

# PROBLEM-BASED LEARNING IN MEDICAL EDUCATION: ISSUES FOR HEALTH SCIENCES LIBRARIES AND LIBRARIANS

---

KARLA J. BLOCK

GRADUATE SCHOOL OF LIBRARY AND INFORMATION SCIENCE  
DOMINICAN UNIVERSITY/COLLEGE OF ST. CATHERINE

*Problem-based learning (PBL) is becoming increasingly widespread in U.S. medical education. The growth of PBL as an educational model brings with it both new challenges and new opportunities for health sciences libraries and librarians. This article presents the characteristics of problem-based learning and discusses PBL's implications for health sciences libraries and librarians.*

Professional Education of the Physician] Report, which . . . recommended curricular revisions that would make medical education more responsive to changes in health care, prepare students to learn throughout their professional careers, and provide for active, independent, and self-directed learning. (Rankin, 1992, p. 36)

## INTRODUCTION

In response to widespread calls for reform in medical education, many medical schools are shifting from the traditional didactic model of medical education in favor of more innovative educational models. A growing number of medical schools have in the past decade adopted some form of problem-based learning (PBL), an educational strategy that many believe responds to the issues behind demands for reform in medical education (Rankin, 1993a). PBL's growth as an educational model brings with it both new challenges and new opportunities for health sciences libraries and librarians.

## PROBLEM-BASED LEARNING (PBL)

Problem-based learning developed largely in response to widespread calls for reform in medical education.

A growing number of medical schools are adopting PBL in response to criticisms of the conventional medical curriculum, which continues to be based on Abraham Flexner's recommendations to the Carnegie Commission in 1920. A number of calls for curricular reform have surfaced since Flexner's time, most recently the landmark GPEP [General

As U.S. medical schools searched for alternatives to the traditional curricula, they began to investigate problem-based learning, which had been utilized extensively outside of the United States since its founding in 1969 at McMaster University in Canada. In 1979, the University of New Mexico became the first U.S. medical school to offer an alternative PBL track. When Mercer University established its medical school in 1982, it became the first U.S. medical school to operate solely within a PBL curriculum. From these foundations, PBL spread to other institutions, including Harvard University, Bowman Gray University, and the University of Hawaii (Donner & Bickley, 1993). According to responses from the 1993-94 LCME (Liaison Committee on Medical Education) Annual Medical School Questionnaire, 114 medical schools in the United States reported using some form of problem-based learning. Of those, 33 schools reported using PBL as a major part of many courses or as a curricular track, 38 reported using PBL as a major part of one or several courses, and 43 reported using PBL as a minor part of one or several courses. Only 11 schools indicated that they did not use any form of problem-based learning (Jonas, Etzel, & Barzansky, 1994).

Problem-based learning developed primarily as an alternative to the first two years of medical school, which are traditionally devoted to the basic sciences. More

recently, the literature includes references to the utilization of PBL throughout undergraduate education as well as in residency programs and continuing medical education (Foley, Polson, & Vance, 1997). While traditional programs focus on rote memorization of concepts in the basic sciences during the first two years of medical education, PBL uses problem-solving to encourage the learning of basic sciences within the context of clinical applications (McGowan, 1995). PBL curricula cover the same subject content as traditional curricula while emphasizing additional educational aims, including teaching problem-solving skills, integrating basic sciences with clinical sciences throughout the curriculum, and developing the skills of lifelong learning (Rankin, 1992). PBL allows information to be mastered in the same context in which it will be used. Moreover, PBL is a student-driven process, whereby the student sets the pace of learning and the teacher acts as guide, facilitator, or resource (Donner & Bickley, 1993).

The foundation of problem-based learning centers on the biomedical problem, which is "a typical case of a disease chosen to illustrate the area of basic science to be studied" (Donner & Bickley, 1993, p. 296). Rather than emphasizing the traditional method of lectures, the PBL curriculum emphasizes small-group tutorial meetings as the center of learning. Each group typically consists of six to seven students and one to two faculty members (Donner & Bickley, 1993). Because PBL is a student-centered educational method, the role of the faculty member differs vastly from that in the traditional medical school program. In PBL, faculty members serve first as tutors and second as resource persons when so requested by the students (Rankin, 1992). As the tutorial group is presented with a biomedical problem, the students identify specific learning objectives or issues:

Students then collect needed information from a variety of sources, including the library, the laboratory, other students, and faculty members. After initial information gathering is completed, the tutorial group discusses the findings. Further learning objectives may be identified, and information gathering continues as needed throughout the clinical program. (Rankin, 1992, p. 37)

As an educational methodology, PBL seems tailor-made for medicine, offering advantages for acquiring knowledge and developing patient problem-solving skills, characteristics that will remain important long after graduation from medical school (Barrows & Tamblyn, 1980).

## CHARACTERISTICS OF THE PROBLEM-BASED LEARNER

In response to the growing use of PBL in medical school curricula, librarians and medical educators alike have questioned whether students and faculty in PBL programs use the library and its resources and services differently than do their counterparts in traditional programs (Marshall, Fitzgerald, Busby, & Heaton, 1993). Research has demonstrated that students in PBL programs do indeed use the library differently than do students in conventional medical education programs. Studies at institutions such as McMaster University in Canada and Rush University, Bowman Gray University, and the University of New Mexico in the United States provide evidence that library resource use is one of the primary differences between PBL students and traditional medical students. Rankin studied second-year medical students at four institutions and found that PBL students used the library more than traditional students (Marshall et al., 1993).

A comparative study by Marshall and her colleagues (1993) supports these earlier conclusions that PBL students use the library in greater proportions than do students in traditional programs. Moreover, when PBL students use the library, "they do so more frequently, for longer periods of time, and as a source for a greater proportion of their study materials" (p. 304). In general, Marshall and her colleagues found that problem-based learners utilize library resources and services more heavily, including database searching, journals, reserve materials, photocopy services, and audiovisual materials. Problem-based learners "use and value information resources that support the independent learning process, acquire information-searching skills at an earlier stage in their medical education, and report greater ease in using these resources" (Rankin, 1992, p. 42). Finally, students in PBL programs are more likely to use self-selected, rather than faculty-recommended, resources (Rankin, 1992).

## PBL AND THE HEALTH SCIENCES LIBRARY

As more medical schools incorporate aspects of problem based learning into their curricula, health sciences libraries face interesting and challenging new roles: "Whether the institution is contemplating a total shift to a problem-based curriculum or investigating methods for only partial integration of problem-solving learning, there is a role for the library to play"

(Tooley, 1993, p. 86). As with any new role, the shift to a problem-based curriculum creates greater demands as well greater opportunities for innovative educational participation by the health sciences library (Saunders, Northup, & Mennin, 1985). Problem-based learning raises issues for both health sciences libraries and health sciences librarians.

### The Health Sciences Library

Problem-based learning focuses attention on a broad range of issues relevant to health sciences libraries. First, the physical structure of the library must be viewed with the special needs of problem-based learning in mind. Because PBL students spend more time in the library, "the physical facility, therefore, must be adequate for PBL needs. For example, the library must be near the tutorial areas—a special challenge for many medical schools where the library is not close to the medical education facility" (Watkins, 1993, p. 308). Since PBL draws so heavily on small tutorial groups, the library must anticipate the need for small group space, both for studying and using library resources (Blake, 1994). Incorporating additional small group rooms into the library can be challenging, especially if space in the library is already cramped. Large and small libraries alike may face problems related to PBL space needs, which must be balanced with changing institutional missions, new and advancing technologies, and evolving patterns of information use (Rankin, 1996). The library must also anticipate increased space needs for virtually all of the library's resources: "[T]here must be adequate seating in the library or nearby tutorial rooms for students using reserve materials and other materials that do not circulate. Resources such as models, specimens, and X-rays require viewing space so they may be displayed at appropriate points in the curriculum" (Watkins, 1993, p. 308). Most libraries find that the traditional 4:1 ratio of students to library seats is no longer adequate, while more computer workstations and audiovisual viewing equipment may also be necessary (Rankin, 1993b).

Second, the library faces issues relating to its hours as well as staffing and service levels. Several libraries serving PBL programs have already recognized the possible need for additional hours and staff in order to effectively serve PBL students (Watkins, 1993). Because PBL students use the library differently than traditional medical students, library staff may need to be sensitized to PBL's unique circulation, shelving, and photocopying needs in order to provide timely and appropriate levels of service (Canning, Edwards, & Meadows, 1995).

The library and its staff may also be challenged by the timing of PBL students' needs. In one case study,

the challenge to the library was to make sufficient resources available so that students could investigate learning issues efficiently and successfully. Because all 144 students were looking for information on the same general topic during the same independent-study period, it was necessary to plan carefully the logistics of the information-seeking activities. Librarians had to ensure that . . . the PBL students did not become frustrated because books or journals were off the shelf. (Schilling, Ginn, Mickelson, & Roth, 1995, p. 180)

Moreover, Watkins (1993) reports that the demand for library resources or services at any one time may also vary because the small groups may identify different issues to be addressed or may identify the same issues but in a different sequence. Most PBL curricula are planned in shorter modules of four to ten weeks as opposed to the quarters or semesters of a traditional curriculum. "Therefore, the objectives, the reserve materials, and the needed resources change much more frequently than in a conventional curriculum. In addition, the first- and second year students may be on different schedules for the modules or phases" (Watkins, 1993, p. 308).

Third, PBL programs often place a heavy burden on collection development. Problem-based learning has evolved along a continuum, with no suggested or required resources at one end, a reserve collection from which students can select in the middle, and a curriculum bibliography consisting of either required or suggested resources at the other end (Watkins, 1993). Each level of the continuum presents challenges for collection development staff:

In the classical PBL curriculum, with only objectives and no assigned readings, a heavy burden is placed on the collection development staff because, despite faculty input, the library must ensure that there are adequate resources for each clinical problem at all levels, from the molecular pathways to the clinical presentation. The library staff must be familiar with the clinical problems in order to select materials to meet the needs of the stated curriculum objectives. (Watkins, 1993, p. 307)

Alternately, in programs utilizing a curriculum bibliography, "new challenges arise, influenced by student purchase or non-purchase of basic texts. These challenges include providing adequate resources to meet student needs, including multiple copies of resources, a

well-policed reserve collection allowing fair and reasonable access, and adequate service hours” (Watkins, 1993, p. 308). Smaller libraries in particular may face special difficulties in providing both the depth and breadth of materials needed to support PBL students. In general, according to guidelines promoted by Rankin (1993b), a strong book and journal collection and a sufficient collection of basic texts are needed to support the learning objectives in each assigned biomedical problem. In addition, a strong collection of non-print resources may also be appropriate.

Fourth, the library faces issues relating to the costs of serving PBL programs. PBL costs may include the purchase of several to many duplicate copies of basic texts, additional library staffing to accommodate extended hours, and capital expenditures for added seating, extra computer workstations, and more audiovisual viewing equipment (Rankin, 1993b). There may also be costs associated with providing a wider range of library resources than would normally be required. Although some researchers have attempted to compare the educational costs of PBL and traditional programs, less attention has been paid to examining PBL’s library-related costs (Rankin, 1996). In times of diminishing library budgets, these additional costs associated with PBL must be studied further and examined seriously.

Fifth, the library may face challenges in serving both PBL medical schools along with other patron groups. With PBL students placing heavy burdens on the library, staff must ensure that the entire library is not disrupted and that other clients may continue their activities unhindered. Moreover, libraries serving medical schools with concurrent PBL and traditional tracks may face unique challenges (Schilling et al., 1995). In some programs with dual tracks, PBL students may represent only a small fraction of the total medical students, yet may consume a large amount of the library’s time and resources. Many, if not most, libraries serving PBL programs also serve multiple allied health schools that often do not utilize problem-based learning and the different groups may present conflicting library needs (Watkins, 1993). Conversely, “pharmacy, nursing, and veterinary medicine programs, in addition to medical schools, are shifting in whole or in part to this new curricula [PBL]” (Nagle, 1996, p. 668). As the use of PBL in other disciplines grows, the library may feel a cumulative burden on its staff and resources.

### **The Health Sciences Librarian**

While PBL presents challenges and opportunities for the health sciences library in general, it also raises

issues of particular importance to health sciences librarians. First, PBL brings with it exciting and challenging new roles for professional librarians. While librarians have long been involved in bibliographic instruction, PBL allows librarians to participate in a much broader range of educational initiatives:

In PBL curricula, the health sciences library is generally responsible for giving an extensive library orientation to students beginning the program and assisting with all their information acquisition assignments. In addition, health sciences librarians work closely with PBL faculty to suggest resources, knowledge, and skills appropriate to specific clinical problems. In some instances, medical librarians also serve as facilitators of the small groups. (McGowan, 1995, p. 187)

The librarian may, for the first time, work alongside medical school faculty in teaching and evaluating students. Relationships formed in response to problem-based learning allow staff to both expand networking activities and develop professional relationships outside the library (Satterthwaite, Helms, Nouravarsam, Van Antwerp, & Woelfl, 1995). Many observers have suggested that librarians take a proactive role in problem-based learning:

Medical librarians should make a commitment to participate in the curriculum development process in all possible and appropriate ways. The UNM [University of New Mexico] experience shows that simply expressing an interest and attending meetings has enabled librarians to respond to aspects of the new curriculum. Involvement in this process has helped to identify opportunities for integrating the library into the curriculum and for anticipating special demands upon library resources. (Eldredge, 1993, p. 314)

Problem-based learning also allows librarians to develop a more personal relationship with the students they serve. Because PBL students spend considerable time in the library, their familiarity with specific librarian facilitators or liaisons may encourage further interest in the library’s services, resources, and collections (Satterthwaite et al., 1995).

Second, as problem-based learning grows in popularity, librarians are being called upon to redesign the more traditional role of bibliographic instruction. Because PBL students tend to self-select their resources and use a greater variety of resources, “early information search education assumes a greater importance within the problem based curriculum than within the

conventional curriculum” (Saunders et al., 1985, p. 75). Research suggests that library instruction should be integrated into the PBL curriculum rather than offered as required or optional separate classes. Minchow and her colleagues (1993) found that integration of information-seeking skills into the curriculum in specific directed sequence reinforced the applicability of the skills learned in bibliographic instruction. Librarians serving PBL curricula have also focused on integrating aspects of PBL into library bibliographic instruction itself. At one institution,

the library instruction module utilizes a problem-based approach . . . All students learn how to use Permuted MeSH [Medical Subject Headings], MeSH, and Index Medicus in a problem-based learning context . . . The library instruction session begins with a problem-based case study focusing on hostility as a possible risk factor in coronary disease. Students are guided through the process of formulating a research question, translating key elements of the question into MeSH terms, choosing an appropriate format (journal article, textbook, faculty expert), and, in this case, finding an appropriate journal article. (Eldredge, 1993, p. 311)

In addition to incorporating PBL into library instruction, librarians are being called upon to formally evaluate students in their bibliographic instruction classes. At one library, a specific librarian was assigned to each group of students for the duration of the course. Each group’s librarian assigned information-retrieval exercises, wrote appropriate comments on each student’s exercise, and offered concrete suggestions for each student’s improvement (Albritton, Davis, & Karp, 1995). Such a role transcends that traditionally associated with bibliographic instruction. In these instances, “the library liaison has gone beyond the former role of distributing information to becoming an active member in teaching medical students life long learning skills” (Ohles, 1997, p. 15).

Third, despite the numerous new roles and methods of education possible with problem-based learning, critics question whether these roles ultimately go far enough.

There is some question whether medical education and PBL curricula in particular effectively utilize health sciences librarians. While the involvement of health sciences librarians in PBL curricula has grown over the past decade, there is still no indication that these librarians are involved in formulating the structured clinical problems used as PBL cases . . . [T]here are few examples of medical li-

brarians being integrated into the mainstream of the faculty. (McGowan, 1995, p. 187)

Research has demonstrated that PBL’s effectiveness could be enhanced significantly if librarians were more directly involved in the preparation of the biomedical problems:

[T]here is a need for more extensive involvement between the librarians and the faculty in designing the curriculum to incorporate a broader range of resources. The librarians were only involved after the cases had been prepared to assist with guiding students through the literature. If the cases had required the need for more recently published information along with background information, the journal literature would have been utilized in combination with textbooks, and skills in retrieving journal articles would have been enhanced. (Minchow, Pudlock, Lucas, & Clancy, 1993, p. 11)

While new opportunities have undoubtedly arisen from problem based learning, it appears that health sciences librarians could be utilized more effectively in PBL programs. McGowan (1995) argues that “the instructor of information literacy, the health sciences librarian, must be acknowledged as an equal member of the medical education team” (p. 188).

Fourth, problem-based learning requires new responses from the field of library science, both in library school education and professional development. As librarians seek out new roles in problem-based learning, it must be remembered that traditional professional development and continuing education offerings often do not prepare librarians for the roles of facilitator or instructor (Satterthwaite et al., 1995). Although librarians have not yet been called upon to “design the curriculum, cases, or instructional or evaluation methods, they do contribute knowledge, observations, and opinions on these issues” (Satterthwaite et al., 1995, p. 468). As a result, health sciences librarians must have professional development opportunities that meet the special needs of PBL environments. The Medical Library Association may be instrumental in offering such opportunities for practicing librarians, especially through its Problem-Based Learning Special Interest Group.

Problem-based learning also raises issues related to library school education. In response to the new roles and challenges faced in PBL environments, “information science programs should include formal classes in instructional methodologies and theories, curriculum design, and evaluation methods, with the overall goal of expanding the traditional roles of librarians”

(Satterthwaite et al., 1995, p. 468). As PBL's success is demonstrated in medical education, other professional fields have begun to investigate PBL for their own educational programs. There has even been some interest in incorporating PBL into library and information science education: "Assuming that librarians work in problem-based ways, it seems natural to propose that they should be educated by means of problem-based learning, PBL" (Olander, 1995).

Fifth, librarians must consider whether problem-based learning deserves so much special attention, especially given that it may be a trend with little or no permanency. Critics of PBL have challenged the assumption that this educational method is effective in promoting its desired skills of lifelong learning. Since problem-based learning is largely an alternative to the first two years of medical school, skills learned in PBL programs may be weakened or lost during clinical clerkships, internships, and residency programs (McGowan, 1995). Instead of viewing problem-based learning as the end product, librarians and educators may need to regard PBL as the starting point in the promotion of information skills in all types of medical school programs. Rather than focusing attention exclusively on problem-based learning, it must be understood that "appropriate integration of information-acquisition, knowledge, and skills can take place in the most traditional curricula, provided the program follows the basic tenets of curricular correlations" (McGowan, 1995, p. 188).

## CONCLUSION

Calls for reform in medical education necessitate the investigation of alternative educational methodologies. It must be understood that "in this fast paced and highly technical era, with more and more information to be managed and carefully evaluated, librarians, libraries, institutions, and their faculties must move forward in an integrated fashion" (Eaton & Richardson, 1993, p. 176). Problem based learning offers the promise of an integrated partnership between the medical school and the health sciences library:

Librarians have an opportunity to play a key role in the educational process as more medical schools revise their curricula and place increased emphasis on PBL . . . Although this expanded role requires a significant commitment of time and resources, the long-term benefits to libraries, students, and faculty are considerable. The increased involvement of librarians in planning and implementing curricula

broadens their role as educators. (Schilling et al., 1995, p. 182)

Through problem-based learning, health sciences libraries may capture their rightful position in medical education. "Rather than acting as a supplemental, peripheral resource in the educational process, the library is positioned as an active, full participant in medical education and lifelong learning" (Schilling et al., 1995, p. 182). Fundamentally, problem-based learning

sets the stage for programs medical librarians have believed in for years—systematic instruction in information skills that is integrated throughout the curriculum; direct connection of information with the clinical problem; demonstration of the value and relevance of information in the educational program; incorporation of information use as a central part of the curriculum and recognition of its value in lifelong learning; and ultimately, the positioning of the library and learning resources at the heart of the educational process. (Rankin, 1993a, p. 293)

As such, problem-based learning and health sciences librarianship are complementary endeavors that form a natural and mutually rewarding partnership.

## REFERENCES

- Albritton, T., Davis, F., & Karp, W. (1995). A problem-based learning approach to developing information-retrieval skills. *Academic Medicine*, 70(5), 438-439.
- Barrows, H., & Tamblyn, R. (1980). *Problem-based learning: An approach to medical education*. New York: Springer Publishing Company.
- Blake, J. (1994). Library resources for problem-based learning: The program perspective. *Computer Methods and Programs in Biomedicine*, 44, 167-173.
- Canning, C., Edwards, A., & Meadows, S. (1995). Using focus groups to evaluate library services in a problem-based learning curriculum. *Medical Reference Services Quarterly*, 14(3), 75-81.
- Donner, R., & Bickley, H. (1993). Problem-based learning in American medical education: An overview. *Bulletin of the Medical Library Association*, 81(3), 294-297.
- Eaton, E., & Richardson, E. (1993). Strategies for libraries serving Problem-based learning programs. In P. A. J. Bouhuijs, H. G. Schmidt, & H. J. M. van Berkel (Eds.), *Problem-based learning as an educational strategy* (pp. 171-176). Maastricht, The Netherlands: Network Publications.
- Eldredge, J. (1993). A problem-based learning curriculum in transition: The Emerging role of the library. *Bulletin of the Medical Library Association*, 81(3), 310-315.
- Foley, R., Polson, A., & Vance, J. (1997). Review of the literature on PBL in the clinical setting. *Teaching and Learning in Medicine*, 9(1), 4-9.
- Jonas, H., Etzel, S., & Barzansky, B. (1994). Educational programs in U.S. medical schools, 1993-1994. *JAMA*, 272(9), 694-701.
- Marshall, J., Fitzgerald, D., Busby, L., & Heaton, G. (1993). A study of library use in a problem-based and traditional medi-

- cal curricula. *Bulletin of the Medical Library Association*, 81(3), 299-305.
- McGowan, J. (1995). The role of health sciences librarians in the teaching and retention of the knowledge, skills, and attitudes of lifelong learning. *Bulletin of the Medical Library Association*, 83(2), 184-189.
- Minchow, R., Pudlock, K., Lucas, B., & Clancy, S. (1993). Breaking new ground in curriculum integrated instruction. *Medical Reference Services Quarterly*, 12(2), 1-18.
- Nagle, E. (1996). The new knowledge environment: Quality initiatives in health sciences libraries. *Library Trends*, 44(3), 657-674.
- Ohles, J. (1997). Problem-based learning: A library liaison's role in developing life-long learning skills. *Medical Reference Services Quarterly*, 16(2), 11-21.
- Olander, B. (1995). *Problem-based learning in LIS education*. Available from: <http://epip.lut.ac.uk/bailer/24-oland.htm>
- Rankin, J. (1992). Problem-based medical education: Effect on library use. *Bulletin of the Medical Library Association*, 80(1), 36-43.
- Rankin, J. (1993a). Highlighting problem-based learning and medical libraries. *Bulletin of the Medical Library Association*, 81(3), 293.
- Rankin, J. (1993b). Preparing medical libraries for use by students in PBL curricula. *Academic Medicine*, 68(3), 205-206.
- Rankin, J. (1996). Problem-based learning and libraries: A Survey of the literature. *Health Libraries Review*, 13, 33-42.
- Satterthwaite, R., Helms, M., Nouravarsam, R., Van Antwerp, M., & Woelfl, N.. (1995). Library faculty role in problem-based learning: Facilitating small groups. *Bulletin of the Medical Library Association*, 83(4), 465-468.
- Saunders, K., Northup, D., & Mennin, S. (1985). The library in a problem-based curriculum. In A. Kaufman (Ed.), *Implementing problem-based medical education* (pp. 71-88). New York: Springer Publishing Company.
- Schilling, K., Ginn, D., Mickelson, P., & Roth, L. (1995). Integration of Information seeking skills and activities into a problem-based curriculum. *Bulletin of the Medical Library Association*, 83(2), 176-183.
- Tooe, M. J. (1993). Problem-based learning: Getting started. Part One. *Medical Reference Services Quarterly*, 12(3), 85-89.
- Watkins, M. (1993). Characteristics of services and educational programs in libraries serving problem-based curricula: A group self-study. *Bulletin of the Medical Library Association*, 81(3), 306-309.