Combining Critical Reflection and Action Research to Improve Pedagogy

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**Abstract:** Educators need to reflect critically on their instruction to continue to be effective. This paper will employ case studies to demonstrate how librarians can improve their teaching by applying critical reflection and action research to their information literacy (IL) sessions. The four lenses model of Stephen Brookfield, an adult education expert, will be used for critical reflection, and how librarians can apply each of the lenses to their teaching will be described. Furthermore, lessons learned from incorporating multiple assessment tools in the same class will be presented because these tools are needed to engage in critical reflection and action research.

**Introduction**

The importance of reflection in professional practice has been recognized in many occupations over time, and teachers are no exception. Excellent teachers employ reflection to more fully comprehend their instructional practices and improve their delivery. Reflection allows librarians to make substantial progress in teaching on their own, without the need to receive formal training in educational theory. Librarians teaching information literacy (IL) skills require a toolbox of methods to reflect critically on their instructional practices and continue to be dynamic and effective teachers, as well as to support professional growth and renewal.

Although reflection is beneficial in professional practice, practitioners need to incorporate external perspectives in the process to reap its maximum benefits. Through multiple case studies from different disciplines, Donald Schön demonstrated the link between improvements in practice and a professional’s “reflection-in-action”—that is, thinking about the outcome of one’s actions in the middle of, or after, a situation to adjust future performance. To successfully implement changes in practice, Schön states that...
the practitioner “is unlikely to get very far unless he wants to extend and deepen his reflection-in-action, and unless others help him see what he has worked to avoid seeing.”

Stephen Brookfield, a renowned and prolific researcher who helped shape the theory and practice of adult education, solves this issue in the field of education by involving others in the reflection process. He proposes that teachers question their assumptions and critique their practices by examining their instruction through four different perspectives: (1) their individual experiences as learners and teachers, (2) students’ feedback, (3) colleagues’ comments, and (4) the published literature. Brookfield’s lenses can help instructors identify strengths and weaknesses in the content and delivery of courses in a practical way, whether they are novice or seasoned educators. For example, education programs use these lenses to train future teachers to reflect for the purposes of professional development. The Association of College and Research Libraries uses them in its “Intentional Teaching: Reflective Practice to Improve Student Learning” immersion program, which the author attended, to teach experienced instructional librarians “to become more self-aware and self-directed” as educators.

While applying Brookfield’s lenses will help determine problem areas with instruction, engaging in action research takes the teacher a step farther toward improvement. It allows educators to implement the changes needed to solve these issues. Lin Norton says that action research is the concept of “researching your own teaching.” According to Monica Vezzosi, it involves:

1. Discerning the problem
2. Creating an action plan to solve the problem
3. Implementing and assessing the solution
4. Analyzing students’ responses to the assessment, and
5. Considering the results to plan and implement future changes if needed, thus starting another action research cycle.

Norton further explains:

Pedagogical action research, then, does not have to follow traditional models of experimental design; indeed there is quite a strong case for why it should not. Since the aim of action research is to implement change, such experimental methods are not so useful because they are based on tightly defining and controlling variables that do not allow you to fine tune or change the experimental design. Action research, however, because of its cyclical nature aims to introduce change and refine the next cycle of research based on experience and reflection.

Brookfield’s lenses would be applied in the beginning and middle of the action research cycle, initially when attempting to identify the problem and later to evaluate the change introduced to solve the problem. Two or more of Brookfield’s perspectives can be employed to assess any IL session, the results of which will lead librarians to undertake action research when improvements are needed.

Through the presentation of three case studies, this paper will demonstrate how librarians can apply both critical reflection and action research to IL sessions for the purpose of improving their teaching. Brookfield’s four lenses will be used for performing critical reflection, and methods that librarians can employ to apply each of the lenses
to their teaching will also be described. Moreover, lessons learned from incorporating multiple assessment tools in the same class will be presented—that is, pretest, posttest, peer feedback, and students’ search strategies on their own topics—because these tools are needed to engage in critical reflection and action research.

Literature Review

Multiple education publications discuss Brookfield’s four lenses model, but little is reported in the library science literature. Mandi Goodsett cited Brookfield when discussing the value of keeping a journal, one of Brookfield’s techniques for evaluating teaching from the educator’s perspective, to enable instructional librarians to reflect critically on their teaching practices. Goodsett suggested the creation of group reflection activities to share experiences and ideas on issues encountered while teaching. Donald Gilstrap and Jason Dupree also mentioned Brookfield and adapted his Critical Incident Questionnaire (CIQ), one of Brookfield’s methods for assessing instruction from the student perspective, to evaluate the effectiveness of a four-part information literacy program in an English composition course at Southwestern Oklahoma State University in Weatherford. Three hundred forty-eight students completed the CIQ four times, at the end of each class in the program. The CIQ consisted of five open-ended questions that asked students to describe instances in class when they (1) felt they understood the most content, (2) were the most confused, (3) experienced a sense of accomplishment, (4) were surprised, and (5) thought the content was not clear. The researchers concluded that the CIQ was “an effective qualitative instrument to assess critical reflection . . . during the process of learning” and helped the librarians gain more insight into what students had learned to “further develop the curriculum.”

In addition, Brookfield’s model has been employed in different situations outside of librarianship, such as using the CIQ to evaluate the effectiveness of instruction in online graduate courses, to develop the teaching skills of novice instructors, and to demonstrate how the four lenses can be applied in specific courses to improve teaching and learning.

Although the library science literature seldom discusses Brookfield’s model, many studies report different contexts in which librarians and faculty engaged in action research to improve IL instruction. For example, action research has been used to improve IL workshops for undergraduate engineering students, to redesign how IL sessions were integrated into the curriculum of a master of business administration program, to increase the engagement of graduate social work students with the library’s services and resources after IL instruction, and to demonstrate the need for additional embedded IL instruction in an English-as-a-second-language course for international students. Action research has also been employed to enhance teaching on the social justice elements of information resources to library and information science graduate students. For an introduction to this topic, Vezzosi provides a general summary of how action research can be applied to teaching IL skills.

This article builds on the previous literature by combining Brookfield’s four perspectives model and action research to help librarians critically reflect on their IL instruction with the aim of improving their teaching practices by implementing evidence-based changes in the classroom. Educators have applied Brookfield’s perspectives and action
research together when teaching semester-long, for-credit courses, a context different from the stand-alone IL sessions that librarians typically teach. A 2016 paper on the use of reflection to judge evaluation methods employed in IL instruction states that there are few publications “about potential benefits of reflective practice for librarians themelves.” This article adds to the small pool, presenting case studies and specific methods that demonstrate how librarians can engage in critical reflection to develop their teaching and why it would be valuable to do so.

Applying Brookfield’s Model to IL Instruction

Individual learning and teaching experiences, students’ responses, colleagues’ observations, and reports in the published literature are the four lenses through which Brookfield recommends that teachers examine their work. Brookfield discusses these four perspectives in detail in his 1995 book, Becoming a Critically Reflective Teacher. Each lens is summarized in the following sections, along with a description of some methods that librarians can use to apply the lens to their own teaching.

The Autobiographical Lens

Educators can remember how they learned as students and think about their actions when teaching to enhance their understanding of why they teach in a certain way and why they avoid other practices, especially when some of the practices they use might appear unrelated to any specific pedagogy. For example, individuals who disliked group discussions as students are more inclined as teachers to utilize other activities in the classroom that allow each student’s voice to be heard. The autobiographical lens is the safest and easiest one to apply to teaching because instructors are not exposing themselves to others’ critique. Through personal self-reflection, they become mindful of their assumptions and the reasons behind how they teach. Keeping a teaching log, taking an audit, asking to be recorded, and writing a survival advice letter are a few ways that librarians can apply the autobiographical lens to their instruction.

Teaching Log

A teaching log summarizes, in a regularly kept diary, positive and negative moments that made a strong impression when teaching. According to Brookfield, the log can contain descriptions of teaching moments that made the trainer feel proud, ineffective, anxious, or surprised, and personal notes about what to continue doing or to avoid in the future. Educators who read these descriptions over time will see patterns in their teaching, providing insight into practices that support and detract from the effective delivery of course content. They will become more aware of situations to encourage, avoid, or minimize in the classroom. Moments that took them by surprise or made them
anxious will identify gaps in their knowledge that they may wish to address through professional development activities. Diary entries can be brief and can take any format. For example, after each lecture or workshop taught, the author of this paper wrote notes in the margins of the printed slides from her presentation software about positive and negative teaching moments and any future changes needed.

**Teacher Learning Audit**

An audit answers questions or explains what instructors have learned about teaching and any changes they have implemented over the past few months. An audit might say, for example, “Compared with this time last term/year, I now know that . . .” or “Compared with this time last term/year, I could now teach a colleague how to . . .” According to Brookfield, a personal audit of their instructional activities leads educators to see themselves as adult learners about teaching, enhances their self-awareness as teachers, and shows them how much they have changed over time, all of which enable them to remain engaged in their work.

**Recording**

Recording involves arranging for one or more IL sessions to be videotaped so that librarians can view and hear themselves as others do. Brookfield cautions that, while this tool can identify elements of teaching that need improvement, “It does not necessarily tell us what to do.” Consultation with colleagues and the institution’s educational pedagogy experts can help illuminate which parts of the librarian’s teaching need improvement. The author’s institution, McGill University in Montreal, Canada, has a Teaching and Learning Services Department staffed by pedagogy experts who work with librarians and faculty members to improve their teaching. The librarian or faculty member initiates the request.

**Survival Advice Letter**

A survival advice letter gives guidance to an imagined successor about how to succeed in the role. Such a letter, Brookfield says, addresses “(1) What a teacher needs to know to survive in this job, (2) what she needs to be able to do to stay afloat, (3) what you know now that you wish someone had told you as you began your work in this position, and (4) things your successor must make sure she avoids thinking, doing, or assuming.” The letter should incorporate descriptions of events to support the advice being offered. Composing this letter will help educators identify those elements that they feel are crucial to their success.
The Student Lens

The second perspective teachers can use to examine their instruction is students’ feedback. Because students may interpret instructors’ actions and words in different ways, educators need to research how students understand their teaching to make relevant connections and identify problems and errors in their delivery of course content. The findings from this research will help teachers make evidence-based decisions about how and what to teach. Students should only be asked to assess aspects of the session that they would be capable of judging.

Several methods can be used to examine instruction through the student lens. They include using standard feedback forms, assigning a one-minute paper, administering a CIQ, providing hands-on practice time in class, and reviewing students’ assignments.

Standard Feedback Forms

The feedback students provide about an instructional session can be valuable in helping to improve your teaching. One way of gathering feedback is to take a few minutes during class to have students anonymously complete a feedback form. The form can contain a mix of multiple-choice, open-ended, and Likert scale questions. Another way to gather feedback is to have your students take an anonymous online survey after the session.

One-Minute Paper

A one-minute paper asks students at the end of an IL session, to respond to one or more open-ended questions that take about a minute to complete, such as listing the top three things they learned or describing how they will apply what they just learned to their coursework. The one-minute paper frequently includes questions that ask students to identify the most useful thing they learned in the session, the most confusing point, and one striking fact they retained. This provides feedback on course content that can be employed to follow up with the students.

Critical Incident Questionnaire

Brookfield’s Critical Incident Questionnaire consists of a set of open-ended questions about students’ learning experiences in the class. Some of these questions will be similar to those in a one-minute paper. Gilstrap and Dupree used the CIQ to evaluate IL instruction, which has been summarized in the literature review section of this paper.

Hands-On Practice

Hands-on practice provides students with the opportunity in class to apply what they learned. This demonstrates to the students how the content is useful and reveals any misunderstandings. The author has found that walking around an e-classroom during a workshop to observe students working allows her to quickly gauge what issues they
find challenging. She is then able to discuss these issues with the entire group after the activity.

Assignments

Reviewing students’ assignments enables the instructor to check whether they applied what was taught them. For example, the instructor might examine the bibliographies of student papers to verify whether they used peer-reviewed sources or ask them to submit search strategies on their topics.

The Colleague Lens

Colleagues’ comments are the third lens in Brookfield’s model through which educators can critique their teaching. By inviting colleagues to observe or discuss classroom situations with them, instructors receive moral support and become aware of elements of their teaching and the group dynamics that they have overlooked. Peer review of teaching, peer review of notes, and participating in a “clearness committee” are ways that librarians can apply the colleague lens to their instruction.

Peer Review

Inviting a colleague to audit an IL session, asking them to peer review the teaching notes and handouts for a class, or both, can provide constructive feedback. To ensure that the feedback is constructive, educators should provide a checklist of questions that they would like their colleagues to answer when observing their class or critiquing their notes. Colleagues can be from the same or another department, or they may be pedagogy experts at the institution, for example, staff from teaching and learning services.

Clearness Committee

A clearness committee is a confidential group of four to five trusted colleagues who can help brainstorm ideas to solve a problem in a two- to three-hour meeting. The teacher would reiterate the issue at the beginning of the group encounter, which he or she would have already described in writing and given it to colleagues to read before the meeting. The teacher’s colleagues would only be allowed to ask honest and open-ended questions to help solve the problem during the session. They would not be allowed to comment, offer advice, or refer afterward to what occurred during the meeting. For example, suppose one raised the concern that there is too little time to cover all the content. Clearness committee members can then ask the teacher questions to address this, such as “What content do you leave out?” or “What would be other ways to deliver this content that is not taught in class?” The questions would lead the instructor to think of possible solutions to solve the problem.

By inviting colleagues to observe or discuss classroom situations with them, instructors receive moral support and become aware of elements of their teaching and the group dynamics that they have overlooked.
The Literature Lens

Brookfield also recommends educators examine their teaching through reports in the published literature. Reading the literature will make instructors recognize that the challenges they face are not unique and that they are not solely responsible for every situation occurring in their classrooms. Many economic, social, and political influences affect the group dynamics in class. For example, students’ indifference in a session can be a “consequence of a system that forces people to study disconnected chunks of knowledge at a pace prescribed by curriculum councils and licensure bodies.” Searching the literature and keeping in mind the purpose for reading the articles will help librarians apply this lens to their pedagogy.

Literature Searching

Literature searching involves reviewing the published literature for an issue of interest and expanding the search beyond library science. Experts from many different disciplines write about teaching concerns.

Purposeful Reading

When reading, keep in mind the most important question: What does the article tell me about teaching, learning, or both that will affect my practice?

Combining Brookfield’s Model and Action Research

Identifying the strengths and weaknesses in the content and delivery of courses through the use of two or more of Brookfield’s perspectives is the first step in performing action research to improve existing teaching practices. Action research consists of defining the problem to study in the classroom, planning the educational intervention and its assessment, implementing the intervention and its evaluation, examining the responses collected, and reflecting on the findings to innovate or improve. The last step of action research leads back to critical reflection, coming full circle. The following three case studies will demonstrate how the author employed action research and Brookfield’s model for different IL sessions to improve her instructional practices.

Helping Chemical Engineering Students Obtain Better Search Results

Explaining the Context

Approximately 95 senior undergraduate students in chemical engineering at McGill University take a three-credit course on biochemical engineering topics each year. Students work on a team project as part of this course, completing in a term paper and oral
presentation on the topic selected. The project assignment entails presenting a problem with a biochemical process, discussing probable real-world issues that might happen when this process is used on an industrial scale, listing possible solutions to the problem found in the published literature, contrasting these solutions, and choosing the best along with an explanation of why it was selected. The students are required to cite at least six peer-reviewed journal articles in their papers. To help students research their topics, the course professor has invited the author for the past three years to give a class lecture on literature searching. The lecture lasts 90 minutes, the length of one class period.

Due to the large number of students, this session cannot be taught as a hands-on workshop in one of the library’s e-classrooms, as the author does for the majority of in-class IL sessions that she teaches for other courses. During hands-on workshops, she can easily apply Brookfield’s student lens by walking around during practice exercises to check whether students are encountering difficulties. But walking around is not possible in an auditorium with almost 100 students.

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Based on Stephen D. Brookfield, Becoming a Critically Reflective Teacher (San Francisco: Jossey Bass, 1995).
Defining the Problem

After first teaching the class in 2013, the author distributed a one-minute paper at the end of the lecture, asking the following questions: Was anything unclear in today’s lecture? Or, do you have any questions about anything you learned in today’s lecture? Students responded that the content was clear but that the pace was too quick at times. These responses revealed students’ opinions of the lecture; however, they did not indicate whether students actually understood what was taught and could apply what they learned to search their own topics. Teachers’ own experiences as student learners—that is, Brookfield’s autobiographical lens—tells them that there is often a gap between understanding content and applying it, which is not always easily bridged by the learner.

Therefore, the author obtained Research Ethics Board approval (REB# 518-0114) from McGill in 2014 and again in 2015 to test students during and after an IL session. In the autumn of 2014, she e-mailed the professor a link to an online survey about a month after teaching the lecture, which was then forwarded to all the students in the course. The survey asked students to describe their research topics, perform a search on their topics in Scopus (the database demonstrated in the lecture that year), copy their Scopus search history, and paste it into the survey’s form. Thirty-six students responded out of 91 students enrolled, almost 40 percent of the class. Common problems found in the responses were overly broad topics—for example, what methods are used for wastewater treatment?—and too many search results. Half of those who responded obtained hundreds or thousands of results.

Planning the Educational Intervention and Assessment

The results indicated that more time was needed on question formulation and differentiating between search techniques that provide more versus fewer search results. The author revised her lecture in the autumn of 2015 to include a group activity on question formulation, which would incorporate peer feedback, and expanded the section on how to construct search strategies. The author created a printed pre- and posttest to assess students’ understanding of lecture content, which was to be administered in class. She also modified the previous year’s online survey to connect it to the tests done in class, with the intention of sending it to students a few weeks after the session (see Table 2).

Implementation

Ten minutes into the lecture, after receiving some guidelines on defining a topic, students formed groups of five to seven people to formulate a research topic using one or more supplied words that the author had chosen from term paper topics submitted in previous years (see the author’s article “Question Formation: A Teachable Art” for more details about this activity). All the groups submitted a topic. Students voted for the best research question after they, the graduate teaching assistant, and the author had given feedback on all the topics. Students seemed to enjoy the group activity, and their remarks became more complex as the exercise progressed. The assessment of this intervention occurred as it was happening, eliciting feedback from all parties involved—that is, the students, teaching assistant, and the instructional librarian—thus incorporating the student, col-
league, and autobiographical perspectives in Brookfield’s model. The literature lens was used to help design the group activity on question formulation.

To address the problem of too many search results, the author increased the time discussing elements that affect the number of search results from 20 to 25 minutes and incorporated a third search example. The students completed a pretest at the beginning of the lecture and a posttest at the end of the lecture to assess this second intervention (see Appendix A for the pre- and posttest). The same two questions were on the pre- and posttest. The first question asked students to write out a search strategy on a sample topic, and the second instructed them to rank search statements from 1 to 4, from the strategy that would give them the most search results to the one that would give them the least. Each test took less than five minutes to complete.

Three weeks after the lecture, a link to the online survey was sent to all students in the course (see Appendix B for the survey). Like the previous year, students were asked to describe their research topics, perform a search on their topics in Web of Science (this changed from Scopus because Web of Science was the database demonstrated in the lecture in 2015), copy their Web of Science search history, and paste it into the survey’s form. The same type of ranking question was included as in the pre- and posttest, except that the research topic changed. This question was added to check whether students understood the theory. They might know search techniques and decide not to apply them to their search strategies for different reasons, for example, if they feel it is too labor-intensive to do.

Examining Collected Responses
Sixty-two percent of the students registered in the course (58 of 93) completed the pre- and posttest (see Table 3). Eighty-eight percent of the students (51 of 58) did not

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use synonyms in their search strategies at the beginning of the lecture, whereas only 14 percent (8 of 58) of the students failed to use synonyms at the end. Fifty-two percent (30 of 58) answered the ranking question correctly at the beginning of the lecture; this increased to 74 percent (43 of 58) at the end.

Three weeks later, the students had regressed to their state before the lecture; only approximately half the students who did the online survey (11 of 23) answered the ranking question correctly. However, the majority (17 of 23) still used synonyms for individual concepts in the search strategies for their topics, similar to their performance on the posttest. Among the search strategies students submitted, common issues were an insufficient number of concepts searched (12 of 23) and large search sets with over 100 results (15 of 23). Overall, the students’ research topics were more specific than in the previous year, but many did not use all the relevant concepts in their topics to do their searches and so obtained unmanageable numbers of results.

Reflecting on the Findings

Students struggle with how to increase or decrease the number of search results obtained. Twenty-six percent of the students (15 of 58) still did not understand this concept at the end of the lecture, and 52 percent of the students who completed the online survey (12 of 23) ranked the search statements incorrectly three weeks after the lecture. The knowledge that some students gained on this topic during the lecture seemed to become lost later. A frequent error was the misconception that using quotation marks in a search statement yields more results.
Based on students’ performance and her prior teaching experiences, the author plans to incorporate a hands-on activity during a future iteration of this lecture that reinforces which search techniques increase search results and which have the opposite effect. Adding concepts in a search strategy as a way to obtain a smaller and more relevant result set will also be emphasized in the exercise. This will start another action research cycle because the author will be introducing a new activity and assessing it. Brookfield’s perspectives helped identify the problem and will help, once again, to evaluate the intervention.

**Motivating Engineering Students to Learn about Standards, Codes, and Regulations**

Applying Brookfield’s lenses and undertaking action research need not be a long process. Combining both allowed the author to effect a positive change in the classroom within two days.

**Explaining the Context**

In their last year of study, most engineering undergraduates at McGill University enroll in a one-credit course that covers topics affecting the professional practice of engineers, for example, laws, project management, and interacting with clients. This course is offered each year in the fall and winter semesters, in two class sections per semester, with about 160 students registered in each section. The author was invited for the first time to teach a 90-minute guest lecture on searching for engineering standards, codes, and regulations in the winter 2014 semester. The lecture incorporated hands-on searching exercises. Even though the class was large, there were exercises in each lecture of the course to help students apply what they learned. Students used their mobile devices to complete the activities.

**Defining the Problem**

When the author taught the lecture for the first time, she observed that students were unusually silent and slow to respond to questions she asked. A one-minute paper was distributed to students at the end of the lecture, asking: (1) Was anything unclear in today’s lecture? Or, do you have any questions about anything you learned in today’s lecture? and (2) What did you feel was missing from today’s lecture and would like to learn more about? Ten students responded (about 6 percent of the class), and the consensus was that they did not understand the purpose of the lecture. They thought the lecture was teaching them something too simple, specifically how to use a search engine, which they already knew how to do. The author e-mailed the course professor the student responses and asked for the professor’s perspective, thus applying Brookfield’s colleague lens. The course professor had attended the author’s lecture, and she replied that students had trouble understanding how they could relate the content of the course lectures to the workforce because it was not a practical course, using math and science, like their other engineering classes.
The author had explained the objectives at the start of the lecture, specifically that students would be able to explain the meaning of engineering standards, codes, and regulations; understand who created them; and search for them. They would also have the opportunity to solve exercise problems relevant to their branches of engineering. Based on the experiences of the author, students, and course professor in the lecture, the explanation was not sufficient.

Planning the Educational Intervention and Assessment

The author taught the lecture to the first course section on a Wednesday and repeated the lecture to the second section two days later. She changed 15 minutes of the lecture to clearly state why students should concern themselves with the material presented and planned to redistribute a shortened version of the one-minute paper for evaluating the change. Students would only be asked to answer the first question: Was anything unclear in today’s lecture? Or, do you have any questions about anything you learned in today’s lecture? The author omitted the second question (What did you feel was missing from today’s lecture and would like to learn more about?) because she had received inappropriate answers from Wednesday’s class.

Implementation

Before starting to teach each section in the lecture, the author presented reasons for caring about the content that were related to engineers’ professional code of ethics and gaining employment. For example:

One of the reasons . . . students should care about standards was that using standards in their professional practice and advertising their use of standards to potential clients might give them an edge over their competition, since [Quebec’s] Code of Ethics of Engineers states that an engineer cannot compare his or her services to those of other engineers in advertising materials. Consequently, one possible way of differentiating themselves from their competition would be by mentioning the standards they use in their work.  

The students listened closely to the reasons presented, quickly responded to questions the author posed later, commented at different points in the lecture, and asked their own questions. Once again, the author asked students to respond to a one-minute paper.

Examining Collected Responses

Six students submitted the one-minute paper, and an equivalent number gave their feedback verbally to the author at the end of the lecture (about 7 percent of the class). The course professor also gave her feedback. The comments were positive, with many indicating that the content was clear, helpful, and interactive.

Reflecting on the Findings

A small change in the lecture content made a large difference in the classroom, going from a silent, unresponsive audience on Wednesday to an engaged, participatory audience two days later. Since then, the author has stressed the reasons for caring about
standards, codes, and regulations in this lecture and has continued to experience an animated classroom environment and receive positive student feedback over time.

The professor’s explanation of students’ interpretation of the entire course—that is, Brookfield’s colleague lens—was instrumental in this case to identify what was missing from the author’s lecture that would make it resonate with the students. The author’s autobiographical lens and the student lens identified that something was wrong, but another perspective was needed to help determine an appropriate solution.

**Preparing Graduate Students to Write a Literature Review**

Improvements in teaching are frequently considered after a class is taught to effect changes that will positively impact future sessions, but they can also be implemented in the course design stage to increase the chances of students achieving the learning objectives for the class. In addition to helping assess teaching effectiveness, Brookfield’s model can be beneficial in course preparation. Action research would then be used to address any issues that arise in the course delivery.

**Explaining the Context**

The McGill Library offers a four-part series of two-hour workshops to graduate students on how to use EndNote software to cite; where to find different types of publications, such as books, journals, patents, standards, and theses; creating advanced search strategies on a topic using keywords and subject headings; setting up alerts for database search strategies; and identifying impact measurements at the journal, article, and author level, for example, journal impact factor, citation counts, and h-index, a measurement based on both the quantity of publications by a given researcher and the number of citations the items have received. A team of librarians teaches the series because it is offered in four streams (agriculture, environmental sciences, and nutrition; health and biological sciences; humanities and social sciences; and physical sciences and engineering) to provide customized content for the different disciplines taught at the university.

After taking the series, some students asked the author, who was one of the instructors, about how to bring order to the large pool of articles they had found on their research topics and how to approach structuring the literature review sections of their thesis proposals. The author had also received comments from an engineering faculty member that students’ literature reviews did not include their interpretations and merely summarized publications. These comments led the author, in the winter 2017 semester, to create and deliver a new, 90-minute, stand-alone workshop about organizing, sum-
marizing, and critiquing studies for writing a literature review, which was open to all students. The literature review could be a section of a larger work or an entire article on its own. The first half of the workshop explained the differences between summarizing and critically commenting on studies in a literature review, as well as the importance of doing both in a review. The second half presented practical techniques for keeping track of studies found and read, for example, creating groups in EndNote and using folders and file-naming conventions.

**Defining the Problem**

The author had taught some of the content as a component of another workshop the year before in an engineering graduate course, which included database search tips. From student feedback collected in this course, about half the students found the database search tips more relevant than the other material presented. The second, frequently mentioned element that the students found useful was the presentation of the matrix method, in other words, creating a table for noting down the main points from studies read, which was the only organizing technique presented. The author was concerned that the content of this new workshop might not engage the students because there was no database searching involved and the techniques presented for keeping track of the literature might be too basic for the audience. She spoke to a close colleague about her concerns, who suggested including a think-pair-share activity in which students would be asked to pair up with the person next to them to exchange the ways they currently used to organize the papers they found, to remember the key points from articles they read, or both. This activity would be done before the presentation of techniques for staying organized. The author implemented this suggestion halfway through the workshop as the introduction to the section on keeping track of the literature found. Students had 10 minutes for the activity and were asked to write down at least two strategies on sticky notes, which the author then collected and posted at the front of the room. Due to time constraints, these strategies were compiled in a list and e-mailed to workshop participants after the session along with a short summary of the content covered. Most of the strategies submitted by the students were included in those the author presented to the class. Students were asked to answer the following question at the end of the workshop: What is the most useful technique you learned in today’s workshop about preparing for your literature review?

Twenty out of 28 attendees (71 percent) submitted their responses to the question. The majority of students listed two or more methods they learned for sorting the papers
they found. Seven students (25 percent of the class) reported mixed reactions on the first section of the workshop about summarizing and critically commenting. Some students found it useful and suggested an advanced workshop on the topic, while others did not see the relevance of critically appraising an article in their disciplines. One student stated that authors did not comment on the methodology or results of articles discussed in the theses he or she had read so far in the field. Another participant said that this section of the workshop was too general, but the same student also recognized that it had to be general to teach the material to an audience coming from various disciplines. Attendees were predominantly graduate students from mixed faculties, specifically from agricultural and environmental sciences, arts, education, engineering, science, and medicine. The author had used excerpts from evidence summaries she wrote for the journal *Evidence Based Library and Information Practice* to show the differences between summarizing and commenting. She also worked with the students to identify the strengths and limitations of a short research article from *Nature Nanotechnology*. The topics discussed in the excerpts and article could be easily understood by general readers or nonexperts.

### Critical appraisal of an article was presented as one method alongside other strategies

Critical appraisal of an article was presented as one method alongside other strategies, such as describing what was interesting or novel in the studies selected for the review, explaining why the studies were chosen, or presenting the literature by category or theme to support the objective of the review.

### Planning the Educational Intervention and Assessment

The author was scheduled to repeat the workshop a week later and made some minor modifications to improve the delivery of the content. She condensed her explanations in the first half of the workshop to add a five-minute section on other ways, besides critical appraisal, to comment on the studies selected for inclusion in a literature review. This new section was to clearly show students how they could make their own original thinking come through in a review. The students would be given the same one-minute paper question to provide feedback on the session.

### Implementation

After discussing the differences between summarizing and critiquing studies, and before performing the critical appraisal jointly on the *Nature Nanotechnology* article, the author presented concrete strategies for communicating one’s own interpretation of the topic when writing a literature review. Critical appraisal of an article was presented as one method alongside other strategies, such as describing what was interesting or novel in the studies selected for the review, explaining why the studies were chosen, or presenting the literature by category or theme to support the objective of the review.

### Examining Collected Responses

Sixty-five percent of students (31 out of 48 workshop attendees) answered the one-minute paper question. Once more, most students indicated methods for organizing
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papers as the most useful knowledge they gained from the session. Ten students (21 percent of the class) mentioned something they learned from the half of the workshop about summarizing and critiquing. Unlike the first time the workshop was given, all the comments about the synthesizing and commenting sections of the session were positive. The make-up of the class was similar to the previous session, that is, predominantly graduate students from different faculties.

Reflecting on the Findings

The combination of Brookfield’s model and action research in this case study enabled the author to design and effectively revise a new workshop to enhance students’ learning experience. She created the workshop content by bringing in all four of Brookfield’s lenses: the autobiographical, student, colleague, and literature perspectives. The author described some of her own research projects in the workshop to illustrate how she used the specific strategies taught. Students’ feedback from a previous course, which included some of the same content, was considered. A colleague’s suggestion for a group activity was incorporated into the workshop, and the author read textbooks on writing literature reviews to assist her in developing the content. The steps in the action research process guided the author in implementing modifications to improve the delivery of the session and in evaluating the effectiveness of these changes through Brookfield’s student lens.

The workshop is ready for delivery again in the future. The author will continue to solicit feedback from students and take note of comments and questions raised during the session to identify any problems that arise. She also plans to invite a lecturer from the university’s writing center to observe the workshop and share teaching strategies because there may be more effective ways to teach some of the challenging material in the session.

Lessons Learned

Applying Brookfield’s model and undertaking action research to improve teaching practices require one or more assessment tools for implementation. In the first case study, the author used multiple assessment tools for a 90-minute lecture to assess an intervention. These tools were a printed pretest, a peer-feedback activity, a printed posttest, and an online survey (see Table 2). The lessons learned from employing these tools in the same class are as follows:

- Administer a short pretest and posttest to assess whether students’ knowledge gain is a result of the IL session rather than prior knowledge of the topic. The tests can take less than five minutes each to complete.
- Budget 5 to 10 more minutes in class than originally planned for a peer-feedback activity. The size of the class and the level of student engagement will affect the time to complete the activity.
- Decide how to deal with inappropriate or bogus answers ahead of time for peer-feedback activities that report out to the class. For example, during the research question formulation activity in the first case study, one group submitted a question of a sexual nature using two of the words that the author supplied for the
exercise. The author just announced to the class that they would skip commenting and voting on that question.

- Offer small incentives to encourage students to complete assessments and to thank them, such as giving away chocolates or other candy, food coupons, thumb drives, or dollar store prizes for the winning group of a peer-feedback activity. The prize can also be intangible, such as awarding the winning group an honorary title.

- Use colored paper when distributing an assessment in print. This increased the response rate in the author’s IL sessions because students tend to feel uncomfortable walking out the door with a colored form in their hands when they were asked to complete and submit it. Any light-colored paper that allows text to be easily read will work—blue, green, pink, yellow, or the like.

- Provide a feedback method on students’ search strategies that preserves their anonymity. In the online survey distributed in the first case study, students had the option to receive feedback on their search strategies from the author. Because the survey was supposed to be anonymous, the author arranged for students to pick up the feedback by the date and time that the survey was submitted (see the end of the survey in Appendix B for the instructions given to the students).

- Develop a grading rubric to enable a consistent evaluation of students’ search strategies because many correct answers are possible. A rubric is a grading instrument “for qualitative rating of authentic or complex student work” that “includes criteria for rating important dimensions of performance, as well as standards of attainment for those criteria.”42 As a future area of research, the author is developing a rubric for evaluating students’ search strategies for her IL sessions to help gain an objective picture of the performance of the entire group of students that attended a session, rather than just that of individuals.

## Conclusion

Employing Brookfield’s lenses to critically reflect on one’s teaching practices will help identify elements that need improvement. Keeping a teaching log, completing a teacher learning audit, asking to be recorded, writing a survival advice letter, asking students to complete a one-minute paper, administering a Critical Incident Questionnaire, allowing hands-on practice time during an IL session, reviewing students’ assignments, asking colleagues to peer review a session or teaching materials, forming a clearness committee, and looking to the published literature are different methods that librarians can use to obtain feedback on their instruction. When problems are identified in the feedback and changes are needed to solve them, engaging in action research will assist in implementing and assessing the intervention. The cyclical process of action research means that educators can modify and revise the next round of planning, implementing, and testing an intervention based on the previous findings. Through the knowledge gained from consulting multiple perspectives and implementing changes in the classroom, combining critical reflection and action research will enable librarians to improve their pedagogy.

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Appendix A

Pretest and Posttest

[Course Number] Searching Lecture: Questionnaire

Answer questions 1 and 2 at the beginning of the lecture.

1. Suppose you need to research the following topic for a term paper.
   Topic: Role of cold temperature on the transport and survival of bacteria in an aquatic environment
   Write a search strategy that would enable you to find relevant articles on this topic in a database, i.e., what would you type in the search box?

2. Here’s another research topic:
   Topic: Effect of eating cranberries or drinking cranberry juice on the motility (motion) of uropathogens (urinary tract bacteria) in the body
   Rank the following search strings from 1–4, from the strategy that would give you the most search results (1) to the strategy that would give you the least search results (4).

   ____ cranberries AND uropathogens AND motility
   ____ cranberr* AND (uropathogen* OR Escherichia coli OR urinary tract infection* OR urinary tract bacteria) AND (motil* OR spread* OR swarm* OR swim* OR in-vivo)
   ____ cranberr* AND uropathogen* AND motil*
   ____ cranberr* AND (uropathogen* OR “Escherichia coli” OR “urinary tract infection” OR “urinary tract bacteria”) AND (motil* OR spread* OR swarm* OR swim* OR in-vivo)

Answer questions 3 to 6 at the end of the lecture.

3. Suppose you need to research the following topic for a term paper.
   Topic: Role of cold temperature on the transport and survival of bacteria in an aquatic environment
   Write a search strategy that would enable you to find relevant articles on this topic in a database, i.e., what would you type in the search box?

4. Here’s another research topic:
   Topic: Effect of eating cranberries or drinking cranberry juice on the motility (motion) of uropathogens (urinary tract bacteria) in the body
   Rank the following search strings from 1 to 4, from the strategy that would give you the most search results (1) to the strategy that would give you the least search results (4).

   ____ cranberries AND uropathogens AND motility
   ____ cranberr* AND (uropathogen* OR Escherichia coli OR urinary tract infection* OR urinary tract bacteria) AND (motil* OR spread* OR swarm* OR swim* OR in-vivo)
cranberr* AND uropathogen* AND motil*

cranberr* AND (uropathogen* OR “Escherichia coli” OR “urinary tract infection” OR “urinary tract bacteria”) AND (motil* OR spread* OR swarm* OR swim* OR in-vivo)

5. Do you give Giovanna Badia permission to include your responses to the questions above in a publication and/or presentation that discusses the evaluation of library workshops? (Circle one answer.)

Yes

No

Note that the two questions below will be asked again on an online survey (which will be distributed in a few weeks) in order to link the responses from this questionnaire to the survey. The questionnaire and survey responses will be linked to check for any differences in individual search skills between now and the day that the survey is completed.

What is the name of the school where you attended grade 1?

What is your favorite number?

Thank you.

Appendix B

Online Survey

Assessment of [Course Number] Literature Searching Workshop

This survey will help determine whether you used and can apply what you learned about literature searching in class to researching your own topics.

Consent for Research Study Participation

Project Title: Authentic Assessment of Literature Searching Workshops

Principal Investigator: Giovanna Badia

Department: McGill Library

E-mail: giovanna.badia@mcgill.ca

1. Volunteers are sought to participate in a research study, which will help determine whether students used and can apply what they learned about literature searching in class to researching their own topics. Participation in this research study involves completing this 7- to 10-minute survey. Volunteers who complete this survey will receive a $10 gift card to Tim Hortons [a restaurant noted for its coffee and doughnuts]. Responses to this survey are anonymous, and there is no obligation to participate.

The investigator may summarize the results of this survey in a journal article and/or conference presentation about evaluating library instruction. Any personal informa-
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I have read the consent statement listed above.

2. By completing this survey, you give Giovanna Badia permission to summarize your anonymous responses in a publication and/or presentation that discusses the evaluation of library workshops.

Please choose only one of the following:

☐ Agree
☐ Disagree

Your Searching Experience

[Author’s Note: Questions 3–5 were used in the assessment of the lecture in 2014 because a pretest had not been distributed. These questions were included again in 2015 for consistency. The responses obtained are outside the scope of this paper.]

3. Where have you searched for scholarly or peer-reviewed articles on the research topic for your project? (Select as many as apply.)

Please choose all that apply:

☐ Google
☐ Google Scholar
☐ Scopus
☐ Web of Science
☐ Applied Science & Technology Full Text
☐ Compendex (Engineering Village)
☐ Environmental Sciences & Pollution Management
☐ GeoRef
☐ Materials Research Database
☐ PubMed
☐ ScienceDirect
☐ SciFinder
☐ I haven’t started researching my topic
☐ Other, please specify:
4. Excluding Giovanna’s session in your class this semester, have you attended other workshops or lectures about searching for articles on a topic in the past year?

Please choose only one of the following:
- Yes
- No
- I don’t remember

5. Where did you find relevant articles on your project topic? (Select as many as apply.)

Please choose all that apply:
- Google
- Google Scholar
- Scopus
- Web of Science
- Applied Science & Technology Full Text
- Compendex (Engineering Village)
- Environmental Sciences & Pollution Management
- GeoRef
- Materials Research Database
- PubMed
- ScienceDirect
- SciFinder
- I haven’t started researching my topic
- Other, please specify:

6. Suppose you need to research the following topic for a term paper.

Topic: Effective solutions for disposing of medical waste produced from treating patients with infectious diseases

Rank the following search statements from 1–4, from the strategy that would give you the most search results (1) to the strategy that would give you the least search results (4).

____ dispos* AND medic* AND wast* AND infectio*

____ (dispos* OR remov*) AND (medic* OR clinic* OR health care OR hospital*) AND (waste OR hazardous material*) AND (infectio* OR communicable disease*)

____ disposal AND medical AND waste AND infections

____ (dispos* OR remov*) AND (medic* OR clinic* OR “health care” OR hospital*) AND (waste OR disposal OR “hazardous material”*) AND (infectio* OR “communicable disease”*)
Your Search Topic and Strategy

7. Describe your research topic.

8. Please search Web of Science [hyperlinked] for articles on your research topic. After obtaining relevant results on your topic, copy the strategy from your best search set by following these instructions:

   • Click on the “Search History” link on the top right-hand corner of the Web of Science website.

   • Highlight the entire statement of your most relevant search set. Example: TOPIC: (biosurfactant* OR rhamnolipid*) AND TOPIC: (oil spill* OR petroleum spill*) AND TOPIC: (“clean up” OR cleanup OR recovery OR bioremediat*)

   Refined by: LANGUAGES: (ENGLISH)

   Copy the entire search statement (select Edit > Copy from your browser menu).

   • Paste the search statement in the box below (select Edit > Paste from your browser menu).

9. Would you like feedback on your Web of Science search strategy for your research topic?

Please choose only one of the following:

☑ Yes
☒ No

Linking Back to the Workshop Print Questionnaire

Note that the questions in this section were asked in the print questionnaire distributed in class. These questions will be used to link responses from this online survey to the print questionnaire to check for any differences in individual search skills between the workshop and the present time. The answers to these questions will be kept confidential.

10. What is the name of the school where you attended grade 1?

11. What is your favorite number?

Thank you for your participation. Please make a note of the date and time that you submitted this survey.

Your $10 Tim Hortons gift card will be available at the front desk of the Schulich Library of Physical Sciences, Life Sciences, and Engineering ONE weekday after completing this survey, filed under your completion date and time. If you requested feedback on your search strategy, the feedback will be attached to the gift card.

When you come to pick up the gift card, please say that you completed the literature searching survey and state the date and time that you submitted it.
Notes
5. Ibid., 283.


27. Ibid., 72–75.

28. Ibid., 75, 82.

29. Ibid., 78.

30. Ibid., 92–94.


33. Brookfield, Becoming a Critically Reflective Teacher, 314–16.


35. Gilstrap and Dupree, “A Regression Model of Predictor Variables on Critical Reflection in the Classroom,” 469–81; Brookfield, Becoming a Critically Reflective Teacher, 35–36.


37. Brookfield, Becoming a Critically Reflective Teacher, 37.


41. Giovanna Badia, “Listen Up, Everyone! Conquering Students’ Inattentiveness When You’re the Guest Lecturer,” Issues in Science and Technology Librarianship 80 (Spring 2015), doi:10.3062/1FDJ5CMV.