The role of health sciences librarians in the teaching and retention of the knowledge, skills, and attitudes of lifelong learning

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For the past decade, the medical education community has recognized lifelong learning as a desirable educational outcome. Problem-based learning (PBL) appears to foster the requisite knowledge acquisition, skills, and attitudes. This paper briefly summarizes research that found no differences in perceptions of lifelong learning between graduates of PBL curricula and traditional curricula. The paper analyzes the assumptions that suggest such differences should exist and asserts that these assumptions are invalid within the global context of the education process. The paper concludes by suggesting a new way of looking at the teaching and retention of knowledge, skills, and attitudes of lifelong learning and the essential role that health sciences librarians must play in the process.

INTRODUCTION

Health sciences librarians, practicing physicians, and medical educators across the country have identified the pressing need of health care providers, whether recent graduates or those long in practice, for the information-gathering skills necessary to stay current in their respective practice areas. The need is universal. However, only a relatively small percentage of today's medical students develop the knowledge, skills, and attitudes they so desperately need to meet the informational challenges of the physicians of tomorrow.

For the past decade, medical schools have been changing their curricula to address the pressures of the dynamic health care environment. Several schools have instituted major, innovative curricular programs in hopes of graduating physicians equipped to meet the challenges of tomorrow's medical practices. In 1990, Friedman et al. called on the medical education community to begin a critical analysis of the post-graduation outcomes of innovative curricular programs [1]. Among the outcomes identified were the precepts of lifelong learning, including practice modification based on changing biomedical knowledge, information-access and retrieval skills, and use of those skills to acquire new medical knowledge.

In response to the identified need for such evaluation, a substantive research project was undertaken to look at the preferences of graduates of both innovative and traditional curricula with respect to sources and methods of lifelong learning [2]. This paper presents the results of a small part of that research as a backdrop for discussing the role health sciences librarians play in the teaching and retention of the knowledge, skills, and attitudes of lifelong learning.

Following a brief discussion of the research findings, this paper addresses the basic precepts of problem-based learning (PBL), an educational methodology that by definition integrates the knowledge, skills, and attitudes of lifelong learning into the curriculum. PBL uses problem solving as a means to foster learning of basic sciences within the context of clinical applications, while traditional curricula are predicated on rote memorization of basic sciences concepts during the preclinical years. The paper suggests a role for health sciences librarians in both PBL curricula and traditional curricula and makes recommendations that may result in greater retention of lifelong learning precepts following graduation.

BACKGROUND

In 1982, under the auspices of the Association of American Medical Colleges and supported by a grant from the National Library of Medicine, Matheson et al. published the results of an analysis of the role of the medical library in the academic health sciences center [3]. Their report stressed the institution's re-
sponsibility in educating medical students for lifelong learning.

The Matheson report suggested a two-stage approach for integrating information management education into the academic health center environment. The first stage is incorporation of an instructional approach emphasizing information as opposed to storage medium (e.g., books, journals) and integration of the librarian into the mainstream of the faculty. The second phase calls for the recognition of medical information sciences as an academic discipline.

The report spurred medical educators to begin evaluating the need to instruct medical students in information-gathering skills. Two years later, the report of the Project Panel on the General Professional Education of the Physician (GPEP) and College Preparation for Medicine, commonly known as the GPEP report, was published as a challenge to the medical education community to revise their thinking and educational programs or be faced with graduating physicians ill-equipped to handle the rigors of practice in the twenty-first century [4].

The GPEP report made several recommendations that suggest the need to involve the library in the medical education process. Among these are recommendations for evaluating the ability to learn independently, promoting independent learning and problem solving, and incorporating information sciences. Each concept requires some measure of information-handling skills by the student, and each suggests that use of those skills should be integrated into both the curriculum and clinical practice.

A year later, a joint report by the Association for Academic Health Sciences Library Directors and the Medical Library Association, Challenge To Action, addressed the need for increased involvement by academic health sciences libraries in educational programs [5]. The report suggests that libraries should integrate their educational activities into academic programs and services and outlines many steps libraries need to undertake to ensure their position as viable educational forces within their institutions [6].

Research suggests that integration is the single most important factor in ensuring that the necessary information skills are imparted to the medical students of today and the practitioners of tomorrow [7–9]. Just as any basic science department is virtually insignificant in the medical educational processes without a link to its clinical applications, so does the concept of information skills lose its import unless it is matched to the information needs of tomorrow's practitioner.

One form of medical education increasingly has been seen as offering the greatest potential for meeting the goals established by the GPEP report. Early research indicates that PBL may foster deeper-than-average levels of learning in its students [10–11] and may engender a greater appreciation of the educational process [12–13]. A recent assessment of progress in curricular reform found that schools that had endorsed the basic tenets of PBL had gone further than had other institutions toward the initial goals identified in the GPEP report [14]. However, research on the efficacy of the new curriculum has produced mixed results [15–16].

With its emphasis on self-directed learning and small-group tutorials, PBL appears to promote lifelong learning skills through integration of education with clinical problem solving. Rankin did the first substantive study showing that PBL students tend to use information resources that support independent learning and that they do so with relative ease [17]. Further, PBL students learn to use their medical libraries earlier and then use them more frequently than do students enrolled in traditional curricula. Marshall supported these findings, although she found no difference between faculty in PBL and traditional curricula in terms of their level of library use [18].

Based on the supposition that lifelong learning skills are integrated fully into any total PBL curriculum [19] and the studies showing that enhanced library use is a by-product of such a curriculum, one would be tempted to assume that PBL students likely would retain lifelong learning skills and attitudes following graduation.

THE STUDY

Methods

A comparative study was undertaken to determine whether PBL graduates differed from graduates of traditional curricula in their perceptions of lifelong learning. The two sets of graduates were compared using three variables: sources of information, methods used to acquire information, and orientation to change (e.g., tendency toward innovation, specifically in the acquisition of new knowledge). A stratified random sample of graduates was selected from three classes in nine medical schools, four with PBL curriculum and five with more traditional curriculum.

Each of the four PBL schools had had the innovative curriculum in place for at least nine years, a long enough time to enable surveys of both recent graduates and those who had been in practice or residencies for both two years and five years. Each PBL program was a substantial part of the preclinical curriculum and was offered to either all students or a defined group of students.

To collect the data, a Likert-type survey instrument, drawn from a doctoral dissertation on biomedical knowledge access [20], was sent to the students, along with a personal letter. One follow-up letter was sent to nonrespondents. Return rates for the various schools ranged from 42% to 55%. Because the two
samples (PBL and traditional graduates), were of unequal size (the population of PBL graduates was relatively low), a $t$ test for independent means was used in comparing the two groups.

Results

Table 1 shows the average of the student responses to questions concerning sources, methods, and orientation to change. Table 2 shows the results of the $t$ test. Only one scale in one variable revealed any statistically significant difference: PBL graduates preferred formal continuing medical education (CME) as a method for acquiring new knowledge to a greater degree than did their counterparts in traditional curricula.

Graduates of both types of curricula relied on colleagues as their information source of choice. This finding paralleled earlier research [21-23]. Biomedical literature was also a highly regarded source of information; however, personal libraries were preferred to hospital or academic health sciences libraries, particularly by those who had completed their residencies. Pharmaceutical company literature was valued less than were other information sources.

Respondents who had completed their residencies valued the concept of teaching to learn as a method for garnering new knowledge; there were no statistical differences between the two sets of graduates. Use of computers to acquire information was valued only moderately by both groups. However, virtually none of the respondents were required to use computers as an integral part of their undergraduate medical curriculum.

As mentioned, the only statistically significant difference between the two groups was in preferences for CME as a method for gaining new knowledge. This finding is not surprising, in light of past studies of student satisfaction with medical school curricula [24-25]. PBL students have been shown to enjoy their educational experiences, so a similar positive response to formal CME might be expected.

The data on orientation to change showed that both groups of students tended to fall midway between desiring the status quo and being agents of change.

In summary, this study attempted to determine whether PBL graduates, who developed lifelong learning skills as part of their curricula, would be more likely than would their traditional curriculum counterparts to acquire new knowledge through the identified sources and methods and to display a tendency to adopt innovation. The only area in which they displayed a significant difference was in their preference for formal CME. PBL graduates did not make greater use of health sciences libraries or display a tendency to seek out new methods of acquiring information.

IMPLICATIONS

In questioning unexpected results, beyond the obvious critique of the study design and routine reanalysis of the data, it is helpful to review the assumptions on which the study was predicated.

- PBL integrates the knowledge, skills, and attitudes of lifelong learning into the curriculum.
- Those most skilled in information gathering, academic health sciences librarians, are involved in the teaching of lifelong learning and information literacy in PBL programs.
- Lifelong learning skills are used continually in clinical clerkships, internships, and postgraduate medical education and, therefore, are reinforced to the same extent as are other skills of medical practice.
- Information literacy skills acquired during an undergraduate PBL curriculum are useful in practice.

To determine whether the knowledge, skills, and attitudes of lifelong learning are integrated into the PBL curriculum, it is first necessary to review how this concept is translated into practice. A facilitator gives a small group of students a clinical problem and asks them to research the problem and bring all relevant information back to the group for discussion. In most PBL schools, case-based issues are developed, and global areas of research are assigned to specific students to ensure that all essential elements of the problem are covered.

Because PBL curricula begin during the undergraduate medical student's first year of study, the emphasis is on problem solving rather than rote memorization of basic science facts. Sources of information are primarily knowledge based. Therefore, PBL students rely heavily on medical libraries to glean their information.

In most instances, health sciences librarians provide the initial information about resources and knowledge-gathering methods. As more problems are presented and more knowledge is required to solve increasingly complex problems, students achieve
Lifelong learning

Table 2
Results of t test

<table>
<thead>
<tr>
<th>Scales</th>
<th>PBL curriculum</th>
<th>Traditional curriculum</th>
<th>t test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>Sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collegial access</td>
<td>131</td>
<td>27.10</td>
<td>3.00</td>
</tr>
<tr>
<td>Biomedical literature</td>
<td>131</td>
<td>20.92</td>
<td>3.23</td>
</tr>
<tr>
<td>Pharmaceutical company</td>
<td>131</td>
<td>6.80</td>
<td>1.61</td>
</tr>
<tr>
<td>Methods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching to learn</td>
<td>131</td>
<td>12.86</td>
<td>2.71</td>
</tr>
<tr>
<td>Continuing medical education</td>
<td>130</td>
<td>14.08</td>
<td>3.09</td>
</tr>
<tr>
<td>Use of computers</td>
<td>131</td>
<td>8.82</td>
<td>1.58</td>
</tr>
<tr>
<td>Orientation to change</td>
<td>131</td>
<td>65.36</td>
<td>6.83</td>
</tr>
</tbody>
</table>

Deeper levels of learning and a greater breadth of knowledge about the sources and methods used to acquire information.

Repetitive use of information-gathering skills fosters increased facility with the process of acquiring knowledge. In most PBL programs, library use grows along with ease of using resources. Studies have shown greater use of library materials and services by PBL students than by those in other types of curricula [26–27].

The most important single element in lifelong learning is probably the attitude toward information acquisition. If a student values information as a means to improve clinical practice, a habit of acquiring and using information will develop quickly. However, in most PBL curricula, information is acquired to support an educational process as opposed to professional practice. PBL students graduate with a great deal of knowledge and skill in the use of a variety of information resources; however, as the research suggests, they seldom develop an understanding of when to use those resources or the relative importance of each in assisting with a patient problem.

The role of health sciences librarians

Health sciences librarians not only are well equipped to teach the knowledge and skills of information acquisition but also are well versed in when and how to apply knowledge and skills to acquire information to support patient care. However, there is some question about whether medical education and PBL curricula in particular effectively utilize health sciences librarians.

In PBL curricula, the health sciences library generally is 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.

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. Such involvement might lead to recognition that teaching students appropriate lifelong information acquisition skills must become an objective of any PBL construct. PBL educators will be among the first to extol the virtues of integrating lifelong learning skills into their curricula. They will stress how important the library is to the total program, and they will praise the work of the health sciences librarians in teaching information acquisition skills to the PBL students. However, there are few examples of medical librarians being integrated into the teaching mainstream of the faculty, and the creation of an academic department of medical information sciences, as suggested in the Matheson report [28], appears very remote.

PBL and medical practice

Although PBL curricula do not appear to foster attitudes supporting lifelong learning, and medical librarians apparently have not been utilized optimally in teaching in PBL curricula, repetition can foster learning. For example, conducting a patient history and physical requires knowledge, skill, and appropriate attitudes. Only through practice does the medical student, usually well into residency, begin to master all of the nuances performing an adequate history and physical. Similarly, lifelong learning requires knowledge, skill, and appropriate attitudes. Therefore, all medical students should have the opportunity for reinforcement gained through routine practice.

In PBL curricula, the case-based approach sends students to the library to research problems and bring findings back to the group for evaluation. Group cri-
tiques of the process provide learning opportunities as well as positive reinforcement of a student’s developing knowledge and skills related to information acquisition. Unlike the patient history and physical, however, knowledge and skill development in information gathering essentially ceases after the first two years in most PBL curricula.

Oliver Wendell Holmes once stated, “The most essential part of a student’s instruction is obtained . . . not in the lecture room, but at the bedside” [29]. PBL has been predicated on this concept. Clinical problems used in PBL are intended to bring relevance to basic science materials and demonstrate the interrelationships between the preclinical disciplines and the practice of medicine. Most PBL curricula stop after the first two years of medical school, on the assumption that clinical clerkships and internships provide enough clinical problems and eliminate the need for structured learning. Promotion of the lifelong learning attitude is lost in this approach.

Even if some institutions continued the PBL structure through the last two years of medical school, virtually all graduates would go on to residency training, which values rapid clinical problem solving and expedient acquisition of information to support decision making. This tradition, probably more than others, could be behind the preponderance of research findings indicating that a physician’s primary source of new knowledge is collegial interaction [30].

Obviously, most patients would rather not wait for a physician to perform extensive knowledge-based research to make a diagnosis or select the most appropriate management option. This then suggests that the information-gathering skills learned during a PBL curriculum may not be useful in practice, contrary to the initial assumption. PBL programs have done an excellent job in teaching the knowledge and skills of information acquisition needed in an educational and research program, but have they taught what graduates need to know and will use in medical practice?

What is lifelong learning? If it is a methodology to promote knowledge acquisition to enhance the ability to practice medicine, the PBL approach appears to be valid. However, if lifelong learning is defined as the ability to identify a need, access and retrieve information, filter it for quality in relation to a specific patient problem, and use the information in a timely manner to diagnose or treat a medical problem, the PBL method of imparting lifelong learning skills is inadequate to meet the realities of current medical practice.

CONCLUSION

Medical education is being forced to change to meet the challenges of a rapidly growing medical knowledge base, a dynamic health care policy environment, and a demanding health care consumer population. Information literacy is essential for every medical school graduate; merely having the knowledge and skills of information acquisition is not enough. Lifelong learning must include the adoption of appropriate attitudes and habits, and these can be instilled only through curricular integration with emphasis on appropriate sources and methods.

PBL proponents have made a good beginning in integrating the acquisition and use of information into the curriculum, at least during the first two years of medical school. However, there must be a continuum of learning throughout undergraduate and graduate medical education, if appropriate attitudes and habits are to be formed.

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. Specifically, information literacy must be taught in all four years of undergraduate medical education and during residency programs. The knowledge and skills being taught must be appropriate to those required by the specific course of study. The emphasis, particularly in the clinical clerkships and beyond, must be on the most effective and efficient sources and methods of information acquisition to assist in patient care. Finally, the instructor of information literacy, the health sciences librarian, must be acknowledged as an equal member of the medical education team.

Attitudes and habits of information literacy are difficult to impart. However, if the health sciences librarian, as a recognized information expert, begins teaching knowledge and skills that can be used efficiently and effectively in practice, attitudes and habits will develop to create a truly information-literate physician.

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