Using a Scaffolding Approach to Integrate the Information Cycle into a Library Instruction Course: A Review and Small Case Study

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Librarians at a community college in New York City identified that, unassisted, undergraduate students often find it difficult to categorize the various information formats they are locating and citing, such as a newspaper article, a book, a scholarly article, a blog or wiki entry, or a reference source. Due to their untrained approach defining formats and judging information, broader perceptions go unidentified, specific cues go unnoticed, and the value of information is not acquired. This review and small case study assessed how academic libraries implement the information cycle in library instruction and investigated techniques to determine the credibility of information sources. The information cycle is a sequence of learning based upon publication type. The small case study highlights how the authors developed a scaffolding approach to integrate the information cycle into a credit-bearing library instruction course. By receiving feedback and guidance from their instructor and classmates and analyzing the media progression of a newsworthy event, students develop an understanding of information and modify their heuristic approach toward identifying, evaluating, and using information.

Keywords: authority, format differentiation, heuristics, information cycle, information literacy, scaffolding

The Framework for Information Literacy for Higher Education recognizes the importance of teaching students how to find and assess information. Adopted by the Association of College and Research Libraries in 2016, the Framework's six core concepts outline a way for librarians and other institutional partners to connect information literacy with student success initiatives by redesigning instruction sessions. One concept asserts that the authority of an information source is constructed and contextual, suggesting that the expert researcher understands the need to both determine the validity of information created by different authorities and acknowledge biases that privilege some sources over others. To acquire these skills, the novice researcher must learn to critically evaluate a source, be it a blog post or a scholarly article. The novice must learn to recognize basic indicators of authority and differentiate the various types of information formats. To

KEY POINTS:

- LIS faculty can support instructional design in the classroom and guide both teaching librarians and information professionals.
- LIS faculty can prepare students with foundational knowledge in the library classroom to assist them in examining specialized content.
- LIS faculty can employ "unClassroom" experiential learning approaches to teaching research methods.

assist the novice, librarians instruct how to examine the authority of an information source by identifying the elements that might temper its credibility (Association of College and Research Libraries, 2015, pp. 3–4).

Librarians at a community college in New York City find that students not only have problems recognizing authority of sources; they also often have difficulty differentiating the varied information formats, such as a newspaper article, a book, a scholarly article, a blog or wiki entry, or a reference source. In a study to help students distinguish between information sources, Schlesselman-Tarango and Suderman (2016) found that scholarly articles were new to some students, believing that author affiliations listed in the article meant that the authors were students (p. 64). Due to students' inexperience, and a novice approach discerning information formats, broader perceptions go unidentified, specific cues go unnoticed, and the value of information is not acquired. To that end, Schlesselman-Tarango and Suderman developed a lesson for students to distinguish between the variety of sources in the life cycle of information and to "identify sources having purpose, authority, and audience consistent with one's information needs" (p. 61). The life cycle of information, or information cycle, is a sequence of learning based upon publication type. It is the idea that "events have social and political ramifications and that different types of media have divergent ways that they approach and synthesize information about a particular event" (Hogenboom & Woods, 2006, p. 401). In this view, radio or television provides the initial report following an event. Within days or months, newspapers and popular magazines publish a more thorough report. Eventually, scholarly articles and books synthesize an event into broader constructs. The proposed outcomes of the Schlesselman-Tarango and Suderman lesson was that students not only differentiate sources but also determine the values, perspectives, and processes that shape them and also identify the purpose, authority, and audience consistent with an information need. The lesson used small-group learning and whole-class discussion to engage students in a larger discussion of the information cycle. In a reflection of their study, Schlesselman-Tarango and Suderman submitted that instructor presence and guidance during the lesson was important, especially for controversial topics with sensitive subject matter. They proposed that future research focus on how to engage students in a discussion of scholarly research and how to design assignments that engage in critical analysis using the information cycle.

Central to the purpose of this review and small case study with six students is to highlight the implementation and pedagogical advantages of the scaffolding model and its potential when associated with hands-on classroom activities as a framework to understand information sources. Holton and Clarke (2006) define scaffolding as "an act of teaching that (i) supports the immediate construction of knowledge by the learner; and (ii) provides the basis for the future independent learning of the individual" (p. 131). Can the scaffolding approach be used to guide students in a greater discussion of the value of scholarly research and the importance of evaluating information sources found on the web? How can instructors demonstrate that information changes after it is interpreted and analyzed? In a scaffolding approach to differentiate and evaluate information formats, the authors incorporated the information cycle into a for-credit library instruction course at a community college in New York City. The authors, as the course instructors, utilized the scaffolding

method and small-group learning to guide students in differentiating and evaluating information formats. The final examination of the course requires students to research an event and identify how and why information on the event changed over time. We argue that, by receiving feedback and guidance from their instructor and classmates and analyzing the media progression of a newsworthy event, students develop an understanding of information and modify their heuristic approach toward identifying, evaluating, and using information.

Literature review

This literature review first defines the cycle of information. A look at the Schlesselman-Tarango and Suderman (2016) lesson plan, and other examples of incorporating the cycle of information in classroom pedagogy, will justify the need for the present study. Second, the expansion of the cycle to include modern formats such as social media and an appraisal of techniques that help the novice evaluate information sources will substantiate how valuable the cycle of information is in course pedagogy today and how important it is for students to learn how to assess the multitude of information sources. Finally, an analysis of the scaffolding approach and a sample of how instructors use it in course pedagogy will serve as a framework for how we designed course pedagogy to integrate the information cycle into a library instruction class.

The cycle of information

There are a few unrelated principles defined as the cycle of information, also dubbed the information cycle. The SOWIPORT information cycle divides scientific information and services for researchers into three groups: actors and activities that make up the community, research outcomes in the form of publications, and discourse and communication in the form of conferences, discussion boards, and mailing lists (Stempfhuber, Schaer, & Shen, 2008, p. 124). In another definition, the information cycle encompasses the creation, production, distribution, access, and use of information rather than the different formats produced (Pasek, 2015, p. 289).

This study focuses on the information cycle as a means to frame how information changes over time. Franks (2010) suggested that the information cycle acts as a grand narrative of how we receive news and facts. Furthermore, "the information cycle has traditionally framed information creation as passive, natural, predetermined, and apolitical" (Schlesselman-Tarango & Suderman, 2016, p. 59). In this interpretation, the cycle is a tool to provide an unbiased frame of how information is created and how we obtain it. There are five stages in the information cycle. First, the day an event happens, the public hears about it in traditional resources such as television or radio. The information is short and regularly updated by journalists and meant for a general audience. Second, more information appears in newspapers in the succeeding days. Written by journalists and intended for a general audience, newspaper articles provide explanations and timelines of the event. Third, popular magazines and news magazines in the succeeding days give analyses that are more detailed. Meant for a general audience or a specific nonprofessional group written by authors ranging from journalists to essayists, popular sources discuss the impact on society, culture, and public policy. Here is where various perspectives of the event emerge. Fourth, academic or

scholarly journal articles written months or years later give a focused and detailed analysis based on empirical research. Intended for an academic audience and written by scholars, researchers, and professionals, scholarly articles go through a peer-review process. Lastly, unabridged books provide in-depth coverage a year or more after an event. Authors range from scholars to journalists. Books may also be government reports and reference books, often focusing on policy, legislation, and statistical analysis (University Library, 2018).

Many academic libraries host seminars and outline the information cycle on the web. The Old Dominion University Libraries hosted the event "Stop Trying to Make Fake News Happen" for students enrolled in information literacy courses. Fake news items are "false stories that appear to be news, spread on the Internet or using other media, usually created to influence political views or as a joke" (Cambridge Dictionary, 2019). The event not only provided for a discussion about fake news but also helped students understand the role that they can play in the information cycle. Prior to the event, students felt that they were not very familiar with the journalism process and the information cycle. After the event, they recognized the impact that social media has on the information cycle and how fake news affects society. They also considered taking action to promote change, such as teaching their peers or families to recognize fake news, evaluate information, and seek out quality sources of information (Rush, 2018, pp. 121, 128). The University Library (2018) at the University of Illinois at Urbana-Champaign asserts that the "information cycle is the progression of media coverage of a newsworthy event." The University Library's webpage provides an image of the information cycle, which delineates each media stage with examples. Similarly, the Library at De Montfort University (2017) presents a diagram of the cycle and suggests that "a practical way of evaluating the information is to consider where information comes from and how it has been produced." Palm Beach State College (2019) claims that the information cycle helps students identify "a variety of information formats" and "use information format in the evaluation process." By evaluating an information source based on where it falls within the cycle helps students determine when to use a source and why.

An expanded information cycle and determining credibility

In recent years, the information cycle has expanded to include additional resources, such as websites and social media. In the re-examination of decades-old or current news, websites offer a deeper and broader understanding of issues and topics: "News may be reported, analyzed, debated, corrected, and reinterpreted in a matter of hours" (Notess, 2004, p. 40). The capacity to change information instantaneously differs from the traditional concept of the information cycle, where information is interpreted and analyzed over time. The web makes it easier to publish, change, and update content that pertains to several layers of the information cycle (pp. 41–42).

Previously, media moguls controlled the flow of news in an apolitical manner (Chadwick, 2011). However, in the current anarchic information free-for-all, social media outlets such as Twitter are a significant source of news for the general public, where audiences are agents in the information cycle: "News should be understood as circulating and evolving in the political information cycles embedded in an integrated media system" (Lee, 2018, p. 62). In this discourse, various actors influence how the news is both written and

rewritten for their own political agenda. They can mutate the news in social media and steer it in a specific direction, influencing public opinion (pp. 63–65). This power should not be overlooked. First, there is a threat to the quality of journalism. Second, the sharing of news may lead to select exposure to information, strengthening a polarization of opinion and the spread of fake news (Wang, 2020, p. 11).

In the expanded information cycle, determining format and ascertaining credibility of an information source is more complex. The web, with its ability to wrap information in multiple layers of formats, makes properly identifying a format very confusing, especially for students (Sundar, 2008, p. 74). Students find it difficult to identify the actual format of web content, causing them either to look further than they actually have to or to abandon their intuition about the various cues they encounter. A student's evaluation and use of web-based information can be hindered by a generalized misapprehension to use any information if it was gathered from the web (Hilligoss & Rieh, 2008, pp. 1475–1478). In a study of how students make credibility assessments of information sources, Hilligoss and Rieh (2008) reported a student who was comfortable using the web, believing that it provided many resources of high quality and credibility. However, the student was reluctant to use web resources out of fear that their professor would discredit the source simply because it was web-based (p. 1479). In this example, the student selected information to accommodate a professor's criteria.

Teaching students how to differentiate formats and determine credibility is an important goal for librarians. It includes re-conceptualizing and refining the heuristic processing that students apply when identifying signals or markers that support a sense of credibility. Hilligoss and Rieh (2008) suggested that there are three levels of how students analyze a source:

1. construct (conceptualization of credibility);
2. heuristics (general rules of thumb); and
3. interaction (the reading of cues).

These judgments do not necessarily work independently but are interlinked. In the first level, a student constructs, conceptualizes, or defines credibility based on broad notions of truthfulness and believability. Second, a student uses rules of thumb, focusing on certain characteristics such as aesthetics and endorsement (p. 1473). For example, they can evaluate a source, checking for currency, relevance, authority, accuracy, and purpose in the CRAAP method (Blakeslee, 2004, p. 6). Lastly, a student identifies certain source or content cues specific to the resource. In a similar approach to the CRAAP method, the CARS checklist looks at credibility, accuracy, reasonableness, and support (Harris, 2018). The "Five Ws" method, used in primary schools, has six guiding questions with which to evaluate information: who, what, when, where, why, and how. The questions provide a framework for more detailed evaluation over the CRAAP and CARS method (Radom & Gammons, 2014, p. 337).

The information cycle in course pedagogy

Librarians generally introduce the information cycle in library instruction given in single sessions to varied disciplines across campus. Accardi, Drabinski, and Kumbier (2010) stated that the "information cycle is often used within library instruction to

challenge students to think of how information flows from initial events, ideas, experiments, or studies, into the popular press (newspapers, news magazines), into scholarly articles, books, and finally reference sources like encyclopedias, readers and handbooks" (p. 47). The information cycle is also used to prompt students to consider how information circulates in a specific discipline or major. Hogenboom and Woods (2006) outlined the information cycle as a context for teaching government information by using examples of familiar publication types and associating them with a government resource. For example, the *Congressional Standard* is a government publication meant for a general audience, while the *Journal of the National Cancer Institute* is a government-sponsored journal of peer-reviewed scholarship. Hogenboom and Woods concluded that by illustrating government resources within the information cycle, librarians advance students' information literacy outcomes because a novice learns how to classify government publications and make assertions about content. Since many undergraduates are not accustomed to questioning the validity of what they read, a librarian can instruct students how to critically evaluate the quality, authority, timeliness, and bias of resources, and identify the purpose and the audience (pp. 401–403, 406).

No previous study examined the potential of the information cycle in a credit-bearing library instruction course. However, Schlesselman-Tarango and Suderman (2016) applied critical pedagogy to the information cycle to highlight the context of sources. The hour-long library instruction lesson given in a first-year composition course demonstrated the political nature of information creation, and how it reflected specific times and places, by looking at a socially charged topic such as the murder of Trayvon Martin and subsequent acquittal of George Zimmerman. It highlighted the issues of power and the exploitation of the black male body by engaging students to analyze representation in information in the cycle. After students examined sources at different points in the information cycle, a whole-class discussion encouraged students to determine the values, perspectives, and processes that shaped the key similarities and differences among the sources (pp. 59–60, 63).

Following implementation, Schlesselman-Tarango and Suderman (2016) remarked that many students were new to the concept of scholarly research. Some students believed that the institutional affiliations of the authors meant that they were students. They also struggled with deep reading of the texts and rather focused on understanding the thesis of a scholarly article. Schlesselman-Tarango and Suderman suggested that students read a scholarly article prior to library instruction to become familiar with the format and language. Students need to identify that scholarly articles speak to a specific audience of professionals and that the research is documented in citations (pp. 63–64). They propose three questions for future research:

> How can we engage students in the larger discussions taking place in academic journal articles? Specifically, how do we problematize scholarly discourse communities while at the same time teaching the value of engaging with them? Are there other assignments where students might benefit from using the information cycle to engage in critical analysis? (p. 64)

The present article builds upon the Schlesselman-Tarango and Suderman lesson plan and incorporates the scaffolding approach into course pedagogy in a for-credit library

instruction course. Students in the course are guided throughout several lessons in a larger discussion of scholarly research versus popular sources and when to use them in research. The final examination in the course engages students in a critical analysis of information by comparing and contrasting information at different stages in the cycle. By understanding the progression of an event or how an issue changes over the course of time in the information cycle, students learn the value of information and the importance of evaluating sources found on the web.

Scaffolding approach to course pedagogy

The instructors in this study employed scaffolding, guiding students in how to differentiate format and verify the credibility of an information source. Central to literature about scaffolding is the concept of the zone of proximal development, advanced by Vygotsky (1934). The zone of proximal development is the process by which a child develops learning skills through collaboration with a teacher. Under guidance from a teacher, a child receives instruction in how to complete a task that they are not able to do on their own. Through imitation of what is learned in the collaborative instruction, a child is later able to complete the task. In the zone of proximal development, a child learns to mimic what was learned and complete a task on their own without further learning. Zygotsky submitted that what the "child is able to do in collaboration today he will be able to do independently tomorrow" (p. 210). Vygotsky also asserted, "With collaboration, direction, or some kind of help the child is always able to do more and solve more difficult tasks than [it] can independently" (p. 208). Lastly, a teacher must plan a lesson not on yesterday's development in the child but on tomorrow's development in order to see the full potential of the instruction (p. 221).

Vygotsky first used the scaffolding metaphor in 1929. In Vygotsky's use of the term, scaffolding "focuses on some substance under construction, a transitional, unfinished quality" (Shvarts & Bakker, 2019, p. 7). Nikolai Bernstein later used the term *scaffolding* in describing a child's motor skills as they attempt to master a task or ability. Higher levels of scaffolding in the learning process will "maintain more fluent and automatized performance later in the process of mastering" (Shvarts & Bakker, 2019, p. 10). Wood, Bruner, and Ross (1976) popularized instructional scaffolding in teaching and learning. In their study, they advanced a scaffolding process to instruct young children how to assemble interconnected blocks into an object. The first activity in the process was recruitment, whereby the tutor "enlist[ed children's] interest in and adherence to the requirements of the task." The second activity reduced the degrees of freedom by limiting the number of choices children could make. The third activity was direction maintenance. Here, the tutor kept children "in pursuit of a particular objective." In the fourth activity the tutor "mark[ed] or accentuate[d] certain features of the task that [were] relevant" and interpreted discrepancies. The fifth activity was frustration control, to reduce the frustration level of the activity. In the final activity, the tutor demonstrated or modeled solutions to the task with the expectation that children would imitate the method (p. 98).

Since the Wood et al. (1976) study, the concept of instructional scaffolding has surpassed a tutor instructing children to master a specific task. Instructional scaffolding research is in a range of disciplines in secondary and post-secondary education. This review

discusses some recent literature to provide context to the decisions made in this study. Smagorinsky (2018) argues that current literature goes beyond Vygotsky's (1934) zone of proximal development. In this view, there is a zone of next development that bypasses mastering a task for conventional means and takes into account culture, poverty, and other demographic factors that might affect how a student masters a task. Instructors must be cognizant of these conditions and adapt lessons to suit student needs. For example, Smagorinsky suggests that a teacher must adapt to students rather than it be the students' task to assimilate to a teacher's methods or the institutional practices and culture (pp. 256–257).

The level to which a teacher provides scaffolding is also a consideration. Van de Pol, Volman, Oort, and Beishuizen (2015) studied the amount of scaffolding compared to student success in high-school–level social studies classes. In the experimental group, teachers provided contingent support tailored to advance students' achievement and task effort. When students' independent working time was low, van de Pol et al. found that low contingent support, where instructor intervention was low, was more effective than high contingent support. At the same time, where independent working time was high, high contingent support was more effective than low contingent support. Van de Pol et al. concluded that high contingent support is not always effective. By lowering contingent support, teachers can transfer the responsibility for learning to the student. The efficacy of scaffolding is dependent on the amount of time that students work on a task independently and the effort that they put into it (pp. 615–616, 632). Similarly, with an applicable level of scaffolding in a collaborative task where students work with peers, Krulatz (2016) submitted that secondary education instructors improve classroom practice. In this manner, students not only learn from teachers; they also learn from other students in the classroom as they master a task (pp. 9, 15).

Other studies apply scaffolding to improve students' writing ability at the college level. Pessoa, Mitchell, and Miller (2018) developed three workshops in a global histories course that focused on writing thesis statements and using evidence to support them. In the collaborative approach between faculty in English and the history professor, students were provided with guiding questions and sample compositions. The study determined that interdisciplinary instruction accelerated students' ability to write an argumentative paper and narrowed the gap between students with different incoming skills. The study provided a model of interdisciplinary collaboration to meet the needs of the increasing number of linguistically and culturally diverse students in higher education (pp. 82–84, 94). In another attempt not only to improve writing ability but also to better readiness to join the workplace, Peltola (2018) employed small-group learning and instructional scaffolding in a public-relations writing course. In small-group learning, the role of the instructor is "to facilitate learning by supporting, guiding, and monitoring" (p. 323) student progress in teams. For example, the instructor "walked among the teams to scaffold and redirect as needed" (p. 327), working with and guiding students individually to correct errors in writing. Similarly, Cooper and Robinson (2014) utilized quick-think procedures and cognitive scaffolding. For example, in the quick-think technique termed "Select the Best Response," the teacher gave a small group of students a multiple-choice question to answer. In the "Reach a Conclusion" procedure, students must make a logical inference about what they learned.

Cooper and Robinson recommended pausing lectures every 10–20 minutes and inserting a quick think or scaffolding procedure related to the learning objectives of the lesson. They also encouraged that instructors review previously covered content to promote metacognition, connecting the previous lecture content with current material (pp. 151–153, 155–156).

Case study

Our case study employed the scaffolding approach and small-group learning in a library instruction course to teach students how to identify and evaluate each format within the information cycle. Like most academic libraries, LaGuardia Community College's Library provides instruction in single sessions where librarians teach students how to research various disciplines campus-wide. Sessions are usually in conjunction with a class assignment or the College's first-year seminar program, which is designed to introduce students to the course and their major. Librarians also instruct the semester-long, one-credit LRC 103. Offered in both face-to-face and online sections, this information literacy course teaches analytical thinking and problem-solving skills. After completing the course, students should have the ability to evaluate information resources for authority, currency, accuracy, and bias. We instructed a course section for this study in the spring 2019 semester. To give students the option of earning more credits per semester than a traditional college permits, the College offers two 18-week semesters, divided into a 12-week session, fall I and spring I, and a six-week session, fall II and spring II (Stadler & Rojas, 2019). Classes in the six-week session meet more frequently and are lengthier than in the 12-week session. The course in this study was ABC 123, given in the spring II 2019 session in two-hour face-to-face sessions.

Methodology

We guided students and required them at times to work collaboratively in groups. Instructional scaffolding and small-group learning was the best approach, allowing the instructors to walk among the small groups and support, guide, and monitor students (Peltola, 2018, pp. 323, 327). We used a combination of soft- and reciprocal-level scaffolding. In the former level, we circulated the classroom and communicated with their students individually, while the latter level involved a group of two or more students collaboratively working together with instructor support. In this way, a group working on a task can learn from their instructor and each other's experiences and knowledge (Holton & Clarke, 2006, p. 136). The final examination evaluated student progress over the course of the semester, demonstrating the ability to complete the task of evaluating and identifying sources in the information cycle and understanding how they change over time.

Stage one: Sources of information

We implemented the six-stage scaffolding approach in the second week. We gave a brief overview of the information cycle and exhibited print examples of each source to the class. Next, we divided students into small groups and instituted the quick-think procedures "Select the Best Response" and "Reach a Conclusion" (Cooper & Robinson, 2014, pp. 151–153). Given a stack of print examples from each stage of the cycle, students needed to identify them on their own, determine what source had the most information about the topic, and

present their findings to the class. Since independent working time was low, we provided low contingent support as a best practice. We observed student progress in the exercise and recorded each group's responses in an Excel spreadsheet. The simple exercise laid the foundation for the information cycle and identifying non-print sources. The remainder of the second class focused on how to find popular and scholarly sources of information in the library's subscription databases. In the third week, we demonstrated how to find background information on a topic. The lesson included breaking down a topic into related concepts with examples for each in a concept map. Concept maps help students graphically represent and organize ideas (Appalachian State University: Belk Library and Information Commons, 2019). We guided students in creating a concept map on a whiteboard and later asked them to complete the task on their own by creating a concept map as an assignment.

In week four we recruited student interest by leading a whole-group discussion focused on how the public gets information on events and whether information about the event changes over time. Prior to the discussion, we demonstrated the CRAAP method. We selected the Columbine High School tragedy of April 20, 1999, to demonstrate how information about an event changes from the time it occurs through the days, months, and years that follow. In the deadliest American high-school shooting, two Colorado students killed 12 fellow students and a teacher, and injured 23 others, before killing themselves (Thiel, 2011, p. 95). Since the Columbine tragedy was an America-based event that happened over two decades prior, it may not be in the knowledge context of younger students or international students. Therefore, it requires an introduction for students to become familiar with it. We screened *The New York Times* (2015) audiovisual documentary titled *Haunted by Columbine: Retro Report Documentary*, which highlights the event, and how it "continues to shape how [the public views] and understand[s] school shootings today." We used the program to show students how perceptions about events may change as more information becomes available with the passage of time. For example, initial coverage of the Columbine tragedy reported that the killers were part of a larger cult. Scholarly articles and books written months or years later place the event in context with similar tragedies that have happened since and suggest that the high-school students worked alone after bullying experiences in school. Students can then use this analytical approach to better understand various information formats and connect them to their appropriate place within the life cycle of information. If they are exposed to the life cycle of information to introduce formats, students' anxiety and frustration levels, in theory, will be much lower and their ability to differentiate formats appropriately will be much higher when exposed to them in future assignments. After watching the program, we directed a discussion of how students can evaluate a source and determine its credibility not only by using the CRAAP method but also by identifying its position on the information cycle. To test students' ability to evaluate sources on their own, we asked them to search a topic from a previous assignment in a Google search and evaluate the sources that they found (see Appendix A).

Stage two: Researching an event

In the fifth week, we completed the second and third stages. First, we provided systematic instructions illustrating how to search the *Opposing Viewpoints in Context* and *Nexis Uni*

databases; the former provides multiple viewpoints of controversial events and topics, and the latter is a newspaper source. Next, students in groups of three or four collaboratively researched the Columbine tragedy using the skills that they learned to search a database and evaluate sources, including the Boolean operator strategy and the CRAAP method. To reduce the number of choices that students could make, we assigned each group to a specific library database or the web and asked them to find the titles of two sources. This hands-on task allows students to interact and learn from their peers, engage with library resources, and develop research skills. We monitored students through the hands-on activity and provided low contingent support, which functioned as an interactive conduit to get them to the next stage.

Stage three: Format and its place in the information cycle

In the same class session, we wrote down the titles that each group found on the classroom's whiteboard. Next, we led a discussion about the seeming depth or superficiality of each title with predictions as to which title would be representative of a particular format. In a direction maintenance exercise in pursuit of a particular objective, we asked students to predict where they think each title lies in the Columbine timeline of information without knowing the dates of publication.

Stage four: Correct answers and discussion

In the final week, we screened the audiovisual documentary *Did You Know? Information Cycle*, created by the News and Microforms Library at Penn State University. The program highlights "how today's events are tomorrow's information" using "different types of news publications that circle the events of the Columbine" event (PennStateNML, 2011). Then, we directed a discussion about why a particular format lies at a particular point in the life cycle of information. Finally, we reviewed answers from stage three, discussing and interpreting student discrepancies identifying titles.

Stage five: Reinforcement of formats and assessment

For the purposes of this study, we did not incorporate the fifth stage of the scaffolding approach proposed by Wood et al. (1976), which seeks to reduce a student's frustration level performing an activity. We skipped to the final stage, where students must show what they learned, in this case, over the course of the entire semester by evaluating and identifying sources in the information cycle. The final examination asked students to research a well-known news event and find information from each phase of the information cycle (see Appendices B and C). We assigned an event rather than have students choose on their own to reduce the degree of freedom and room for error. This ensured that students researched an event that had examples from all phases of the information cycle. Question prompts on the final examination asked students which source had the most information about the event and why. The examination also asked students to compare and contrast all information sources that they found and identify any contradictions or misinformation, and explain why the inconsistencies occurred. The final not only evaluated student progress in the course; it also determined whether students developed an understanding of how

information changes over time and how sources of information vary depending on their position on the information cycle.

Results

As predicted, students had little difficulty identifying the format of print sources, especially books. There were four student groups and each had to identify five sources. Newspaper titles included *The Chief* and magazine examples were *Time* and *Travel & Leisure*. Journal titles were *Journal of Marketing* and *Advanced Emergency Nursing*. When asked which source had the most information on an event or topic, the four groups differed; two groups said books and the other two said journals. Students generally felt that these sources had information based on fact written by someone with experience in the event or topic.

In the recruitment stage, student answers to how the public gets information were newspapers, social media, radio, from other people, and Google. As expected, these responses are indicative of a mindset that does not think events become researchable and academic topics well after they occur. There was no mention of encyclopedia, magazine, or scholarly articles. Students consented that information changes over time depending on the information source. However, they were uncertain as to why it changes, suggesting that it may be because time allows for more facts.

In the direction maintenance exercise, students more or less correctly identified where each Columbine title fit on the information cycle. Some of the sources did go outside of the somewhat rigid principles of the cycle. For example, the newspaper articles "Columbine: A Blueprint for Mass Shooters" and "Suburban Denver Debates Tearing down Columbine School," both written in 2019, were beyond the typical newspaper timeline of information. The magazine article "I Survived the Columbine Shooting," written a half-year after the tragedy, was outside the expected timeframe for magazines. The examples demonstrated that compilations or reviews of events are common within the information cycle.

Unfortunately, of the 12 students who completed the final examination, the instructors analyzed only six students' work. Students were either unwilling to participate or did not want their work studied. Student participants demonstrated either proficient or competent skills based on the rubric of the final examination. Punctuation in citations was students' weakest skill. The examination required citations in APA style. The biggest errors were capitalization in article titles and not arranging journal and database titles in italics. Students also did not answer question prompts in detail. However, they displayed an understanding of how information changes over time and how sources of information vary depending on their position on the information cycle, showing growth from the first stage of the scaffolding process.

A student who chose the Las Vegas mass shooting that occurred in 2017 suggested that the scholarly article had the most information on the event. They wrote, "I believe these types of articles contain the most information because they are made by scholars for scholars." Here, the student identifies the peer-review process as vital to article's accuracy and authority. Another student who also selected the Las Vegas shooting similarly chose the scholarly article having the most information:

> Not only does the [author] analyze the case and how it manifested itself, but [they] also [try] to explain why the situation occurred. All the other sources will offer key features of the case but they will not attempt to figure out why the killer carried out his plan. Additionally, since being a year from the occurrence, the author must have collected stronger information to complete the profile of the killer.

The student explained that the article's author synthesized the information surrounding the event well after it occurred, unlike other information sources that reported it shortly thereafter. Similarly, another student suggested that a YouTube video made within days of the event "did not have much insight." However, a student who selected the #MeToo Movement submitted that each source was equal in presenting information in light of its position on the information cycle. In other words, a source on the cycle is representative of the time reported and that information changes over time.

When comparing and contrasting sources, some students identified inconsistencies. One student noted that news sources reporting on the Las Vegas shooting had different death numbers. They concluded that the discrepancy was due to the time written and that subsequent sources "provided more quantifiable data." Another student commenting on death numbers claimed, "Nothing can be clear the moment that the events occur until some time passes." Similarly, a student observed that the more time passes, the longer the information source is in length, adding, "Some sources [have] a small amount of information and some have a lot." They did not, however, explain that this is because scholarly sources of information synthesize material based on studies. Still, students largely did not go into details comparing information, often missing cues as to why information changes. Rather, they simply compared what was in each source of information.

Discussion

The limitation of the small case study was the number of students willing to participate. Another limitation was the final examination and accompanying rubric created for the grading. They both need revision to capture how students analyzed information. The 75-word limit was not enough to provide reasonable analysis. A higher word count displaying how they utilized the CRAAP method or some other tool to evaluate resources would have provided more evidence to validate that they learned course material and were able to complete the task on their own.

However, we assert that the scaffolding approach and small-group learning can guide students in a greater discussion of the value of scholarly research and the importance of evaluating information sources found on the web. With guidance and collaboration, students were able to mimic what was learned and complete a task, identifying and evaluating information. Students understood that the scholarly article's author synthesized the information surrounding the event well after it occurred, unlike other information sources that reported it shortly thereafter. In general, low contingent support in scaffolding is the best approach, especially when students receive a short task. Given that many students may not know what makes research scholarly, a teacher must adapt to students and design course pedagogy to take into account the basic elements of each stage in the

information cycle (Smagorinsky, 2018, pp. 256–257). Instructors should also demonstrate to students the importance of evaluating sources by giving assignments that ask them to search for information on the web and then evaluate it by suggested criteria. Typically, instructors highlight the CRAAP method in a single library instruction meeting, in either a credit-course class or a one-time session. Lastly, the five stages in this study were connected, encouraging metacognition. Instructors should review previously covered content, bridging the previous lecture content with current material (Cooper & Robinson, 2014, pp. 151–153, 155–156).

Using the information cycle, instructors boost students' information literacy skills. Hogenboom and Woods (2006) suggested that students are not accustomed to questioning the validity of information. The information cycle helps students classify formats and assertions about its content (pp. 401–403, 406). In future work, they understand the need to both determine the validity of information created by different authorities and acknowledge biases that privilege some sources over others (The Association of College and Research Libraries, 2015, pp. 3–4). As submitted by Palm Beach State College (2019), evaluating an information source helps students determine when to use it in their academic work and why.

There is potential in library instruction to scaffold the information cycle into course pedagogy, not as a replacement for credibility tools such as the CRAAP method and the CARS checklist but as an expansion of them to help students differentiate format. This study demonstrated the efficacy of implementing the information cycle over the course of a semester, something that is difficult to accomplish in a single class. By analyzing how and why information changes over time, students learned how to differentiate and understand the varied formats of online sources in addition to determining their credibility. They constructed a new concept of credibility based on position on the time cycle of information. They can add this conceptualization to their general rules of thumb in the research process and readily recognize cues in a diverse world of information format.

Conclusion

This article highlighted the use of a class activity to illustrate the linking of credibility and the judgment process with myriad forms of information. Recognizing how information unfolds and changes over time, students identify false claims, distortions, and commentary circulated during the first hours of a story unfolding. By following an event over time, they recognize that facts materialize near the end of the time continuum, detecting the information formats that value depth and accuracy over speed. This skill helps students select the most appropriate source of information in their academic work. Lastly, the authors applied the scaffolding approach based on the understanding that students need direction when navigating the information ecosystem. Ideally, students will be motivated to internalize the teacher's guidance and the constructive role their peers played in promoting better behaviors for identifying information formats and judging credibility. Students should be moved to modify their heuristic approach with a more systematic, logical, and rational process. Specifically, students will be better able to identify the different formats of information they encounter, they will recognize the role time plays in the development of facts

and construction of context, and, most important, they will be more skilled at navigating a complex information ecosystem.

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Appendices

Appendix A: Evaluating information exercise

1. Search for your midterm topic
2. Describe your results. What did you find?
3. Can you find scholarly sources?
4. Can you find popular sources?
5. Can you find encyclopedia articles?

Appendix B: Final examination

1. Choose one the following events that interests you:
   - Opioid Crisis
   - Hurricane Maria in Puerto Rico
   - Las Vegas Mass Shooting, 2017
   - Zika Virus, 2016
   - #MeToo Movement
2. Research the event using the Internet and the Library's databases. Find one source of information connected to the event from each of the seven formats listed below:
   - Encyclopedia article or reference material
   - YouTube video
   - Online Newspaper or Internet news sites
   - Popular magazine
   - Tweet
   - Book
   - Scholarly journal article
3. Create an APA citation for each of the seven sources of information you found. If you use the auto-generated citation builder in a database, make sure to check for errors. Place the APA citations in chronological order by the date of the publication or web- post. The first citation listed will be information produced on the day of the event. Additional citations will list information produced: the next day or week of the event, between six months and two years of the event, or two years or later.
4. Which of the sources has the most information about the incident? Why do you think that source has the most information about the incident? Explain in 50 words
5. In 75 words, compare and contrast the information in each source. Specifically, identify and list any contradictions and misinformation you find. If you cannot identify any contradictions and misinformation, explain why you think there is none.

Appendix C: Grading rubrics for the final

Criteria	Proficient (25–23 points)	Competent (22–20 points)	Developing (19–18 points)	Novice (17 points or Under)
Selects tools to find information	Selects sources that satisfy the information need and uses additional library services when necessary.	Selects sources that mostly satisfy the information need.	Selects sources that partially satisfy the information need.	Selects sources that may be inappropriate for the information need.
Locates information	Employs a variety of advanced search strategies or classification schemes, effectively; conducts searches with strategic terminology.	Employs many advanced search strategies or classification schemes; conducts some searches with strategic terminology.	Employs some advanced search strategies or classification schemes; conducts some searches with strategic terminology.	Employs few, if any, advanced search strategies or classification schemes, conducts searches with little strategic terminology.
Selects information	Can differentiate among all information sources, can identify all formats.	Can differentiate among most information sources, can identify most formats.	Can differentiate among some information sources, can identify some formats.	Does not differentiate among information sources, cannot identify formats.
Analyzes information	Engages in a thorough, complex, and detailed analysis of information sources in terms of examining where the information would appear in the information cycle.	Engages in a mostly thorough, complex, and detailed analysis of information sources in terms of examining where the information would appear in the information cycle.	Engages in some complex analysis of information sources in terms of examining where the information would appear in the information cycle.	Engages in little or simplistic analysis of information in terms of examining where the information would appear in the information cycle.

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