Efficacy at the End of Students' Undergraduate Careers

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This study explored the information literacy practices of undergraduate students conducting research for their Honors theses in their final year of study. Data was collected from 11 Honors students during several months through four rounds of open-ended, journal-style questionnaires and two rounds of interviews. Honors students' sense of confidence varied throughout the thesis process, and several practices were identified that influenced students' sense of self-efficacy. This study suggests that instruction librarians can help to increase students' self-efficacy by modeling advanced research strategies, designing opportunities for students to practice challenging research tasks that build on previous skills, and addressing the affective and self-regulatory aspects of conducting higher-level research.

Introduction

What types of challenges do undergraduate students face with executing complex research tasks at the end of their college careers? How do their views of their own abilities affect the successful completion of those tasks and what research practices affect these views? One group that can provide insights into these questions are Honors students who are completing their final thesis projects. The Honors thesis project represents the most challenging research project that many undergraduate students will undertake. Students complete these projects in their final year of study, demonstrating their mastery of advanced research, writing, analysis, and critical thinking skills. Honors thesis projects therefore provide an excellent subject for the study of information literacy (IL) at the end of a student's undergraduate experience.

Librarians are committed to teaching students the skills and concepts needed for good information seeking and for the critical analysis and use of information. However, students must also believe that they are capable of successfully performing IL tasks to the level required; that is, they must have a sense of their own efficacy. A concept that was first introduced by Albert Bandura,[1] self-efficacy describes belief in one's ability to execute certain tasks to achieve certain outcomes. Self-efficacy has received recent attention in the library literature,[2] as librarians increasingly rec-

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ognize the role that different factors play in the development of good researchers. Self-efficacy theory provides a useful framework for understanding the Honors thesis-writing process because it encompasses multiple components that can help to explain why some students persist in the face of difficulties and others do not. Students' self-efficacy relates not only to their ability to successfully act upon their IL skills but also to other factors such as motivation, self-regulation, positive attitude, and other affective components of the information search process.

While self-efficacy has been the subject of several research studies, few of these have used qualitative methods to investigate students' perceptions about their self-efficacy in executing IL tasks. This study sought to fill this gap by using questionnaires and interviews with high-performing students to understand their perceptions of conducting their thesis projects. Data was collected from Honors students over the course of several months as they moved through the various stages of their projects to understand how their feelings and attitudes changed in response to various challenges. Most important, this study sought to determine what IL and research practices were used by high-performing students to complete their culminating research projects and how these practices related to their self-efficacy.

Literature Review

Bandura introduced the notion of self-efficacy as part of his social cognitive theory of learning, which described learning in relation to the social environment, the learner's internal state, and the learner's behavior.[3] As a description of one's belief in one's ability, self-efficacy relates to how much effort a student puts forth to complete a particular task and how much they persevere when faced with difficulties. A student's level of self-efficacy with respect to a particular skill or discipline will also have an impact on their decisions to take on future challenging tasks or avoid them completely. Self-efficacy also closely relates to how a student understands and manages their emotional reactions to tasks, how they manage their stress levels, and how they employ self-regulatory strategies when tasks prove to be difficult. A student with higher self-efficacy is more likely to use good time management, change their strategies when faced with obstacles, and learn from past mistakes.[4] However, because it describes a learner's *beliefs*, self-efficacy may not always correspond with an accurate representation of a learner's ability.[5]

A student's self-efficacy may be influenced by four main sources, which provide varying levels of impact:

- Mastery experiences consist of performance accomplishments; that is, the successful completion of similar tasks in the past. When students repeatedly and successfully accomplish certain tasks, they will have a stronger sense of self-efficacy about performing similar tasks in the future.
- Vicarious experiences occur when individuals observe others performing similar tasks. Students' self-efficacy may be strengthened after observing the modeling behaviors of teachers, librarians, and peers.
- Verbal persuasions are the messages students receive from others about their abilities to accomplish certain tasks. Verbal persuasions often come in the form of messages of encouragement, although they can be either positive or negative and can serve to either strengthen or weaken a student's self-efficacy.
- Physiological and emotional states include factors such as reactions to stress and anxiety. While positive emotions and moods may strengthen self-efficacy, negative emotions and moods may weaken it.[6]

Studies of IL self-efficacy have frequently used measurement scales, many of which are based, at least in part, on the Association of College and Research Libraries' (ACRL) *Information Literacy Competency Standards for Higher Education*.[7] These scales assess students on different components of IL self-efficacy (such as using Boolean search operators or searching for article citations). One of the most commonly used scales was created by S. Serap Kurbanoglu, Buket Akkoyunlu, and Aysun Umay to help educators identify and respond to learners with low IL self-efficacy[8] and has since been adapted and used by other researchers for use with different groups.[9]

Students' IL self-efficacy may increase through exposure to some of the sources of self-efficacy described by Bandura. Mastery experiences are thought to be the most influential source of self-efficacy,[10] but they are most effective when they are tied to challenging tasks that allow students to learn critical skills. Consistent opportunities to gain hands-on practice with using information resources for academic assignments helps to strengthen self-efficacy.[11] Tasks also need to be structured to help students achieve a pattern of perceived success. Tasks should be moderately challenging, build on previous tasks and acquired skills, and enable students to make progress toward achieving more difficult tasks, which helps to build confidence. Instructors can also strengthen students' self-efficacy by creating vicarious experiences through modeling desired tasks and skills and exposing students to peer models.[12] Verbal messages of reinforcement and encouragement can also be used.[13] Finally, students' emotional states are also critical. Students who possess an intrinsic motivation to know—that is, they feel joy in learning—have higher levels of IL self-efficacy.[14] In addition, students with higher IL self-efficacy may also experience fewer negative emotions and have more attitudes that are more positive.[15]

Several studies have shown that IL instruction helps to increase students' self-efficacy.[16] Wen-Hua Ren suggested that library instruction may be effective in strengthening students' self-efficacy when it incorporates hands-on practice, which provides students with mastery experiences.[17] Shelda Debowski, Robert E. Wood, and Albert Bandura found that online search instruction combined with guided exploration exercises, in which a librarian guided students through search activities and modeled responses to problems, strengthened self-efficacy.[18] In fact, in some studies it can be difficult to untangle whether increases in students' self-efficacy actually come from the instruction itself, the mastery experiences students had when completing their research assignments, or both.[19] Lorne D. Booker, Brian Detlor, and Alexander Serenko suggested that, although IL instruction contributes to boosting students' initial self-efficacy, continued mastery experiences after initial instruction may play an even stronger role in strengthening self-efficacy.[20]

While some links between IL self-efficacy and performance have been found, the connection between these is sometimes difficult to interpret. Some studies have found that students with higher levels of self-efficacy demonstrated better and more sophisticated information search and library skills.[21] However, other studies have found that students often feel overconfident, even if their skills do not warrant it.[22] Melissa Gross and Don Latham[23] studied students with proficient and below-proficient IL skills and found that not only did both groups feel confident about their abilities, but students who self-identified as average at IL tasks performed better than those who self-identified as better than average. Another study found that students' performance of information-seeking skills did not correlate with a self-efficacy pretest.[24]

Not only is there an unclear connection between levels of IL self-efficacy and performance, but students' self-efficacy may not necessarily rise steadily over time with increased experience. Kurbanoglu found that university students' self-efficacy regarding their information and computer literacy skills did not change substantially from the first to the fourth year of study.[25] Peter Stokes and Christine Urquhart found that nursing students' self-efficacy as it related to information skills peaked in the middle of their program but declined toward the end.[26]

Many questions remain about IL self-efficacy, including an explanation of the factors that contribute to it and the ways that instructional strategies can be used to increase it. Melissa Clark's review of this topic notes that while many IL self-efficacy measurements exist, some are less reliable and most are based on the aforementioned *Competency Standards*, which are no longer in use by the ACRL.[27] While quantitative methods have been commonly used, mixed and qualitative methods have been used less frequently but are more appropriate for understanding causal mechanisms regarding self-efficacy's relationship to instruction, motivation, affect, and other factors. Thus, in this study qualitative methods were used to study Honors students over the course of several months to better understand their feelings and attitudes about their use of information and research strategies. In doing so, the following research questions were explored:

- What IL and research practices do Honors students use to complete their thesis projects?
- How do these practices relate to their self-efficacy?

Through a better understanding of the challenges faced by Honors students and the research practices they used, librarians and others can design IL instruction in such a way as to help strengthen students' self-efficacy in executing difficult research projects.

Methods

This work is part of a larger project that examined undergraduate students' perceptions of self-efficacy when writing a senior thesis; the information reported in this article focuses on the IL and research aspects of their experiences. This study was approved by the institution's ethics review board.

This research was conducted at a public university of approximately 21,500 students. The university's Honors Program serves approximately 450 students and requires that they take designated Honors courses, maintain a high grade point average, participate in experiential learning opportunities, and complete a scholarly or creative thesis or project during their senior year. Honors students generally have two semesters in which to research and write their theses; many elect to take a one-credit course in discovering secondary research, which is taught by librarians. During the first semester, students are expected to select a topic and advisor, complete a research prospectus, and submit an application to the institutional review board, if appropriate. The second semester culminates with the submission of the final manuscript and either an oral defense of the work before a committee or participation in a poster session at an institutional gathering.

Honors students were recruited in November of 2018 through an email message that was sent by the director of the Honors Program. Students who were interested in participating were asked to fill out a form, and participants were selected who represented a variety of majors. Initial meetings were held with participants in late November or early December to explain the project and receive their written consent. Compensation for participation was offered in the form of gift cards.

Each of the four researchers on the project was responsible for working with two to three students. This included the initial meeting with each student, sending email requests and reminders to the students to complete the four questionnaires, and conducting the first and second interviews. All interviews were conducted in group study rooms in the main campus library and were audio recorded.

Participants consisted of 11 Honors students out of a total of 78 who were completing their theses in the spring semester of 2019. They came from a variety of majors: biology, chemistry, economics, English literature, journalism, linguistics, management, mathematics, molecular microbiology and immunology, philosophy, and Spanish. Eight of the participants were female; three were male. Participants ranged in age from 20 to 22.

Data was collected through two methods, which were administered to the same 11 students. The two methods were designed to be complementary in capturing students' thoughts and feelings, as well as any changes that they were experiencing, over a five-month period. The first method consisted of four online questionnaires created using Qualtrics software. Questionnaires were distributed several weeks apart beginning in late November of 2018 and concluding in April of 2019. The researchers developed the questionnaire from scratch and pilot-tested it with four library student workers. The questionnaire consisted of a combination of both closed- and open-ended questions. The closed-ended questions asked students to rate themselves on various aspects of the thesis-writing process, including their level of organization, their interest in their topics, and their confidence in their ability to find good information sources. The open-ended questions were designed as a series of reflection prompts with the intention of gathering data in a manner akin to guided journaling. These questions asked students to share what actions they had recently taken on their thesis, what challenges they had encountered, what aspects of the process had been the easiest, and what their plans were for moving forward in the next few weeks. Each questionnaire was expected to take students about 30–45 minutes to complete, and some of the responses from the questionnaires were used as discussion prompts during the interviews. The complete questionnaire is provided in appendix A.

The second method consisted of two interviews, each lasting about an hour in length. The first interviews were conducted in late January/early February 2019 when students were in the midst of conducting research and writing parts of their theses; at this point all 11 students had completed the first questionnaire. The IL-related questions that were asked during the first interview concerned the students' topics, their past research experiences, their process for finding secondary research, and their process for organizing their sources. During the first interview, students were also asked to demonstrate how they found sources for their theses, using a laptop in which the screen and their voices were recorded. The second interviews were conducted in April when students were almost finished with their projects and had completed the second, third, and fourth questionnaires. The IL-related questions that were asked during the second interview concerned the challenges they encountered during the project, their level of confidence with finding information sources, the sources they found to be most helpful, what they might have changed about their process of finding sources, and their methods of staying organized. Students were also asked to write an outline of the various parts of their theses and explain each part. The complete interview questions are provided in appendices B and C.

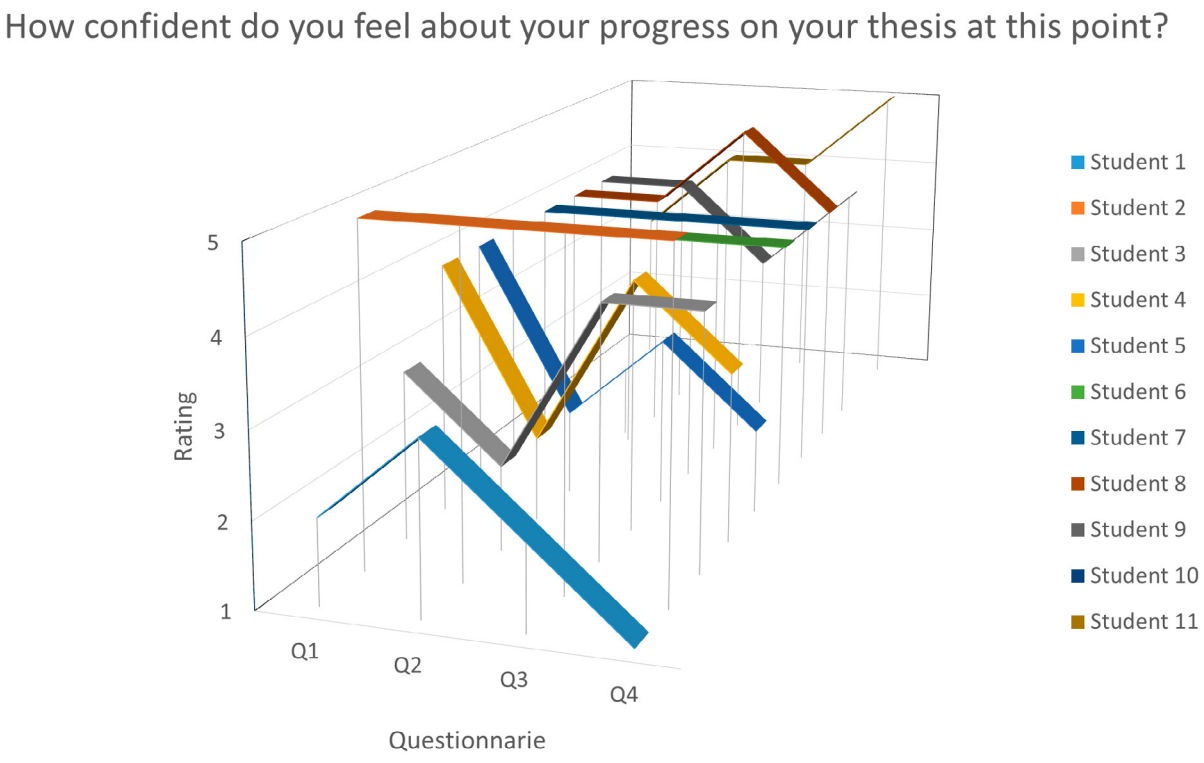
After all interviews and questionnaires had been completed, the interviews were transcribed and all questionnaires were exported from Qualtrics as Word documents. Graphs

were created to represent the results of the closed-ended questions to show how students' feelings and levels of confidence varied over the course of the project as represented in the four questionnaires. To facilitate the analysis of the video screencasts, each video was analyzed in relation to six questions that described the students' search process.

To code the data, an initial coding scheme was developed that was based on a close reading of the data as well as information from prior literature. It soon became clear that certain research practices used by students appeared to increase their self-efficacy, while other practices appeared to decrease it. Sometimes students directly voiced their feelings of confidence about certain practices, while at other times the researchers concluded that these practices affected students' self-efficacy on the basis of a careful analysis of the language they used. The coding scheme was tested independently on sample data; areas of overlap and difference were discussed and the coding scheme was refined. After finalizing the coding scheme, the comments feature in Word was used to code all documents, and all coded material was copied into a master coding Excel spreadsheet to allow for data sorting. Upon completion of the coding, narratives were written to summarize each of the major practices, and narratives were adjusted, divided, or combined as the material necessitated. The practices that emerged from the data analysis are presented below with quotations from both the interviews and questionnaires.

Finally, it should be noted that this method has some limitations. The types of projects described here required Honors students to conduct original research and present their find-

FIGURE 1
Students' Confidence on Their Thesis Progress, as Shown in the Four Questionnaires



Rating Scale: 1 (very unconfident; I'm a bit worried about being able to complete it), 2 (somewhat unconfident; I have a few doubts but hope I can pull it off), 3 (neither confident nor unconfident), 4 (somewhat confident; OK, not bad), 5 (very confident; I'm sure it will all go well)

FIGURE 2
Students' Confidence with Finding Good Information Sources, as Shown in the Four Questionnaires

Rating Scale: 1 (very unconfident; I have no idea where to look), 2 (somewhat unconfident; I think I can find some sources but not everything I need), 3 (neither confident nor unconfident), 4 (somewhat confident; I can find some good information sources), 5 (very confident; I have no problem finding the information sources I need)

ings in a manner consistent with professional, disciplinary expectations; thus, the findings of this study may be most applicable for high-performing students at institutions with similar requirements. Furthermore, it must be noted that participants self-selected into this study; they may have been more confident in their abilities than other students and thus more willing to talk about their experiences.

Results

Students' confidence about their progress on their theses varied considerably over the course of the project, as measured through the four questionnaires (see figure 1). Only three students maintained the same somewhat or very confident levels throughout the entire time.

Students' confidence levels with finding good information sources throughout the project also varied, but in three main ways (see figure 2). First, many students' levels of confidence fluctuated from one questionnaire to the next but generally ranged from "neither confident nor unconfident" to "very confident." Second, a few students rated themselves as very confident throughout the entire process with no variations. Third, two students experienced a drop from an initial high confidence level and did not regain the same level of confidence. A number of situations contributed to variations in confidence levels, such as frustration with finding specific sources and comparison with graduate students in labs who could find bet-

ter information faster. Although these levels varied, students' overall confidence in finding sources remained neutral to high throughout the project, but they rarely felt unconfident.

Analysis of the data revealed that students used seven main practices that increased their self-efficacy: having a passion for the research project, using familiar search tools, using proven strategies for selecting reliable sources, identifying and using key sources, searching for cited works, having an organizational plan, and using strategies for reading effectively.

Having a Passion for the Research Project

Most students were passionate about their theses, which contributed to their feelings of confidence. Some had an enduring interest in their topic, while others were deeply engaged by the research process itself. For example, Student 5 said, "I really love my topic," while Student 8 said, "I love the research aspect of it." Students described their thesis as "fun," "cool," "interesting," "exciting," and "important," and the experience impacted students' postgraduation plans.

Some students described a deep, personal connection to their research. It reaffirmed their commitment to their major and gave them a sense of purpose. For example, Student 2 said, "It just makes me feel like I'm in the right field." Some students described a passion for "giving back" through their research. For example, Student 5 said, "It's really affirming to me to know what I'm doing could positively impact, down the road, someone." For these students, it was important that their research had real-world relevance.

Designing and carrying out an original research project was meaningful for many students. For some, ownership of their research was important. For example, Student 8 said, "Being able to design the project myself and seeing what doing research is really like was really important for me." Others, like Student 10, were excited to be on "the cutting edge" of their field: "Nobody really knows what's gonna happen. We're just sort of taking it day by day and learning new things. It is interesting that I'm kind of learning with everyone else in the lab."

Although they had an enduring interest in the work, some students acknowledged fatigue with their thesis topic over time. For example, Student 5 said, "I'm looking forward to getting it over with! I still really enjoy my topic and would like to continue research on it into grad school, but right now I know I've spent so much time on it that I need to take a break." Rather than communicating a lack of interest in research, these students described an eagerness to complete their current project and move on to future research endeavors.

Using Familiar Search Tools

Students were confident in their ability to choose the right search tools for their research. While they were at times uncertain about *how* they searched, they did not express doubts about knowing *where* to search. Whether their tools of choice were research databases, journal websites, Google, Google Scholar, or a combination of the aforementioned tools, they seemed to have established, go-to search tools.

Participants gravitated toward familiar tools to search for secondary sources. Many talked about using Google because it was easy; Student 10 commented that "I don't actually really know how to use Google Scholar," as even Google Scholar was different enough from Google that they had not explored it. Several participants described learning about OneSearch (the library's discovery tool), Google Scholar, or library databases in library or research instruction sessions in previous classes, and subsequently using those tools for all their research going forward.

Participants often recognized the limits of free, easy-to-use tools, employing them when they needed more general information or inspiration but turning to library databases to locate specific content they needed and to find scholarly sources. Many could articulate clearly and confidently why they chose a certain tool for a particular task. Student 5 explained, "I tend to start in OneSearch because that has the best search algorithm for scholarly articles." Student 1 talked about using YouTube or Wikipedia when "I need inspiration or if I'm slowing down." Most participants were aware of specialized databases in their fields, but they would use them in combination with the library's discovery tool or Google. They mentioned using the *MLA International Bibliography*, *Ethnologue, PubMed, PsycINFO, PsycTESTS*, and *EconLit*. They learned of these databases in different ways—from advisors, coworkers in labs, library instruction classes, and independent exploration. Student 4 turned often to *JSTOR* to search for articles since "it was one of the first databases that I used in high school."

Using Proven Strategies for Selecting Reliable Sources

Many participants discussed the challenge of picking relevant and reputable sources. To manage this, they used strategies that they had learned from advisors or in previous research situations, which made them feel confident that they were selecting good sources to include in their theses. These included proven strategies for quickly identifying reputable sources, such as selecting sources associated with known publishers, associations, or journals; selecting peer-reviewed sources; selecting recent sources; selecting sources by well-known researchers; and selecting sources that had been highly cited. Student 7 described how they learned about an important association by looking it up online after seeing it on their advisor's mousepad. They described their reaction after searching for sources produced by this association: "Wow, look at all of this research. Oh my God, this is great." Student 9 explained that "whenever I find my sources, I feel most confident about the ones that are academically vetted." As students became more familiar with key authors and sources, they gained confidence with determining other sources that were good to use. Student 5 explained, "This field is very small, so I know names of researchers who[m] I should look for."

Identifying and Using Key Sources

Many participants identified key sources that were critical for their thesis research and helped them to feel confident about their secondary research. These key sources were often textbooks, dissertations, books, or articles; they may have been sources about methods, sources about theories, sources by specific authors or publishers, or seminal sources. Student 11 described how they used a key source for methodological guidance: "This source is very valuable because it looks at a data set that is similar in several ways to mine." Student 5 described the importance of a work from a key author, "He's written a ton, and all of his work is really helpful and useful." A few students described how they repeatedly turned to these key sources throughout the course of their projects. For example, Student 3 described how they "had read that [key source] over and over again." Once they identified key works or key authors, participants often used these to mine for other article or book citations.

All participants received sources from their advisors, which they identified as essential in helping them move forward with their research. Students described being helped by guidance from their advisors toward specific articles or books, or specific authors who were important in the field. Student 11's advisor "pointed out …specific textbooks that were sort of iconic in

the field and really the standard." Some participants' advisors lent them copies of books from their personal libraries. Others described how their advisors gave them suggestions not only about what sources to use but also about how to use them or how to incorporate them into their theses. Receiving source suggestions from their advisors often helped students overcome difficulties with searching. For example, Student 4 described how their advisor "pointed me in the right direction when I was feeling lost about finding sources." Once oriented toward those key sources, participants expressed more confidence in finding secondary research.

Searching for Cited Works

Most students described how the use of citation searching increased their confidence with finding secondary research. Once they found useful sources, they typically searched for references listed in those sources in research databases or the library's discovery tool. For example, Student 8 praised all of the "cool stuff" found as a result of citation searching, and Student 1 described it as the "easiest part" of finding sources because it was "extremely helpful in saving time and effort searching for content." Several participants described how they found many or even most of their sources using this strategy. Student 5 stated, "After I have my initial sources, 80% of my additional sources come from citation mining the articles I already have."

In addition to aiding them in the process of finding literature, citation searching offered other benefits as well. A few students described tracing citations forward not only to find more sources but also to help them gauge the importance of sources or to identify seminal authors. Citation searching helped Student 10 better understand the scholarly conversation occurring in the literature: "Because then you already hear a discussion about it and then you can read the paper and you're like, 'OK, I kind of know what's going on a little more.'" Student 7 initially struggled to know when their literature review was completed, but through citation searching they began to apprehend that the researchers whose work they were reading were citing each other. This made Student 7 feel confident that they had done a thorough job of finding sources.

Having an Organizational Plan

Having a good plan for organizing and taking notes from source material seemed to increase students' sense of self-efficacy. Most students recognized the importance of having some kind of organizational system, describing ways that it was important to their writing process. They organized their notes, quotations, and sources into online folders, spreadsheets, and physical piles of PDFs with annotations. Some learned the importance of organization as they went along. For example, Student 1 understood that not having a method earlier "wasted a good chunk of time," while Student 9 stated that not remembering where a source came from could be a "big problem."

Participants had different organizational plans for keeping track of their sources, many of which they had developed on their own. Many students used cloud storage such as Dropbox and Google Drive to save PDFs of research articles. A few students used citation management software (like Mendeley) to organize their sources. When taking notes in documents, many students listed citations near copied paragraphs or paraphrased notes to easily refer back to and cite a work.

Students appeared to feel more confident with writing when they had a clear method of note-taking. Students used print notebooks or Word documents to keep track of notes and

quotes from source material. Many described using different methods of outlining ideas, taking notes, and/or highlighting source material that helped to facilitate their writing processes. Often these systems were unique to them, developed through trial and error to accommodate their own individual writing styles. Having set systems for note-taking and organization helped not only to facilitate their writing but to clarify their thinking. For example, Student 5 explained, "I try really hard to keep an organized system of files…. Because if I lose it and I can't find it easily, it really screws up my ability to think about it. If my files aren't organized, it's really hard for me to organize my thoughts."

Using Strategies for Reading Effectively

Participants devised reading strategies that helped them gain control of the difficult process of digesting large chunks of information. A few students recognized the need for prioritizing what they "would read and how in depth" they would read it. When discussing a certain work, Student 2 commented, "If I had dedicated all of my time to actually understanding the full grasp of that entire work that would have been a thesis in itself." Recognizing this led them to target specific readings to understand particular concepts relevant to their research, rather than trying to comprehend all of the author's ideas. Student 4 learned that they did not need to read a book in its entirety and that they could skim specific sections of online books by using the Ctrl + F feature.

Participants took different approaches to reading individual articles. Many students began by reading the abstract. While some participants then read the entire article, others only read specific sections. Some read the introduction next while others read the conclusion. Most of the participants mentioned reading the methods section eventually, but others ignored it.

While the seven practices described above helped to increase students' self-efficacy, students also commonly used three practices that appeared to decrease their self-efficacy: not using the best keywords for searching, missing critical sources, and not understanding expectations for different sections of the thesis.

Not Using the Best Keywords for Searching

All participants used keywords to find sources for their literature review and many recognized this as a key search strategy. Some participants had no trouble using discipline-specific vocabulary "to zero in on exactly" what they needed. They developed more keywords by using articles they already found to "collect all of the main jargon" they needed. Student 6 explained, "I've gotten really good at just finding the keywords and not the anti-keywords." Often, these students were able to identify "specific subtopics" that were fruitful for their research.

Although the use of keywords while searching was helpful for most participants, some had problems with identifying effective keywords; this made them feel uncertain about their ability to find good sources. Finding an appropriate balance between a narrow, focused search and a broad, "big picture" search was a challenge for many students. Some students struggled with finding specific keywords and felt the keywords they selected were "obviously too ambiguous" to find relevant articles. Student 7 described that sometimes their search terms "would not give me anything that I wanted, and it was just a dead end." Students described issues such as using too many keywords or following hyperlinked key terms down a trail of irrelevant results. Most students seemed unaware of controlled subject terms or did not

know how to use them. Student 5 wished they had placed "a higher priority on figuring out how to use subject words."

Missing Critical Sources

Most participants expressed the belief that they had missed critical sources in their literature review search, which led to their feeling a lack of confidence in their research skills. A common problem was being unable to find sources that treated their exact topic or method. Some students believed that their topics were too "new," "niche," or "specific" to enable them to find sources that were directly relevant. Participants also described problems with tracking down sources that were critical to their research, such as older sources, sources cited in other works, or sources by specific authors. Student 5 lamented, "I never, ever, ever found the original study …I don't know why this is hard." Missing critical sources was often described as "a huge frustration."

Some students attributed their failure to recognize which sources were most important to a lack of experience. Student 6 explained, "My grad student [in the lab] pretty much showed me how fast he could find better sources…. He just had a better eye for it." Student 3 described not knowing what sources were most important and relying on their advisor: "I would pick smaller theorists and their works, and I'd be like, 'Oh, this is super relevant,' but he'd be like, 'No, focus more on really well-known theorists.'"

A few students could find the sources they needed but could not access them. These students described "gleaning information from the internet" about a source or "working around" it. They seemed unaware that interlibrary lending services would allow them to access these materials and even described paying for some resources themselves.

Not Understanding Expectations for Different Sections of the Thesis

Participants often struggled with understanding the different sections of the thesis and their purposes (examples: literature review, methods, results). Many students also struggled to grasp the content and formatting expectations for each section (such as where to discuss statistical analyses or when to use footnotes) as well as the order of the sections. For a section such as the literature review, some students did not understand what kinds of sources were appropriate to include, when they were done finding sources, and how to synthesize sources. For other sections, students grappled with understanding what content should be included or excluded, or knowing when to provide more detail or focus on the "big picture." Several explained that they were unsure about the length or depth that was required in each section and described feeling the need to "beef up" or "put all this fluff in" to make those sections seem substantial enough. When students did have a clear understanding of the expectations for each section, they found that the writing process was easier.

Discussion

Honors students articulated several research practices that strengthened or weakened their self-efficacy when completing their thesis projects. At the beginning of their projects, the majority of students were confident they could find good information sources, but their confidence shifted throughout the process. Students often held themselves to the high standards demanded by their advisors and program but then experienced stress when trying to meet those standards (Bandura's physiological and emotional states). Inexperience with independent

research projects and uncertainty about their skills once they got deeper into research and writing caused students' initially high confidence levels to dip. Conducting a literature review tested students' confidence as they felt that gathering sources was a never-ending process or that their research topic was too new, making it impossible to find enough published sources. While these factors contributed to varying confidence levels, most students consistently rated themselves between neutral or highly confident in finding good information sources. Students felt that they had good research preparation from previous classes (mastery experiences), which contributed to their feelings of confidence.

One area in which students' overconfidence may have served as a barrier was the selection of search tools. Students were fairly confident in their choice of search tools to find relevant sources for their research. They gravitated toward tools with which they were familiar, either from prior experience doing research (mastery experiences) or from instruction from professors or librarians (vicarious and mastery experiences). When they were searching for known items (particular authors, articles, or books), this strategy seemed to work well. Yet when they ventured into searching more broadly to identify content and choosing their own keywords, they expressed some uncertainty and frustration and worried that they might be missing important works. When they had difficulties, they generally assumed that the problem lay in *how* they were searching, not in *where* they were searching. They did not seem to consider whether they could or should be using different search tools. Initial overconfidence in selecting tools for research thus may have contributed to drops in confidence levels as students moved through the thesis process.

When students described certain IL skills that they used in their thesis research, they were sometimes able to articulate how they had learned these skills, such as through a previous class, an advisor, a librarian, or having figured it out on their own. While it was difficult for students to precisely pinpoint the sources of their research practices, all four of the sources of self-efficacy articulated by Bandura likely played a role. Students' practice of using familiar search tools was clearly developed through previous mastery experiences. Their strategies for selecting reliable sources may have been learned through the vicarious experiences of seeing others use these strategies either in instructional situations, in lab or research settings, or through interactions with peers. In this study, verbal persuasions appeared to have played a lesser role in students' development of IL self-efficacy, but their understanding and use of key sources, many of which they received through recommendations from their advisors, suggests that their advisors provided verbal encouragement to use certain types of information search strategies. Students' passion for their projects ensured that their emotional states helped them to maintain positive attitudes toward their research, even when they encountered challenges.

The results of this study have implications for library instruction. While library instruction was not the focus of this study, many students described learning research skills from librarians during classes or consultations. In a variety of instructional settings, librarians are well-positioned to help increase students' self-efficacy through vicarious and mastery experiences by modeling effective search strategies and providing opportunities for active learning.[28] In particular, librarians can directly address research practices that decrease self-efficacy, especially regarding keywords, critical sources, and the structure of scholarly works. Demonstrations and activities that focus on identifying effective search terms, including both keywords and subject terms, can help students develop focused searches. Active exploration of key disciplinary databases can help students gain familiarity with a variety of search tools

to expand their searches and catch critical sources. Activities that analyze the structure of a research article can help students recognize the conventions of scholarly writing in their field. Librarians can also reinforce research practices that increase self-efficacy, such as developing organizational systems or practicing citation chaining from key sources. In addition, during instructional situations, librarians can recognize the powerful role that verbal persuasion and emotional states play in developing self-efficacy and let students know when they are doing well so they will continue to use effective practices. In both classroom instruction and one-on-one consultations, librarians can recognize the importance of students' emotional states by encouraging them to select topics that hold personal interest for them or by helping them understand ways that they can handle the negative feelings that arise when they encounter research challenges.

The practices that Honors students articulated in this study reinforce the importance of mastering discrete IL skills, such as using search tools, using strategies for selecting reliable sources, developing appropriate keywords, and using effective organizational strategies. Perhaps even more important, the experiences of these participants emphasize that students must grasp larger IL concepts and internalize certain dispositions to be able to confidently and effectively complete a research project of this scope. These are captured by the conceptual approach to IL that is described in ACRL's *Framework for Information Literacy for Higher Education*.[29] In fact, in this study, many of the challenges students faced and the practices they enacted map directly to some of the ACRL threshold concepts. For example, participants' struggles to understand the different parts of their theses suggest that they were having trouble grasping the concept that people within certain communities have expectations and conventions for communicating effectively, which links to the frame of Information Creation as a Process. Their passion for their research projects suggests that they were driven by intellectual curiosity that helped them to be persistent in the face of difficulties, which links to Research as Inquiry. Participants' use of key sources, their use of cited sources, and their frustration with missing critical sources suggests that they were learning that scholarship is about communicating with others, which involves "listening" to key voices and following the scholarly "conversation," which link to Authority Is Constructed and Contextual, and Scholarship as Conversation.

Thus, this research suggests that possessing a conceptual understanding of IL, as described by the *Framework's* threshold concepts, may help to strengthen self-efficacy. In addition, previous research in IL self-efficacy is largely based upon the ACRL *Information Literacy Competency Standards*, and the profession is moving away from this model.[30] The research described here may provide a basis for further studies of IL self-efficacy that are grounded in the *Framework*.

Conclusion

Undergraduate students benefit from a strong belief in their own abilities when they undertake an Honors thesis research project; greater self-efficacy contributes to a more positive and manageable research experience. This study found that high-performing students' levels of confidence varied throughout the project as they faced numerous research challenges. Despite these difficulties, students' use of several IL practices strengthened their belief in their ability to complete their theses: having a passion for their research projects, using familiar search tools, using proven strategies for selecting reliable sources, identifying and using key sources, searching for cited works, having an organizational plan, and using strategies for

reading effectively. Practices that decreased their sense of self-efficacy included not using the best keywords for searching, missing critical sources, and not understanding expectations for different sections of the thesis.

These practices not only relate to basic IL competencies; they also show the importance of understanding higher-level information concepts and demonstrating positive dispositions toward research projects that promote engagement and tenacity. Librarians and others involved in supporting undergraduate research projects can model effective research practices, incorporate hands-on activities in instruction, address the affective dimensions of research, and provide verbal encouragement to increase students' self-efficacy in conducting research.

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APPENDIX A. Questionnaire

Please answer each of the questions below to the best of your ability, thinking about your most recent work on your thesis project. We hope that you will provide detailed responses to these questions so that we can get a thorough understanding of your work on your thesis over the last few weeks.

We expect that this questionnaire will take between 30 and 45 minutes to complete. If you start it and need to return to complete it later, your answers will be saved.

1. What is your thesis topic?
2. Describe the most recent work that you have done on your thesis (examples: research, writing, meeting with an advisor, and the like).
3. Please provide enough details to give a thorough picture of the type of work you've been doing. For example, if you did research, did you use print books, online materials, or a particular database? If you collected data, how did you go about doing it (examples: conducted interviews, did lab work)? If you met with your advisor, what did you discuss? If you wrote part of your thesis, which part did you work on?
4. What external sources have you used for your thesis over the past few weeks? Please be as specific as possible. For example, did you use books, articles, websites, databases? Did you speak with experts? Please give details. For example, if you used web sources, please provide the title of the source and URL.
5. How organized do you feel about your progress on your thesis at this point?
   - Very disorganized; I don't know how to get on top of this
   - Somewhat disorganized, but not drowning
   - Neither disorganized nor organized
   - Somewhat organized, but could be better
   - Very organized; I'm on top of this
6. How confident do you feel about your progress on your thesis at this point?
   - Very unconfident; I'm a bit worried about being able to complete it
   - Somewhat unconfident; I have a few doubts but hope I can pull it off
   - Neither confident nor unconfident
   - Somewhat confident; feeling OK, not bad
   - Very confident; I'm sure it will all go well
7. How interested do you feel in your thesis at this point?
   - Totally uninterested; I would rather do anything else than work on my thesis project
   - Somewhat uninterested; my topic is not the most exciting thing in the world
   - Neither interested nor uninterested
   - Somewhat interested; I like my topic and project plan
   - Very interested; I love working on this project
8. How confident do you feel that you can find good information sources for your thesis at this point?
   - Very unconfident; I have no idea where to look
   - Somewhat unconfident; I think I can find some sources but not everything I need
   - Neither confident nor unconfident
   - Somewhat confident; I can find some good information sources
   - Very confident; I have no problem finding the information sources that need

9. How confident do you feel that you can write the required portions of your thesis at this point?
    - Very unconfident; I'm not a good writer
    - Somewhat unconfident; I have some doubts about writing it
    - Neither confident nor unconfident
    - Somewhat confident; I feel like I should be able to write it well
    - Very confident; I'll have no problem writing a spectacular thesis
10. What has been the biggest challenge that you've encountered in working on your thesis project over the last few weeks? Please be as specific as possible.
11. What has been the easiest part of working on your thesis project over the last few weeks? Please be as specific as possible.
12. What helped you the most in the last few weeks when working on your thesis project? Please be as specific as possible.
13. What would make your work on your thesis project go more smoothly? Please be as specific as possible.

Looking forward…

14. Which parts of your thesis project will you work on in the coming weeks?
15. What are you looking forward to working on in regard to your thesis project in the next few weeks?
16. What are you worried about with your thesis project in the next few weeks?

APPENDIX B. First Interview Questions

1. In the questionnaire you indicated that your topic is ____. Please tell me more about it.
   How did you decide upon this topic?
   What have you done so far for your thesis and where are you now in the process of working on it? (for example: using outside research sources, collecting data, writing sections, and so on)
2. Please describe some of the experiences that you have had with conducting a research project in your college career up until this point. Can you give some specific examples?
   What has been the most helpful experience?
   How do you feel that previous research experiences in college have or have not prepared you for working on the Honors thesis project?
3. How do you feel that your thesis is going at this point?
   In the questionnaire you mentioned that you feel ___ confident about completing your thesis. Are you still feeling this way? And can you explain why?
   In the questionnaire you mentioned that you feel ___ interested in completing your thesis. Are you still feeling this way? And can you explain why?

OK, thank you. So now we're going to talk a little bit about your thesis advisor.

4. Can you describe your relationship with your thesis advisor. You don't need to share their name, but just tell me about the relationship you have with them.
   How did you come to select them as your advisor?
5. What kinds of feedback have you received from your thesis advisor? Can you give a specific example?
   OK, thank you. Now we're going to talk a little bit about your process for researching outside sources for your thesis.
6. What kinds of outside sources are you using for your thesis?
   Have you been able to find good sources?
   How do you determine which sources to use?
7. Can you think back to the last research that you did where you found a helpful source? Using this laptop, can you walk me through that recent search? And if it's OK, I'd like to record the screen. And could you "think aloud" as you show me how you found your sources? (Record screen capture; provide detailed prompting of where the student goes, how they search, how they select sources.)
   *(Possible prompts: Where do you **actually** start? Do you ever find sources not using the library? One of the sources you listed was ___; how did you find it?)*
8. How did you learn to find outside sources?
9. What have been the most and least challenging aspects of finding outside research sources?
10. How do you keep track of your sources?
    Please describe the process you use to read through secondary research and synthesize it in your thesis.
    Do you take notes from your sources? If so, what process do you use?
    OK, thank you. I have a few more questions about how you'll continue in the next few weeks.
11. In the questionnaire, you mentioned that ___ was challenging. Do you still feel this way? Please explain.
    When you find that a particular task is challenging, how do you go about completing it?
12. What do you plan to do next in completing your thesis?
13. Is there anything else that comes to mind about your thesis that we haven't discussed here? Do you have any questions for me?

APPENDIX C. Second Interview Questions

1. How are you feeling about your thesis project at this point? Please explain.
2. In the questionnaires you mentioned that you feel ___ confident about completing your thesis at this point. (*Possibly in addition:* Your confidence level seems to have varied/decreased/increased throughout the semester). Can you explain why you've felt this way?
   You also mentioned that you feel ___ confident about finding good information sources and about writing your thesis. *(Note whether this has varied over the semester.)* Can you explain?
3. In a recent questionnaire/last interview you mentioned that ___ has been challenging. Do you still feel this way?
   What did you do to overcome this challenge? Please explain.
4. What have you enjoyed most about conducting your thesis project?
   And least?
5. Which information research source, other than a person, did you find most helpful in preparing your thesis? It could be a book, article, or something else.
   How did you find it?
   (*If they gave a data source:* Can you tell me about the most helpful source that you used for your literature review?)
6. Has anything changed in your process of finding research sources over the course of this semester? If so, what have you learned?
7. Using this sheet of paper, can you write out an outline of the parts of your thesis?
   Can you describe the different parts of your thesis and how you approached writing each part?
   Which part did you find to be most challenging? Why?
8. Last time we talked about your relationship with your thesis advisor. Now that you're close to the end, how would you assess that relationship?
9. How would you assess the support you've received from others, such as the Honors Program, writing consultants, or your peers? In other words, have you received guidance or support from people other than your advisor?
10. Last time we talked about your method of staying organized. Has this changed at all?
11. Looking back, what has this thesis project meant to you?
    Are you happy with your effort on this project?
    What have you gotten out of this experience, or learned from it? (*If appropriate, probe about the relationship of this project to future goals.*)
    Are you glad that you did it? Why or why not?
12. What qualities in yourself do you feel were most helpful in enabling you to complete (or almost complete) this project?
13. What has helped you most during your thesis project? This could be a person, tool, website, or something else. Please describe.
    Looking back, what prior experiences do you feel were most helpful in enabling you to complete (or almost complete) this project?
14. Using this sheet of paper, could you draw something that captures this thesis project for you? It need not be anything elaborate or clever, or demonstrate any great artistic skill. But in a minute or two, could you draw a picture of whatever comes to mind about your thesis project?
    Please explain your drawing.

15. Looking back, what word or two comes to mind when you're thinking about your thesis process?

    (*If necessary:* Explain.)
16. Now that you're at the end, is there anything you would have done differently on your thesis?
17. Now that you're at the end, what advice would you give to another Honors student who is about to start working on their thesis?
18. Is there anything else that comes to mind about your thesis that we haven't discussed here?

Notes

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