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Problem-Based Learning and Information Literacy

A Natural Partnership

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Due to student overreliance on search engines and the time constraints of one-shot instruction sessions, librarians struggle to teach many of the information literacy skills that students need to conduct successful research. Problem-based learning (PBL) provides a way to integrate information literacy naturally into an assignment or course by guiding students through the research process as they work to find a solution to a problem. This article first explains the PBL process, then describes the design and implementation of a PBL project in a required first-year general education course. Finally, it details the Association of College & Research Libraries' (ACRL) *Information Literacy Competency Standards for Higher Education* addressed by the project, as well as possible future modifications.

Introduction

In an age of Googlitis where students turn first to Google and other search engines for all their research needs, information literacy skills are of increasing importance (Leibiger, 2011). Traditional methods of library instruction (e.g., lecture-based) show varying degrees of success in helping students develop these skills. Spence (2004) enumerated many failed attempts to help students gain research skills, especially the ability to evaluate information. There are also a variety of drawbacks to lecture-based instruction in any classroom, including difficulty maintaining student attention and a lack of student motivation (Lorenzen, 2001). In addition, an overemphasis on information retrieval techniques in traditional library instruction may leave students without a broader understanding of research as an ongoing, iterative process (Paterson & Gamtso, 2012). Consequently, librarians are always looking for new and engaging information literacy delivery techniques.

Problem-based learning (PBL), as an active-learning, student-centered technique, presents an intriguing option. Active-learning techniques motivate students and maintain their attention by requiring them to engage in course content beyond simply listening to lectures (Lorenzen, 2001). PBL takes the focus away from the task-based process of information retrieval and places it on developing an understanding of the research process as a whole. Information literacy skills, such as the evaluation and synthesis of information, are naturally incorporated throughout a PBL assignment. Studies have shown that student engagement and participation is higher in PBL-based instruction sessions than in lecture-based sessions (Munro, 2006; Paterson & Gamtso, 2012).

Motivated by the desire to try something new in library instruction as well as to find different ways to integrate information literacy into courses, I participated in the PBL Faculty Fellows Program offered at Chatham University. Designed by Chatham Physician Assistant faculty as a result of the successful use of PBL with their students, the fellows program was developed to assist other faculty with the implementation of PBL in their courses. While librarians do not have faculty status at Chatham, I requested and was granted permission from the Assistant Vice President of Academic Affairs to apply to the program. The program is a two-year commitment, which includes a two-day immersive training along with guidance in the development and implementation of a PBL scenario in a credit-bearing course. Since I do not teach a course, I partnered with a faculty member to create and embed a PBL assignment into one of his.

Literature Review

Problem-based learning was developed by McMaster University in the late 1960s out of a desire to move away from the traditional teaching techniques used with medical students at that time (Neufeld, Woodward, & MacLeod, 1989). Leibiger (2011) described this "old paradigm" of lecture-based instruction as involving the "passive absorption of information" imparted by a single expert (pp. 191-192). PBL falls into a newer category of active-learning techniques that help students to develop higher level cognitive abilities, such as critical thinking and problem solving, through collaborative group work and reflection on their own learning. These techniques take students' existing knowledge into consideration and emphasize research as an ongoing process (Leibiger, 2011).

With PBL, students learn primarily through the completion of an authentic assignment, namely the search for a solution to a real-world problem (Carbery & Hegarty, 2011; McDevitt, 2013). Unlike more traditional teaching techniques where the instructor leads the class, the instructor's role in PBL is "to guide and support the learning process" (Carbery & Hegarty, 2011, p. 30). The instructor probes students with questions while they work to determine what knowledge they already possess about a problem and the additional information they will need to solve it. The students then locate that needed information, incorporate it into the information they already know, and use it to arrive at a solution. In this way, PBL gives students ownership over their own learning, and it is often described as a form of self-directed learning (Carder, Willingham, & Bibb, 2001) or student-centered learning (Hasman, 2012).

The actual execution of a PBL assignment varies. Most PBL scenarios require small groups of students to work together to find a solution to a complex problem. Groups larger than eight students usually become unwieldy. The duration of a single PBL scenario ranges in length from a 50-minute class period (more common for library instruction, such as in Carbery and Hegarty's 2011 study) to a series of several class periods. Some institutions, especially medical schools, have full courses or even entire curricula that heavily utilize PBL (Albanese & Mitchell, 1993). Many assignments can be converted into PBL projects. For example, Macklin (2008) described a service-learning project during a first-year orientation that helped students learn about common college health issues by asking them "to design a brochure to educate next year's freshmen about the dangers of binge drinking and STDs on campus" (p. 240).

In addition, the structure of PBL naturally incorporates many of the aspects of information literacy enumerated in the Association of College & Research Libraries' (ACRL) *Information Literacy Competency Standards for Higher Education* (www.ala.org/acrl/standards/informationliteracycompetency). For example, Neufeld et al. (1989) delineated one of the "key features" of the McMaster program as "the development of independent, lifelong learning skills by students" (p. 424). Later modifications to the McMaster PBL curriculum included additional focus on evaluating the validity of the information found and "the ability to acquire, interpret, synthesize, and record clinical information" (p. 426). In a review of the literature on the use of PBL in medical schools, Albanese and Mitchell (1993) found that students in PBL courses used library resources at a much higher rate than did those who were not in PBL courses. In addition, in their study using PBL for library instruction in a first-year composition course, Paterson and Gamtso (2012) observed that "the gradual introduction of resources through scaffolded workshops led to students having a high comfort level with library resources" (p. 124). Clearly, this is a teaching technique that lends itself well to the development of information literacy skills.

Librarians have utilized PBL in library instruction to varying degrees. Several studies involved the use of PBL in one-shot or a short series of instruction sessions, either designed entirely by librarians (Carbery & Hegarty, 2011) or created by faculty and librarians working together (Cheney, 2004; Fosmire & Macklin, 2002; Paterson & Gamtso, 2012). Other studies have incorporated library instruction into a PBL project in a course. For example, Cook and Walsh (2012) worked together to redesign an existing PBL project in Walsh's course and incorporate two library instruction sessions designed to help students locate the information they needed. Bowler and Street (2008) also worked together to design two 90-minute library instruction sessions to help students solve a problem assigned in the course.

Finally, some studies have taken this one step further and fully involved the librarian in the PBL project and even occasionally in the entire course. In one example, faculty members in a dental program requested Hasman's (2012) assistance in the development of library-related aspects of a problem, as well as in the actual design and implementation of the PBL scenario. Hasman then went on to serve as a facilitator to one of the nine groups of students participating in the course. Bowler and Street (2008) reported on an experiment in which a librarian and faculty member co-taught a course that used PBL techniques and thoroughly integrated information literacy.

Many of these studies show that student engagement, motivation, and learning are positively correlated with the use of PBL. In an evaluation given after a one-shot PBL workshop, Carbery and Hegarty (2011) found that 97% of the students felt the workshop was practical and useful, and 98.5% reported a high comfort level with using library resources for their assignment. To assess the results of PBL in a semester-long course, Macklin (2008) used think-aloud protocols, which required students to narrate their internal thought processes as they completed tasks, and interviews. She also had students complete the *iSkills*™ assessment at the beginning and end of the course. While she found no significant improvement on the *iSkills*™ assessment, the interviews and think-aloud protocols showed that students were better able to define their own research goals and to create more effective search strategies as the course progressed. Other studies reported results that were more anecdotal in nature. Cheney (2004) stated that after a 60-minute PBL assignment asking students to search for information in a particular resource, students were able both to find the answer to a research question and to point out database features that librarians usually demonstrate in instruction sessions. Paterson and Gamtso (2012) also found students to be highly engaged with and motivated by PBL—to the point where they developed additional research questions out of their own curiosity and personal investment in the topic.

Literature comparing PBL methods to traditional lecture-based library instruction is limited. Hsieh and Knight (2008) conducted a study with first-year engineering students in which they gave students a post-test designed to assess students' application of the skills learned. They found that students receiving PBL library

instruction scored higher than students receiving lecture-based instruction. However, due to the small population size and other limits of the study, they concluded that more research was needed.

Several studies also found support for librarians' involvement in PBL. Student evaluations were very positive about Hasman's (2012) role as a facilitator of a PBL group. During her two semesters as facilitator, she received a 3.2 average out of 4 and a 4.8 out of 5, respectively, on an evaluation measuring fairness, organization of class time, effective communication of information, and more. Bowler and Street (2008) looked at the impact of the level of librarian embedment in semester-long courses. In all courses studied, a librarian helped design the PBL assignments. However, the degree of embedment varied—from a one-shot instruction session to librarians meeting with student PBL groups for at least six sessions in a semester to a librarian co-teaching the entire course. They found that "generally as the level of librarian embedment increased[,] students' performance on the research component of the rubric increased as well" (p. 443).

One of the challenges of PBL is that a strict definition is not available and its implementation varies widely, as shown in the above studies. As Albanese and Mitchell (1993) noted in their review of the use of PBL in medical schools from 1972 to 1992, "defining what exactly constitutes PBL was a confusing and somewhat contentious task" (p. 53). In the years since they conducted their literature review, the definition does not seem to have grown clearer. However, most PBL designs seem to share certain characteristics as discussed below.

The Problem

PBL is centered on students solving a problem that is open-ended, ambiguous, complex, and engaging (Enger et al., 2002; Kenney, 2008; Leibiger, 2011; Macklin, 2001). In some PBL scenarios, such as those used in the medical fields, complexity arises from the wide variety of available information that students must use to arrive at a single answer, such as a diagnosis. However, in many other fields, there is often not "a single correct answer" (Hsieh & Knight, 2008, p. 26), leaving students open to the pursuit of a variety of existing research and possible solutions. The problem is also often described as real-life or real-world in that it should be something students are likely to encounter outside of their college studies—perhaps in a future job or volunteer experience (Albanese & Mitchell, 1993; Leibiger, 2011).

In most studies, the librarian(s), either alone (Kenney, 2008; Macklin, 2001) or in conjunction with a faculty member (Bowler & Street, 2008; Cook & Walsh, 2012; Fosmire & Macklin, 2002; Hasman, 2012), created a detailed problem for students to solve. One exception was Fosmire and Macklin (2002), who started with the general problem of global warming. They then allowed student groups to choose the solution to global warming they thought would be most effective. More specific problems have asked students to find evidence that Tim Berners-Lee invented the Internet (Cheney, 2004), to pretend that they are advisors to politicians who need reliable information for a speech (Kenney, 2008), and to research medical symptoms to determine the cause (Carder et al., 2001). Hot topics in the news, such as environmental and political issues, make great sources of problems for PBL scenarios.

Facilitator

One of the key differences between traditional lecture-based teaching and PBL is the role of the facilitator. Instead of directing the process, the facilitator promotes a student-centered approach by asking questions to encourage discussion and probe the students for information. This can be one of the most challenging aspects because it is an unfamiliar role for many instructors. A conscious effort is required to turn all questions back toward the students (Pelikan, 2004). Indeed, the extent to which the facilitator directs the PBL process varies widely from study to study. The PBL Faculty Fellows Program at Chatham strongly emphasized that the facilitator avoid providing information or giving any indication of whether students are on the right or wrong track. In the Physician

Assistant curriculum where PBL scenarios consist of a simulated interview with an ill patient, students occasionally arrive at a wrong diagnosis. If this occurs, students are given the correct answer and are expected to spend time researching their errors.

However, in a study by Hasman (2012), the facilitator's role "was to encourage discussion and ensure that the students were heading in the right direction" (p. 339). Other studies have questioned whether more input from a knowledgeable facilitator would be beneficial. Albanese and Mitchell (1993) reported that some studies found that students were more satisfied with the PBL experience when facilitators were more directive in their approach. In addition, Munro (2006) noted that modifying PBL to be more directive by giving students specific tasks to complete allowed for more material to be covered in a one-shot instruction session.

One benefit of the facilitator role stressed in Chatham's PBL fellows program is that it does not require subject expertise, thus making it easier for a librarian to serve as a facilitator in a course. In fact, as Hasman (2012) noted, librarians are even uniquely qualified to play the role of the facilitator due to PBL's emphasis on information literacy skills. Librarians spend a lot of time helping students refine topics, determine information needs, and evaluate the information they find—all things that take place during PBL.

Goal Setting

In order to increase student investment, the PBL process asks students to define their own goals for the overall experience, as well as for individual group meetings. As Macklin (2001) pointed out, students are likely to learn more if they understand the purpose of what they are doing. Further, students who have had a hand in defining their own learning goals are even more likely both to understand and to feel engaged with the process. Facilitators should refer back to student goals frequently to validate them and encourage the students to achieve them.

Learning Issues

PBL's emphasis on self-directed learning is what makes it different from other active-learning methods (Carder et al., 2001). This self-directed learning occurs through students' identification of what they already know about the problem at hand, what additional information they need to know to solve it (often called their learning issues), where to go to find that information, and how to evaluate the information found. This process may repeat many times throughout the overall PBL project as students share information, realize they still have knowledge gaps, determine what additional information is still needed, and seek out that information.

This part of the process is extremely information literacy intensive. Students are expected to think critically about the information they find. Neufeld et al. (1989) enumerated several skills they wanted students to develop, including the ability to evaluate the validity and relevance of the data found, incorporate the information into their existing knowledge base, and understand where their knowledge was lacking and consequently bolster it. Facilitators can probe as deeply as they want as to where students found the information, why they chose the sources they did, what they thought about the quality of those sources, whether or not they should use different sources in the future, and so on.

Student Roles

In order to keep track of the information students already know, along with their goals and learning issues, one student functions as a scribe or secretary. Chatham's PBL fellows program emphasized that this role should be voluntary and rotate among the students as a way to encourage all students to become involved in the PBL process. Other PBL scenarios have included different roles. Macklin (2001) discussed the importance of including a group

leader, which is the student with the greatest familiarity with the problem and/or the information literacy skills needed to find the appropriate information. She also mentioned that most groups would benefit from a devil's advocate as well. In one-shot sessions, Kenney (2008) recommended the role of presenter, which is a student who reports the information found by the group back to the class as a whole.

In addition, peer mentoring is a key component of the PBL method (Macklin, 2001). This is especially true for the information literacy portion of the process. Students who know more about finding high-quality resources can assist the other students. This is a way to take advantage of the well-known trend in which students consult classmates and friends for research assistance much more frequently than they consult librarians (Head & Eisenberg, 2010).

Assessment

Assessment is incorporated throughout the PBL process (Neufeld et al., 1989). The Chatham PBL method includes face-to-face feedback to simulate performance evaluations, which students are likely to encounter in future jobs and other activities. Students evaluate themselves and each other on various criteria periodically throughout the PBL scenario. The facilitator also evaluates each of the students and is evaluated by them. Additionally, several PBL proponents advocate for a self-reflective assignment after the PBL process in which students write about their experience, what they learned, and how well they did (Cook & Walsh, 2012; Enger et al., 2002). Lastly, PBL assignments are usually assessed in more traditional manners as well. Grades are assigned to the final product, be it a paper, presentation, or simply the correct answer.

Challenges of PBL in Library Instruction

Several aspects of PBL make it challenging to implement. One of the largest barriers is the time involved. As Cheney (2004) pointed out about her experience with PBL, "the single most valuable insight librarians may gain from this pilot project is the amount of time it will take for a librarian and an instructor to come to an agreement on how to approach an assignment using PBL" (p. 505). As an alternative to a multi-class PBL scenario involving faculty-librarian collaboration, there are a number of articles that provide thorough outlines detailing the creation of a PBL one-shot instruction session (Enger et al., 2002; Kenney, 2008; Macklin, 2001; Munro, 2006).

An additional challenge is that most PBL designs are intended for small groups of students. However, in their discussion of a PBL variant called case-based, problem-based learning (CBPBL), Carder et al. (2001) provided an example in which CBPBL could be used in large groups. This method would commence with the introduction of a problem and a discussion of its various aspects in the large group. Then students could subdivide into smaller groups for further discussion and research into possible solutions.

Benefits of PBL in Library Instruction

The benefits of PBL are numerous. It provides the opportunity to teach students information literacy skills as a fully integrated and natural part of a research assignment instead of as a one-off instruction session that feels detached from the overall process. It is also a great option for teaching information literacy to uninterested students who believe they already know how to find the information they need (Macklin, 2001). As Spence (2004) argued, students learn by adding new information into their existing knowledge base. PBL provides a way for instructors to gain an understanding of the knowledge students already possess on a topic and then probe them with questions to help them to fill in the blanks.

PBL also promotes lifelong learning by helping students move from the memorization of facts (Hasman, 2012) to "learn[ing] how to learn" (Spence, 2004, p. 491). Most employees will be expected to learn new skills and

information throughout their careers. PBL provides practice with this process by helping students to identify what they know, figure out what they do not know, and learn how to find that information. As several researchers have pointed out, PBL also provides an opportunity to reach students with many different learning styles (Carder et al., 2001; Macklin, 2001).

Lastly, librarians almost always wish for more time with students to cover important aspects of information literacy. At the same time, course instructors have a large amount of discipline-specific content to cover, and inviting outside presenters into a class infringes on that time. Consequently, instructors are often less than eager to devote multiple class sessions to library instruction (Bowler & Street, 2008). PBL provides one possible solution by integrating information literacy skills into the course content faculty need to address.

The Project

As mentioned previously, the implementation of a PBL assignment in a course was a required part of the PBL fellows program at Chatham University. This involved recruiting a faculty member willing to change a course to include a PBL scenario. I have worked with Dr. Lou Martin, Assistant Professor of History, in his required first-year general education course, IND108: Gender & Contemporary Social Issues, for several years. Dr. Martin's interest in modifying each iteration of the class in order to provide the best learning experience for his students makes him a particularly appealing collaborator.

In late fall 2012, we worked together to create an outline of a PBL project to take place over five 75-minute class periods at the end of his spring 2013 course. We continued to adjust the outline into the spring semester and also while the PBL assignment progressed. This was a fairly time-intensive process. Due to the many steps involved in PBL and the desire to ensure consistency among facilitators, the outline was highly detailed and included estimates of the amount of time each step should take. Additional documentation was required as well, such as guidelines for the facilitators who were not trained in PBL.

Because PBL works best with small groups of students, Dr. Martin divided his class of 24 students into three groups of eight—based on the students' preferences for three broad topics: gender inequality, sexual inequality, and racial inequality. Dr. Martin and I each facilitated one of the groups. For the third group, we recruited a student in the Master of Education program and another librarian to share the responsibilities.

The IND108 Problem

Contrary to the more traditional PBL scenarios found in the early medical literature, this project involved a problem that was much less well-defined. From the broad topics of sexual, gender, and racial inequality, the student groups each had to decide on a specific problem to address. The students in the sexual inequality group focused on marriage equality, the gender inequality group addressed the problem of unequal pay between men and women, and the group with racial inequality chose to address racial representations in the media. The students then had to create a presentation to raise awareness of the issue and convince their classmates of their issue's importance. They also designed a campaign proposal that they could carry out to help address these problems. The PBL module was designed to build upon and reiterate much of the course content Dr. Martin had addressed earlier in the semester.

Class 1

The first class period opened with introductions to help everyone in the group get to know each other. The facilitator followed this with an overview of the PBL process to give students a sense of what to expect. Next, a student scribe recorded the group's discussion of their goals for the overall PBL exercise on a flip chart placed on an

easel. The flip chart provided an easy way to save the information recorded by the students and bring it to each group meeting.

Students were then prompted with a question about the ways in which they could ensure equality within their group. This discussion concluded with the creation of the role of a moderator, which is not traditional to PBL. This role rotated among the students throughout the PBL exercise and required them to mediate group interactions to maintain equality. In a sense, this is usually one of the facilitator's responsibilities, since the facilitator aims to make sure all group members feel welcome and comfortable participating in group discussions.

Finally, the students addressed the broad type of inequality (gender, racial, or sexual) that was the focus of their group. They spent time brainstorming possible topics within the overall topic and then discussed which subtopic they wanted to attack or change in some way. The class concluded with students determining what they felt they needed to know about their chosen subtopic in order to solve the problem inherent in it.

Class 2

This class started with a discussion of the learning issues from the end of the previous class and the relevant information the students located on these learning issues during the previous week. Then, the groups discussed where they found the information with an emphasis on the quality of their sources. The facilitators asked the students which characteristics led them to deduce the quality of the information and prompted them to think about additional sources to consult. The facilitators did not tell students which types of resources they needed to use but rather questioned them about which would be appropriate and why. All students had attended a traditional lecture-based library instruction session the previous semester, so the hope was that they would apply the information they had already learned in that session to the task at hand and then expand upon it.

Next, the facilitators described the final assignments the students would create, both the presentation to raise awareness and the campaign to affect change. More time was allotted for them to think about any additional information they might need.

The facilitators then introduced students to the idea that they would evaluate each other during the next class meeting. They asked students what feedback would be most useful to them. In at least two of the groups, students felt it would be helpful to evaluate how well everyone in the group communicated and was respectful and open-minded. Finally, the facilitators described the format of the feedback. Students would be expected to evaluate themselves, all the other students in the group, and the facilitator. The facilitators would also evaluate themselves and all the students in the group. The feedback was to be face-to-face and to include both a rating and a rationale to support it. The three-point rating scale used the broad categories of *exceeds expectations*, *satisfactory*, and *needs improvement*.

Class 3

This class again began with a review of information found on student learning issues, then moved into the face-to-face evaluations. The students were evaluated on two categories, one for participation and one for respectful and open-minded communication. The initial PBL outline had included the category for participation, and student discussions in class 2 resulted in the development of the second category. The facilitators were evaluated on a category defined as *climate setting,* which addressed the degree to which they encouraged group feedback and created a safe and comfortable environment for the PBL experience.

Next, the facilitators prompted students to think about which pieces of information would be most effective in raising awareness and convincing others of the importance of the inequality issue. Finally, the facilitators told the students they would be giving a 10-minute presentation the following week to raise awareness about their topic.

Class 4

Each student group gave the 10-minute presentation. All students viewing the presentations responded to two prompts: "What I found most compelling from the presentation..." and "What I found least compelling...." Student groups then reviewed the feedback and decided how they could improve their presentations. Finally, they started to develop a campaign for their inequality issue.

Class 5

During the final class, each student group gave two presentations: one that was revised from the previous class and another that proposed a campaign to take action about the inequality issue. To give the presentations a more authentic feel, Dr. Martin recruited a board member from a local social justice center to view them and provide feedback.

Assessment

Dr. Martin took primary responsibility for assigning student grades with input provided by the other facilitators. Students were graded on their participation, their presentations, a one-page handout to accompany one of the presentations, and a reflection paper. The facilitators provided information in support of the students' participation grades. This included general attendance as well as the results of the face-to-face evaluations from class 3. Dr. Martin graded student presentations on design, polish, research consulted, and how well they met group goals. For the reflection paper, he gave students full credit as long as they wrote 900 words about the PBL exercise.

While all groups completed the required handout and presentations, the group that focused on unequal pay for men and women stood out. Since Chatham University's undergraduate college is a women's college, the students in this class were all female. It is possible that the gender inequality students were more engaged and motivated than the other groups because as women, they would all be likely to be directly affected by this issue when they enter the workforce. In the other two groups, it was unlikely that all group members would be directly impacted by the issues selected, although many clearly had friends and/or family who might be affected.

Discussion

ACRL Information Literacy Standards

The PBL format used in this project touched on four of the five *Information Literacy Competency Standards for Higher Education* developed by the ACRL. Through the iterative process of determining learning issues, students engaged in standard 1: "The information literate student determines the nature and extent of the information needed" (Association of College & Research Libraries, 2000, p. 8). Performance indicators 1, 2, and 4 were addressed through the recognition that information was needed (indicator 1), the identification of potential resources (indicator 2), and the conclusion that additional information was required (indicator 4).

The students also worked toward meeting standard 2: "The information literate student accesses needed information effectively and efficiently" (Association of College & Research Libraries, 2000, p. 9). The facilitators did not attempt to ascertain whether or not students found the information "efficiently." However, discussions about where they found the information revealed the variety of resources they used, which included library subscription databases, websites found through Google searches, and Wikipedia (indicator 3). Probing questions were used to help them think of other resources to consult (indicator 4). Students worked toward accomplishing indicator 5 by

managing the information they found. Contrary to more traditional library instruction sessions, very little time was spent on indicator 2 because students were not instructed in the use of library resources.

Standard 3 addresses the quality of information used: "The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system" (Association of College & Research Libraries, 2000, p. 11). Part of the discussion concerning where students found their information included prompting them to think about the quality of that information. For example, in several of the groups, students had discussions about peer-reviewed literature versus a general Google search and made comments on the bias inherent in some of the resources (indicator 2). Group discussions also involved comparisons between students' existing knowledge and the new information shared by the group (indicator 4). They consulted different viewpoints on the topics (indicator 5) and reviewed the information collectively (indicator 6). Lastly, they debated whether more information was needed or if the topic should be modified (indicator 7).

Finally, according to standard 4, students should be able to use "information effectively to accomplish a specific purpose" (Association of College & Research Libraries, 2000, p. 13). This occurred through the process of students synthesizing all the information they had located and turning it into two different presentations. The quality of the presentations varied, but all three performance indicators were addressed. The students organized the information into presentations (indicator 1), revised one presentation and wrote a 900-word evaluation of their experience with the PBL process (indicator 2), and presented the material to their classmates, facilitators, and an outside evaluator (indicator 3).

Modifications to the PBL Exercise

Dr. Martin, the other facilitators, and I had several discussions about changes we might make if given the opportunity to do another PBL project like this one. First of all, the PBL process is usually quite foreign to students, and our experience with this exercise was no exception. In the future, we could spend more time on the clarification of PBL by either explaining it more than once or by having the students attempt to explain it to each other. The latter option would be helpful in illustrating where the confusion might be occurring.

Students expressed frustration with not knowing what the final project would be until partway through the PBL process. In the future, we could explain it earlier, which might help guide them toward topics that lend themselves better to a campaign. We could also increase student buy-in and enthusiasm by creating a competition for best campaign.

We did not set the expectation that students would need to share the information found on their learning issues with each other prior to the next class period. This could be a helpful requirement that would allow the students to check each other's work, perhaps prompting even more discussion about the quality of information found.

Changing the timing of the assignment is another option we debated. If we were to conduct the PBL scenario at the beginning of a course, students would be fresh and would not yet look to the professor as the expert from whom to expect instruction. This would also encourage their interest in the topic earlier in the semester. Then, the lectures and class discussions that followed would be more meaningful as the students applied the new information to the project they attempted earlier. However, a PBL assignment at the end of the course allows them to build on everything they were taught earlier in the semester. Spacing out the PBL classes to allow for more time for the development of the presentations was also suggested.

Lastly, in general, some of the PBL facilitator skills simply take time to develop. It is a challenge to avoid guiding students in a specific direction. As librarians, we possess the research skills they are lacking, and it is hard to hold back and let them stumble and even fail. Being supportive while allowing the students to guide their own

learning and recognizing the best facilitator response in certain situations takes time. For example, in my group, students repeatedly expressed frustration and confusion around what was expected of them for the campaign proposal. Instead of simply repeating the description of the assignment, I could have turned their questions back on them. More PBL-appropriate statements might have been: "If this were for a job, your boss might not be willing to explain the project more than once or twice," followed by questions such as "What do you think is expected of you?," "What do you find frustrating?," and "What can you do about this?"

Conclusion

The immersive nature of a PBL experience like this one can help reemphasize the importance of aspects of information literacy that time constraints rarely allow librarians to address. I was able to guide students through much of the research process and was struck by the benefits of placing more emphasis on helping students determine their own information needs. As Pelikan (2004) asserted, students actually find it easier to navigate library databases than to understand what information they need, yet so often librarians find themselves with barely enough time to show the databases, let alone anything else. Spending more time on the students' information needs, even if it allows less time for searching library resources, could prove very fruitful, especially for lower-level students.

Having the opportunity to implement a more time-intensive PBL scenario provides librarians with practice in useful skills that can be applied to other non-PBL library instruction sessions. For example, fostering discussion when one only has 50 minutes with students can be very challenging. PBL provides practice with several relevant skills, such as rephrasing the same question in different ways and asking students to respond to comments made by their classmates. In addition, because PBL requires students to direct their own learning, it also provides excellent practice at being comfortable with silence while waiting for students to speak up. These skills and others emphasized by PBL can help librarians encourage students to take charge of their own learning in one-shot instruction sessions and beyond.

This PBL experiment presented the opportunity to become thoroughly engaged in a research assignment in a course. Working with a group of students for a longer length of time than a one-shot instruction session was incredibly rewarding, as was assisting a professor in the redesign of an assignment. In addition, using PBL to integrate information literacy into a course provided a way to actively engage students and to help them understand how library research and librarians fit into their assignments. With any luck, they may apply the skills they learned to problems they encounter in their lives outside of the classroom as well.

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