

Using Problem-Based Learning to Facilitate Student Learning

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Today's students are exposed to an increasingly complex and demanding information landscape, making it very difficult for them to know where and when to turn to librarians for help. Furthermore, a variety of large scale studies show more times than not, they rely on Google and their peers to make sense of this complexity, often leaving librarians and the library out of their information seeking behaviors.¹

Problem-based learning (PBL), a conceptual model of facilitated learning, has been used with outstanding results in the education of various health care professions including nursing, pharmacology, and physician education. The components of PBL, using real world situations (problems), group learning, student-directed solutions for problems, and teacher serving as facilitators of learning has much promise for, and important applications in the information literacy pedagogy and curriculum.² According to Kwan,³ PBL is more than a teaching pedagogy, it encompasses "a nurturing environment in which all curriculum elements are systematically aligned to help students achieve the learning outcomes" set by the instructor.

In the library setting, PBL has many advantages over traditional teaching methods used in library instruction, including:

- it allows librarians to become learning facilitators rather than lecturers
- it promotes critical thinking while conveying information literacy content/concepts
- it is much more suited to teaching conceptually about digital information rather than

just illustrating various online resources in a given subject area

- it promotes peer-to-peer learning, which is more closely aligned with how students learn

PBL encompasses "active learning with particular relevance to the learning objectives (as opposed to the traditional passive spoon-feeding rote learning based on teacher-designed didactic lectures and instructions)."⁴

PBL promotes critical thinking, as Downing et al.⁵ found that "in addition to the formal learning context, everyday challenges emerging from the additional new social contexts provided by problem-based curricula provide fertile environments for the development of metacognition...in other words, when we are faced with finding solutions to a problem whether posed by the teacher as part of a problem-based curriculum or a new social environment, we are more likely to develop generic, as well as subject specific skills" (p. 609). PBL allows librarians to link their curricula not only with the specific class and assignment for which they are currently teaching, but also to help students understand the link between what they are learning that day with similar assignments for their entire post-secondary career and beyond, which hopefully, starts (or continues) them on the path to life-long learning.

This paper describes a spectrum of innovative PBL teaching and learning concepts librarians at the University of Michigan have developed to help facilitate the learning of critical thinking and information literacy among students at all levels of the university.

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These techniques include peer-to-peer, librarian facilitated teaching/learning exercises in the classroom to enhance critical thinking and to facilitate the learning of information concepts such as the *Open Web versus the Hidden Web*, *Primary/Secondary/Tertiary Sources* and *Scholarly versus Popular Resources* (among others).

The paper also shares an easily adapted model of facilitative techniques and services that can be applied to a variety of settings and circumstances, as well as information from outcomes assessments of the PBL activities to date.

PBL in the First Year Undergraduate Classroom

PBL is a wonderful way to keep restless undergraduate students engaged and working actively to achieve information literacy learning objectives. At the University of Michigan, we have used PBL extensively working with first year students. It works best in classes of 35 or less, but with additional librarian-instructors/facilitators, it could be implemented in larger classrooms.

One example of implementing PBL includes working with a variety of Living and Learning programs on campus. For example, at the University of Michigan, one such program is the Women in Science Residential Program (WISE-RP). The program enrolls approximately 120 first year undergraduates each year, and they all take one of three sections of a University 170 class designed around concepts of scientific inquiry. Librarians visit each of the three sections which meet for 90 minutes each. In those 90 minutes, librarians come to the classes with learning objectives including:

- understanding the difference between scholarly and popular resources
- learning how to navigate the open web versus the hidden web
- learning how to find scholarly resources on a topic related to women in science
- knowing how to contact a librarian for assistance at any point during the discovery process

These librarian facilitated classes are entirely active—there is absolutely no lecturing in these classes! Librarians facilitate the peer-to-peer learning through the use of PBL exercises. One active exercise feeds into the next, until all the learning objectives have been met.

We begin by breaking the class into dyads or groups of three, and handing out one popular and one scholarly article on the topic of women in science to each group. We ask them to look over each article individually, and to mentally note the similarities and differences between the articles. We set up the exercise by asking them to first observe the articles, talk within their dyads about the articles, and then be prepared to share to share an observation or two about the articles' similarities and differences with the whole class. A minute or two into the exercise, we ask them to switch articles within their groups so that each member has an opportunity to look at each article. After about 5 minutes of observation/skimming and dyad conversation, we ask the whole class to comment on the articles. The learning objectives for this exercise include:

- Similarities: topic
- Differences: language, author authority, citations, structure, audience, peer review, etc.

After raising all of these points, the librarians then point out that one article is labeled “popular” and the other “scholarly.” This leads to asking the students how they might find each type of article on the Internet, and into a discussion of the “open web” versus the “hidden web.” Points here include:

- Open Web: Google-able, commercial sites, blogs, wikis, free, etc.
- Hidden Web: often behind a pay-wall, where scholarly material is usually found, library pays licensing fee to provide access to campus

This leads into a complex PBL exercise where the entire class is given a “problem” or topic that directly relates to the theme of the class, and each dyad/group is given a difference database to use to find one peer-reviewed article on the topic. The students then volunteer to stand before the class and teach their peers how to navigate the database, and how to use either the functionality of the database or their own interests to narrow the topic and the search results they return with their search. Peer teaching keeps the students engaged, as they know they will be teaching their classmates what they are learning themselves. It never fails to amaze us how they are able to find advanced functionality within each database, and clearly demonstrate their search techniques and the problems they encountered to their classmates.

The assessment of these classes has taken two modes. First, we do an online evaluation that is linked

right from the LibGuide we prepare for the classes. During the last several minutes of class, we direct the students to the LibGuide and give them time to provide feedback on the learning goals. Second, at the end of each school year, we conduct semi-structured interviews with many of the instructors of these classes to determine what, if any, outcomes they see as a result of the problem-based instruction. The feedback we have received confirms the efficacy of the problem-based pedagogy. Instructors have shared that they have seen a marked improvement of the quality of the papers and assignments that students have turned in. They are using better sources, and they have “grown from simply Googling for sources to entering into the scholarly conversation.”

PBL in the Graduate Student Classroom

As mentioned above, PBL has most often been used in the education of physicians and other health care professionals. PBL was actually designed for the graduate student environment—it is an excellent method for facilitating learning of complex, reality-based concepts, and is easily applicable to graduate curricula. Many graduate programs emphasize literature searching, in-depth paper writing, and group learning, so PBL aligns nicely with these assignments and pedagogical models.

At the graduate level, it is even more important to understand the students' prior experience with libraries and level of information literacy before creating a set of problem-based activities because there may be more variability in those experiences than with undergraduate students. It is always a good idea to have this discussion with the instructor before the class; however, the instructor may not know their students' competencies fully. Polling the students ahead of time (or at least at the beginning of the class) can help you tailor the class(es) to their needs. Asking open ended questions such as: “What do you find most difficult about finding information?” or “If you change one thing about using the library, what would it be?” may get you better answers than questions such as “How would you rate your level of comfort using the library?” In today's higher education setting, many graduate students are returning to school after long breaks in their formal education, so don't take their level of information literacy for granted.

Adapting the exercises in the section above is relatively easy for graduate student classes. I throw in

more complex and discipline related databases in the database exercise, introduce them to citation management tools in conjunction with the database exercise, and make sure they know about the full range of subject librarians available to them.

Conclusion

Problem based learning is an active and engaging pedagogy to use for teaching information literacy concepts and skills at both the undergraduate and graduate level. It has been used successfully in the health sciences for many decades, and more recently by academic librarians at the University of Michigan with great success. Instructors report a variety of positive learning outcomes after their students have had library classes utilizing problem based learning pedagogy. These outcomes include much better papers using a greater array of scholarly resources, students becoming part of the “scholarly conversation”, and a stronger understanding of the difference between popular and scholarly resources.

Problem based learning pedagogy is easily adaptable to any discipline, and it encourages active engagement among peers as well as with the librarian facilitator. Every instructor we have used this pedagogy with has asked us back for more instruction, and is very enthusiastic about the learning outcomes. The librarians who have employed problem based learning have found that it makes for a more interesting and lively classroom experience both for the students and the librarians! We have found it to be a useful learning tool in the arsenal of learning and teaching methods.

Notes

1. These studies include:

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Lenhart, Amanda, Kristen Purcell, Aaron Smith, and Kathryn Zichuhr. “Social media & mobile Internet use among teens and young adults.” *Pew Internet & American Life Project* Last modified February 3, 2010 <http://www.pewinternet>.

- org/~media/Files/Reports/2010/PIP_Social_Media_and_Young_Adults_Report_Final_with_toplevels.pdf.
2. Oja, Kenneth. Using problem-based learning in the clinical setting to improve nursing students' critical thinking: An evidence review. *The Journal of Nursing Education*, 50:3 (2011) 145-151.
 3. Kwan, Anna. "Problem Based Learning." In: *The Routledge International Handbook of Higher Education*, edited by Malcolm Tight, Ka Ho Mok, Jeroen Huisman, Christopher Morphew. New York: Taylor & Francis, 2009 91-108.
 4. Kwan, C.Y. (2000) "What is Problem Based Learning (PBL)?" *CDTL Brief*, 3:3 (2009), 1-2. Last modified 2009 <http://www.cdtl.nus.sg/Brief/Pdf/v3n3.pdf>
 5. Downing, Kevin, Theresa Kwong, Sui-Wah Chan, Tsz-Fung Lam, Woo-Kyung Downing. "Problem-based Learning and the Development of Metacognition." *Higher Education* 57 (2009) 609-621.