醫學圖書館與「問題導向學習」：挑戰和機會

Medical libraries and problem based learning：new challenges and opportunities

陳冠年*

Kuan-nien Chen

摘要

　　本文主旨在經由文獻分析探討醫學校院圖書館在醫學教育革新浪潮－「問題導向學習」(problem-based learning, PBL)的環境中所應扮演的新時代角色，以及如何積極地扮演該角色，期能在資訊科技日新月異和組織資源日益緊絀的情形下，有效地展開圖書館和館員的新使命，更深刻地融入醫學課程的規劃以及與師生的需求互動，使有關的教師、學生，乃至於醫護同仁都得到教學、學習和醫療方面所需的資訊，更重要地，促成這些圖書館資源利用者都能充分明瞭和自主利用館方的各項資源，以順利達成「問題導向學習」過程中的諸多目標。本文從圖書館資源指引、相關資訊科技、館藏問題和館員角色等方面進行說明和討論。

Abstract

　　This article explores the changing role of the medical library and librarians in the context of problem-based learning in terms of five aspects – impacts on medical libraries, library instruction, technology, the collection, and the new role of the librarians. For the libraries, the role change process is ongoing rather than a single event. The medical school and the library must collaborate and interact in the areas of curriculum design, communications, and library user education. In addition, administrative supports such as budgets, staffing, and building space of the library are always in demand.

關鍵詞：醫學圖書館、醫學圖書館館員、問題導向學習

Keyword：medical library; problem-based learning.

Background

　　Problem-based learning (PBL) is an important component of recent medical education reform. It poses significant challenges for both educators and librarians (Connor, 2000:200). Aldred et al. summed up the factors that have influenced the increased adoption of PBL:

- the need for professionals to be more able to fulfil the needs of the community
- perceived deficiencies in 'traditional' professional education
- the need to be able to cope with the demands of the information explosion in many areas of professional knowledge
- the need for professionals to be able to adapt to challenge and communicate effectively
- the need to acquire skills for lifelong learning (1997:2).

　　These changes are reflective also of the growth of knowledge and technology generally. The speed of change in learning and information makes any older

*　　高雄醫學大學圖書館副館長（Deputy Head Librarian, Kaohsiung Medical University）

learning context out of date so quickly that both educators and students must now constantly operate on the cutting-edge of knowledge development. The PBL approach is a method of organizing teaching and learning experiences so that students can be prepared for an ever changing professional world. It is a direct outgrowth of the factors cited by Aldred et al. particularly the third and the last factors. These factors indicate that demand for library resources is one of the crucial aspects of PBL.

PBL defined

PBL is an instructional method in which students learn by brainstorming and searching for related information aiming at solving either real or hypothetical problems. Students synthesize the problems with their prior knowledge and skills, apply it to the problem based on the ability to think critically, and then evaluate and modify the problem solutions. Though a collaborative effort students socially negotiate the learning, creating mental models about the subject, and solve the problems (Moore, 2003). The "problems" in PBL are essential because they encourage and enable students to learn something from instruction in the form of "cases".　There is no right or wrong answer; rather, there are reasonable solutions. "By creating well designed problems the teacher can employ multiple intelligences with the student" (Moore, 2003).

One of the main features of PBL is that it is "student-oriented" which means that learning opportunities are relevant to students themselves and the learning goals are at least partly determined by the students. Barrows and Kelson of Southern of Illinois University School of Medicine regard PBL as both a curriculum and a process. "The curriculum consists of

carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies, and team participation skills. The process replicates the commonly used systemic approach to resolving problems or meeting challenges that are encountered in life and career" (Barrows and Kelson, 2000).

The impact on medical libraries

Studies have shown that PBL students spend more time using library resources than traditional medical students (Marshall et al., 1993; Rankin, 1996; Khoo, 2003; LaBeause, 2004). Indeed when PBL students use the library, they do so more frequently, for longer periods of time, and as a source of a greater proportion of their study materials. PBL students also use the library more than their counterparts as a place to study and meet other students. More specifically students in the problem-based curriculum "use the following resources more extensively: end-user MEDLINE searching, library journals, reserve or short-term loan materials, photocopy services, and audiovisual materials. PBL students also report purchasing more textbooks" (Rankin, 1996: 34).

As medical schools have made a dramatic change with their emphasis on the PBL approach in the curriculum, medical libraries face a significant challenge now and in the years ahead. The additional resources needed, as one factor alone, is more than sufficient to bring about a major challenge. What makes the situation more difficult is the fact that libraries traditionally have little communication with their users, and with the rest of their institutions at large. As Fitzgerald (1996:17) wrote, "the library operates in an environment where there are no lectures,

no courses and no marks and this has a strong influence on the nature of the service provided and the use of library."

In a study comparing the use of library facilities by first year undergraduate medical students and graduate students, Martin (2003:48) pointed out that PBL "increases pressure on library services with many students searching for information on one specific clinical problem at the same time. The Library will need to plan for increases in short loan collections, textbooks and monographs, …and provision of web resources to support clinical problems."

Theoretically, PBL focuses on real-life, open-ended, and complex problems for students to analyse and solve. In PBL activities, students therefore need more access to completely up-to-date and relevant materials, which are certainly not confined to the published textbooks and the lecturers' course notes. Instead, the materials are necessarily gathered from various sources: student journals, teaching materials prepared by pre-service teachers, written questionnaires, semi-structured interviews, and so forth (Enger et al., 2002:355).

Well designed problems are at the heart of the PBL approach. Problems must be effective in involving students in inquiry learning. Well-designed problems will:

Engage students' interests and motivate them to probe for deeper understanding of a topic, and be

complex enough so cooperation is necessary to solve the problem.

Relate to real-world situations that are not limited to one correct answer and connect to previously learned knowledge.

Require students to make decisions based on facts, requiring them to define what assumptions are needed, what information is relevant, and what steps are needed to solve the problem (Enger et al., 2002:356).

It is clear from these listed characteristics that medical libraries cannot continue in the traditional way. We now turn to more specific implications of the new PBL approach, namely library instruction, technology, the collection, and the new role of the librarians.

Library instruction

Developing information literacy skills is undoubtedly one of the major responsibilities of librarians, but unfortunately, "information literacy skills are often approached from the perspective of the librarians – rather than the student's point of view or immediate needs" (Macklin, 2001: 310). As a result, students may be trained about what their library and its electronic databases, had but not how to meet their own needs independently. Rosenberg (2001:13) described the difference between "instruction" and "information" – the former is required by learners, not just the latter. The distinctions are shown in Table 1.

Table 1 Characteristics of Instruction and Information

Instruction
●Focused on a specific learning outcome
●Purpose defined by instructional designers, instructors etc.
●Based on a strong diagnosis of user characteristics and needs, and targeted to meet those specific needs
●Sequenced for optimum memory retention
●Contains presentation, practice, feedback, and assessment components.
Information
●Focused on a specific organization of content
●Purpose defined primarily by users
●Based on the characteristics of the particular knowledge discipline and targeted needs
●Sequenced for optimum reference
●Primarily centered on effective presentation.

Source:　　Rosenberg, M.J. (2001). E-leaning: strategies for delivering knowledge in the digital age. New York: McGraw-Hill, p.13.

Librarians must be very careful when they provide instruction for students, especially those in their first two years of tertiary study. To avoid giving the students only "librarian-oriented" information instead of "user-oriented" instruction, it is suggested that librarians who are planning to instruct students should work with the faculty members for each of the content areas in order to plan for information literacy education, including evaluating overall information needs and designing PBL information literacy activities (Macklin, 2001:313). That is, the library must become involved more in the faculty's curriculum. Such involvement will afford an opportunity for librarians to interact with the academic and the administrative staff in the roles of educators, consultants and intellectual partners. As a result, the librarians will gain an improved understanding of the curricula and of what resources are needed by the library users (Myers, et al., 2002:474). The following list delineates the instructor's role more comprehensively:

· setting up the problem/situation
· balancing student-direction with assistance
· contributing knowledge and experience
· creating a pleasant learning environment
· stimulating critical evaluation of ideas (Macklin, 2001:310).

To effectively introduce the library resources to the users, librarians need to be encouraged as much as possible to use as examples the problems students might encounter. Friden (1996:5) is supportive of this idea, writing: "The PBL system with tutorial groups gives the library an ideal opportunity for small class education. The learning problems – paper cases or real patients – can easily be used for information-seeking." The involvement of the University of Toronto library in the Curriculum Design Committee demonstrates some relevant experience. The task of the library was mainly in assisting course directors who were writing cases. Librarians developed guidelines for producing case "readings" and "hospital library reserve collections were

expanded to hold these case readings" (Fitzgerald, 1996:18 & 27).

Enger et al. (2002:356) suggested the following outline for guidance as to how librarians might proceed:

Design an engaging problem, preferably controversial or mysterious in nature.

In class, distribute the problem. For five to ten minutes, have students work in pairs or triads, to discuss the problem itself, what they know about the topic(s) within the problem, and what information they would need to gather in order to address the problem.

Provide a guided exercise question, or two, to push the students to explore the areas in which you wish them to develop. For example: take the next five

minutes to do the following – provide databases with brief descriptions.

Take the next five to ten minutes to search or develop whatever is necessary. Make available, various resources that would assist the students to make decisions.

Encourage follow-up activities by professors. They may see, after watching their students participate, that they could use this session as a springboard for a class assignment.

Enger et al. also provided a 50-minutes instructional session that can be used for students who seek a librarian's assistance to solve problems (see Table 2).

Table 2 The 50-minute PBL template

What to do	How it could look
1. Design an issue or problem related to the subject presented by the faculty requesting library instruction	1. Present problem to students
2. Draw out of the students what they already know about the problem, and where they would go to find resources to solve it	2. Query students about what type of information they will need to know how to develop a position on the problem
In this context, PBL assumes: that students know something about the problem and that they can be encouraged to collaborate and share their knowledge	
3. Shape the student contributions of one or two basic concepts and definitions of the problem, then proceed to search methods (Boolean, keyword, subject headings, etc.); Conduct the information-gathering process.	3. Demonstrate an effective search of relevant database/Web tool(s)
PBL takes the new material of student input and shapes it. The outcome approximates the collective prior knowledge of the students	
4. Provide students with tools for solving the problem, such as Web-based pathfinders and homepages, resource sheets or handouts, or facilitation with courses.	4. Ensure that students have access to legal, ethical, medical information to develop a position
PBL can give students the knowledge that they already "know something" and that, given the tools, they can solidify what they know, refine their knowledge and discover more	
5. Follow-up, if possible	5. Students present positions/solutions in class, if time allows. With the cooperation of the instructor (in person or by e-mail) complete the investigation process: an essay, class visits, presentations, or debates.

Source: summarized from Enger, K.B. et al. (2002). Problem-based learning: evolving strategies and conversations for library instruction, Reference Services Review, 30(4), 357.

It is vital to realize that these types of programs and activity outlines are not stand-alone modules for the library staff to conduct whenever it may seem appropriate. These activities must be properly integrated into the medical school's curriculum so that the timing, content and learning experiences will have the greatest effectiveness. The library and the medical school are partners in the teaching process, sharing the education of the students.

Technology

Information technologies have affected most library users, particularly the younger generations. Many libraries provide a wealth of information through networked electronic databases, and even in the not-too-distant, future wireless communication. "The development of services available to students remotely such as e-journals, e-books, database access and PCs in student halls of residence may lessen the physical presence of students in the Library" (Martin, 2003:48). This phenomenon applies of course to PBL students in terms of their information-seeking behaviours. Macklin (2001:306) has pointed out that even though current university students are more familiar with information technology than ever before they still require technology instruction. To help promote the critical and analytical thinking of students, he suggests that the library should combine problem-solving techniques with information technology to teach the students about information literacy skills.

Ironically increase familiarity with information technology can lead to counter-productive complacency. According to Watson (2001: 114): "today students routinely turn to the Internet for supplemental course resources. …We recognize that the Web is full of misinformation, biased representation, and even outright lies. However, this provides an opportunity to work with students to develop their critical thinking skills in the context of evaluating on-line resources. …the ability to 'learn how to learn' is also an important part of PBL."

In summary then the important point is that the students must be able to use effective methods to gain access to all the resources in the library and acquire the remote resources through inter-library loan service or some other ways of document delivery. Lewis (2000:257) considered library user education to be essential to that exploitation, and "one of the fundamental elements in the success of a PBL curriculum and of lifelong learning."

One program which does focus on the information needs of PBL is a project called Telehealth Outreach for Unified Community Health (TOUCH) (http://80-hsc.unm.edu. wwwproxy0.nun. unsw.edu.au/touch). It has a special emphasis on the process of PBL case development. The TOUCH project utilizes Internet-based technology to conquer geographic barriers and successfully deliver the materials of tutorial sessions to the off campus students and the persons living at remote sites.

"A specific case scenario is developed to serve as a demonstration of the technology and to assess learning using this system. One such case might involve traumatic head injury with resulting neurological effects stemming from an epidural hematoma. The objective of the case is to provide the tutorial group with an appropriate clinical experience for exploration of underlying basic medical science mechanisms" (Jacobs & Joshua, 2003:18). This example clearly indicates the complexity of current

medical problems, and is directly suggestive of the extensive library support needed.

As mentioned earlier, wireless technology will bring an environment where information is delivered and received more conveniently. For instance, the personal digital assistant (PDA) already allows us to have a "portable library" through which we may have "just-in-time" connectivity to resources such as evidence-based literature. PDA could also be used to record and transcribe dictations, especially with patient charting; to interact with the patient records, being used to order tests; to notify the clinicians when the results are in; and to help the clinicians summarize answers to clinical questions, download, read, and share the summary with colleagues (Rios, 2004:19-20).

As an example of the usefulness of the PDA, electronic patient records accessed by PDA "afford the opportunity for direct information resource integration" (Shipman, 2004:10). Further, health-care providers can "manage their personal information such as schedules and 'to do' lists as well as check possible drug interactions, consult full-text online journals, record patients' histories, lab results and other needed bedside treatment information" (Shipman, 2004:10).

It should be noted that the technologies indeed enhance the convenience, the speed and the multi-functionality of information seeking and dissemination. However, more attention should be paid to the content and the needs of the information users. The process and the results of information generation and management should be the core issue here. In the experience of Friden (1996:5), "teachers tend to stress too much the ability to handle the computer and too little the conceptual understanding of information-seeking process." The librarians must always keep one thing at heart: technology and techniques are not the "answer" to the

learning but simply tools for information. What students must learn is to "acquire and assimilate knowledge to use in their personal and professional lives and learn how to make their own unique contributions for expanding and improving their fields" (Powell, 2001:414). This is particularly the case as information technology is currently entering a new revolution based on the principles of digitization, wireless and convergence. This will be the world of medical practice which students will enter.

With the prevalence of information technology, distance education has become a popular mode of delivery. Urquhart et al. (2002: 155) summarized the critical factors for the development of distance-learning programmes in health information management and health informatics, as follows:

- Recognition, and integration of learning in the workplace into the curriculum and assessment methods. Learning should be relevant to the students;

- Provision of opportunities for face-to-face learning with other students, and complementing the face-to-face interaction with computer conferencing. Students need to meet each other and learn from each other, particularly when they often work in isolation in their own organizations; and

- Assessment of student needs fully before implementing new learning technologies or educational methods. Delivery of learning should match student needs.

It is a mistake to suggest that as more remote technology facilities are installed in a library then the space of the library building and the number of library staff should be downsized. Martin (2003:48) rebutted

41

such a suggestion, claiming that the development of remote services "will not lessen the commitment of time and resources needed to support such new innovative courses by Library and Information Services staff." Taylor and Lande (1996:10) advised that students would need to be in the library to access multimedia teaching programs, videotapes and other electronically and optically stored information. These facilities require space. Taylor and Lande also pointed out the need for more reading rooms and meeting rooms for students. At MacMaster University, for example, it is considered that the library should have a well-equipped computer learning laboratory to meet PBL needs (Fitzgerald, 1996:18). The University of Sherbrooke has also taken the view that "the library must accommodate greater use of space, for use of on-line catalogue, databases, Internet, and reference services" (Fitzgerald, 1996:20)

The Collection

With regard to the supply of material for PBL settings, it seems that the library can never adequately meet the needs. In addition, the library seems never been able to buy and process new books quickly enough for the PBL needs. As for buying extra copies of books, the alternative some libraries choose is to place one copy of each recommended book to the short-loan collection section. This is mainly because that the collection space is already limited (Martin, 2003:180). It seems quite apparent that diverse and various needs arising from different users in different fields, budget constraints, space concerns and supplier-dominated publishing markets must challenge the library at all times.

In medical schools, PBL integrates a variety of disciplines including medicine, ethics, sociology, pharmacy, psychology, biology, engineering, and even

business management. A popular modus operandi is that the library supplies each PBL room with a small collection of frequently used textbooks, selected on the basis of an analysis of the short-term loan collection lending statistics and the tutors' recommendations (Martin, 2003:180). Fitzgerald (1996:19) reported the result of an investigation at the University of Calgary, where "the use of journals, both those in-house and those received through inter-library loans, has increased significantly and the use of the 'textbook' materials on reserve decreased since the university has introduced a PBL curriculum."

Textbooks are the greatest necessity for medical students. Many libraries find it difficult to purchase multiple copies of popular textbooks due to budget restrictions. One solution for this is that the library provides the reserved textbook to the tutors, not the students (Fitzgerald, 1996:19). The practice of PBL may pose additional problems: in the PBL curriculum, students normally do not espouse and read through a "standard" text. When textbooks are not assigned or are assigned partly, students may not purchase the textbooks for use. To successfully complete one clinical problem, however, up to fifteen different texts could be used. As a result of this, PBL encourages the development of personal libraries in the earlier phase of the medical education process (Watkins, 1993:308).

In addition to the usual book and journal collection, for PBL the library needs to provide a variety of types of information such as printed materials, audiovisuals, in-house multimedia clinical problem packages (Rankin, 1996:35), and particularly images such as "X-rays, ultrasounds, ECG, tissue sections… good quality illustrations and photographs" (Martin, 2003:180). When developing library collections, it should be borne in mind that the collections are not just for the students

but also for the tutors. Bibliographic references are usually vital for problem writers. Although many of the recommended books offer numerous clinical cases, new problems still need to be developed. Alternatively, Watson (2001:116) provided an idea - a "PBL clearinghouse" in which field-tested problems in all disciplines are available to the PBL tutors and educators. Problems are submitted online to an editorial panel for peer review. Supporting materials are associated with each problem. Problems published in the clearinghouse are electronically searchable by keyword, discipline, or author. In addition, the clearinghouse will publish articles and tutorials to support its mission to demonstrate and disseminate PBL as a superior teaching methodology. In short, the clearinghouse will become a 'one-stop shop' for educators looking for PBL materials and resources."

New role for medical librarians

In the PBL era, medical librarians play a crucial part in the library support for the environment which "promotes many values that librarians have believed in… We do know that library use patterns are different, with the result that resource and service needs are affected" (Rankin, 1996:33-34). As King and MacDonald (2004:210) argued,

based on information requests related to specific cases, the librarian performs a series of literature searches, selects relevant articles, and delivers them to the practitioners. …Because residents, physicians, and nursing staff now perform many of their own searches, the clinical librarian must take on the additional role of searching coach and mentor.

Miflin (2000:304) claimed that librarians should "spend considerable time coaching students in accessing and using databases, both in conventional and electronic forms." To support student self-directed learning,

librarians may direct students to information resources and recommend additional resources. More importantly, librarians, particularly those in the reference service section, must assist students in formulating and refining a line of inquiry as well as demonstrate the methods of how to assess the valuable information effectively. Problem scenarios particularly demand "open-ended questions and an objective attitude rather than closed questions and judgment" (Satterthwaite et al., 1995:467). Librarians can advance the process of self-assessment by asking such questions as:

- Why did you choose that resource?
- How valuable did you find that resource?
- How do you know the information in that resource is accurate?
- How will you better choose resources for your next problem? (Kanter, 1998:394)

To facilitate students' learning processes, librarians may ask:

- What can you do next time to formulate better hypotheses?
- What can you do to solve the next problem more efficiently?
- How can you contribute better to the group? (Kanter, 1998:394)

As librarians seek to fulfill roles as faculty facilitators and as educators for knowledge management, a basic understanding of PBL becomes a necessity (Kanter, 1998:392). In fact, librarians have the fundamental knowledge and skills that are needed by other PBL facilitators (eg, group tutors, clinicians, problem writers). However, "traditional professional development programs do not prepare librarians for facilitator or instructor roles. As the librarianship

profession matures and encompasses educator roles, numerous changes must take place – and quickly – in information science curricula" (Satterthwaite, et al., 1995:467-468). One of the significant jobs here for PBL librarians is involve themselves in the curriculum planning committees, to "contribute to the discussion of how students interact with the library…to ensure that information management objectives are better articulated and achieved" (Fitzgerald, 1996:18). To this end, McMaster University Library experience suggests that librarians should receive PBL training either on-site or in workshops, and should participate in the education committee of the school (Fitzgerald, 1996:18). Besides, "PBL students' evaluations often provide useful feedback for librarians; their ratings and comments are generally positive and enthusiastic. In some programs, librarians also participate in the evaluations of students" (Rankin, 1996:38).

Self-directed learning and small group learning are the major patterns of the new curriculum and probably the most important PBL phases for the librarians to work with the students. "Self-directed learning is the time between the problem presentation and problem discussion meetings, during which students, individually or in small groups of varying size, pursue an iterative process of seeking information" (Kanter, 1998:393). "Students set their own learning objectives around the health care problems and there are no lectures or assignments to structure the information. Students rely heavily on the reserve (short-term loan) collection and the resource lists for each problem" (Fitzgerald, 1996:17). This seen as a direct result not only of PBL but of the self-directed component of the curriculum (Fitzgerald, 1996:21). It is important for librarians to pay attention not only to the medium but also to the end result; although the basic needs for

information have not changed, the means of information delivery certainly have (Rios, 2004:19).

In addition to their work in relation to curriculum development, librarians struggle to keep up with ever-changing information literacy and skills in the profession. The specific information skills they need include:

1. effectively sorting through the volume of information available by utilizing research skills;
2. evaluating information based on the specific clinical or health care need;
3. transforming that information into productive results (via a presentation or decision) (King & MacDonald, 2004: 210).

King and MacDonald (2004:213) also explained:
the importance of informatics skills should result in a significant continuing education role in hospitals. …The library connection to informatics training is within that area where librarians have traditionally excelled: leading patrons to the information they need. In this venue, librarians have the opportunity to move increasingly into a mentoring/teaching role. Among information professionals, librarians have a unique perspective, offering enduring, interpersonal informational skills that are not technology dependent. To the contrary, the successful implementation of knowledge-based technology is dependent on effective librarian support.

To perform successfully in the PBL context, librarians need to broaden their awareness and understanding of their professional practice which includes encompassing a new role, that of a tutor. As Eldredge (2004:54-56) noted, librarians "willing to meet the challenges of tutoring can

succeed in this non-traditional role with the many associated benefits. …Librarian-tutors facilitate by prompting students to focus on mechanisms rather than pigeon- holing diagnoses." The tutors also ensure that the environment can strengthen all students to learn effectively by guiding them in evaluating information resources used to answer learning relevant questions, providing feedback to the students, and encouraging them to reflect on and assess their own and others' efforts and performance (Eldredge, 2004:56).

According to Watstein, to act as the emerging roles of health sciences librarians, librarians do have much to learn about:

- the many ways in which we might assist users in the process of transforming information into knowledge;

- the many ways in which we can contribute to the mission of our institutions; and

- our roles in our institutions – both real and symbolic (2004:14).

Miller (2004:361) recommended that librarians should consider both "the obvious goals" and "not-so-obvious goals" of offering a credit course. The obvious goals refer to the ability to provide students with knowledge and skills which will assist the students in the career enrichment as well as to provide them with the better prospect toward graduation. Not-so-obvious goals refer to the supports to faculty librarians particularly in their teaching role. These types of goals also provides librarians with another opportunity of interacting with the faculty members and "may increase the campus visibility of the library."

In summary, librarians have a significant role to play in PBL, their contribution encompassing, as Shipman (2004:10) noted, "technological advancements;

intense research in human genomics, biotechnology and life sciences; changes in health-care provision and education, …The burgeoning information of the scientific, technical and medical literature, combined with that of basic science research, has created new opportunities for health sciences librarians."

Conclusion

The required changes in medical libraries resulting from the PBL are both exciting and seemingly discouraging. Among the possible hurdles encountered are the incremental costs of PBL resources, the increased task of measurement of learning resource use, the evaluation of the effects of library staff's efforts on the education process (Rankin, 1996:40), the chronic insufficiencies of professional staffing and budgets for the libraries, the fact that the degree and the level of curriculum involvement may seem unrealistic to some librarians (Powell, 2001:415), and even the ambiguous future of the PBL reform itself.

Nevertheless, the addressing of such hurdles can bring major benefits to the library. In reporting on the characteristics of services and educational programs in libraries serving problem-based curricula, Watkins (1993:309) indicated that the PBL curriculum "offers a challenging opportunity for academic medical libraries to train users in the information-seeking process as an integral part of undergraduate medical education."

To the credit of medical libraries and their librarians for a number of years now there has been a redefining of roles, both in their established practice (traditional role) and in the new practice (PBL role). Some of the librarians may have worried about the influence of PBL on their traditional professional status

and the routine jobs in the library. However, the majority perceive the arrival of PBL as an opportunity to develop a closer and more confident relationships with the users, not just by helping them find the information needed but by partnering them in solving the problems. Watstein (2004:15) commented that "personnel are the key to the centrality of our libraries – in particular librarians who understand the place and role of libraries in their institutions, the place and role of information in their institutions, who see crisis, change and transition as opportunities, and are able to redefine their roles accordingly." Furthermore, the "emphasis on the necessity of librarians' enhanced teaching roles may help us make the necessary arguments to get priority for new librarian positions and other resources when opportunities arise" (Powell, 2001:415). An emphasis on and the promotion of medical librarians' new roles may be a very effective method of medical library improvement.

One important aspect of this improvement is that the whole process should assist libraries in becoming learning organizations which are able to respond to their changed external environment. The importance of this type of structural and organizational climate change is seen when it is realized that PBL will in time be replaced by newer and partially different approaches to medical teaching and learning. Libraries can only prepare themselves by using PBL as both a trigger and ongoing agent for change.

Bibliography

Aldred, S.E. et al. (1997). *The direct and indirect costs of implementing problem-based Learning into traditional professional courses within universities*. Canberra, Australia: Department of Employment, Education, Training and Youth Affairs.

Barrows, H. and Kelson, A. (2000). Problem-based Learning. Accessed on December 22, 2004 at http://www.pbli.org/pbl/pbl.htm.

Brittain, J.M. and Norris, A.C. (2000). Delivery of health informatics education and training. *Health Library Review*, 17(3),117-128.

Brown, C. et al. (2003). Building an information-literate population through problem-based learning experiences. *Canadian Journal of Information and Library Science*, 27(3), 129-131.

Connor, E. (2000). Handbook on Problem-Based Learning. *Bulletin of Medical Library Association*, 88(2), 200.

Delisle, R. (1997). *How to use problem-based learning in the classroom.* Alexandria, VA: Association for Supervision and Curriculum Development.

Eldredge, J.D. (2004). The librarian as tutor/facilitator in a problem-based learning (PBL) curriculum. *Reference Services Review*, 32(1), 54-59.

------- et al. (1998). The roles of library liaisons in a problem-based learning (PBL) medical school curriculum: a case study from University of New Mexico. *Health Libraries Review,* 15(3),185-194.

------- (1993). A problem-based curriculum in transition: the emerging role of the library. *Bulletin of the Medical Library Association,* 81(3), 310−315.

Evensen, D.H. (2000). *Problem-based Learning: a research perspective on learning interactions.* Mahwah, NJ: Lawrence Erlbaum Associates.

Enger, K.B. et al. (2002). Problem-based learning: evolving strategies and conversations for library

instruction, *Reference Services Review*, 30(4), 355-358.

Fitzgerald, D. (1996). Problem-based learning and libraries: the Canadian experience. *Health Libraries Review*, 13(1), 13-32.

Friden, K. (1996). The librarian as a teacher: experiences from a problem-based setting. *Health Libraries Review*, 13(1), 3-9.

Jacobs, J. et al. (2003). Integration of advanced technologies to enhance problem-based learning over distance: Project TOUCH. *The Anatomical Record,* 270B(1),16-22.

Kanter, S.L. (1998). Fundamental concepts of problem-based learning for the new facilitator. *Bulletin of the Medical Library Association*, 86(3), 391-395.

Khoo, H. (2003). Implementation of problem-based learning in Asian medical schools and students' perceptions of their experience. *Medical Education*, 37(5), 401-409.

King, S.B. and MacDonald, K. (2004). Metropolis redux: the unique importance of library skills in informatics. *Journal of the Medical Library Association,* 92(2), 209-217.

LaBeause, J.H. (2004). LibQUAL+[TM] in a problem-based learning (PBL) medical school: the case study of the Medical Library and Peyton T. Anderson Learning Resources Center (LRC) at Mercer University School of Medicine in Macon, Georgia. *Journal of Library Administration*, 40(3-4), 59-72.

Lewis, M. (2000). Library requirements and problem-based learning: the medical sciences library, The University of the West Indies. *Bulletin of the Medical Library Association*, 88(3), 255-257.

Macklin, A.S. (2001). Integrating information literacy using problem-based learning. *Reference Services Review*, 29(4), 306-314.

Marshall, J.G. et al. (1993), A study of library use in problem-based and traditional medical curricula. *Bulletin of the Medical Library Association*, 81(3), 299-305.

Martin, S. (2003). Impact of a graduate entry programme on a medical school library service. *Health Information and Libraries Journal,* 20(1), 42-49.

-------. Practical aspects in supporting the St George's graduate entry programme. *Health Information and Libraries Journal,* 20(3), 179-184.

Miflin, C. (2000). A conceptual framework to guide the development of self-directed, lifelong learning in problem-based medical curricula. *Medical Education*, 34(4), 299-306.

Miller, J.M. (2001). A framework for the multiple roles of librarians in problem-based learning. *Medical Reference Service Quarterly*, 20(3), 23-30.

-------. Issues surrounding the administration of a credit course for medical students: survey of US academic health sciences librarians. *Journal of the Medical Library Association*, 92(3), 354-363.

Moore, J.K. (2003). What is PBL? Access on January 1, 2005 at http://www.kings.edu/jkmoore/PBL/whatpbl.htm

Myers, G. et al. (2002). Beyond the virtual library: electronic curriculum Web resources. *The Electronic Library*, 20(6), 473-480.

Powell, C.A. (2001). Future teaching roles for academic librarians. *Bulletin of Medical Library Association*, 89(4), 414-415.

Rankin, J.A. (1996). Problem-based learning and libraries: a survey of the literature. *Health Libraries Review*, 13(1), 33-42.

------- (Ed.). (1998). *Handbook on problem-based learning*. New York: Medical Library Association.

Rios, G.R. (2004). PDA librarian. *Reference Services Review*, 32(1),16-20.

Rosenberg, M.J. (2001). *E-leaning: strategies for delivering knowledge in the digital age*. New York: McGraw-Hill.

Satterthwaite, R.K. et al. (1995). Library faculty role in problem-based learning: facilitating small groups. *Bulletin of Medical Library Association,* 83(4), 465-468.

Shipman, J.P. (2004). Why emerging roles for health sciences librarians? *Reference Services Review*, 32(1), 9-12.

Taylor, S.I., & Lande, R.E. (1996). A library for problem-based learning (PBL). *Health Libraries Review*, 13(1), 9-12.

Urquhart, C. et al., (2002). Evaluation of distance learning delivery of health information management and health informatics programmes: a UK perspective. *Health Information and Libraries Journal*, 19(3), 146-157.

Warling, B.N. and Stave, C.D. (1995). The health sciences librarian as Internet navigator and interpreter. *Bulletin of the Medical Library Association*, 83(4), 395-400.

Watkins, M.C. (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.

Watson, G.H. (2001) Problem-based learning and the three Cs of technology. In Duch, B.J. et al. (Eds.). (2001). *The Power of Problem-based Learning*. Sterling, VI: Stylus.

Watstein, S.B. (2004). Emerging roles of health sciences librarians: academic library centrality. *Reference Services Review*, 32(1), 13-15.