

Use of Problem-Based Learning in Canadian and U.S. Dental Schools: Results of a Survey

• The International Dental Problem-Based Learning Network •

A b s t r a c t

Problem-based learning (PBL) is an increasingly common pedagogical method in health sciences education. Medicine has led the way, but many health science educators in other disciplines have begun to use PBL or are looking seriously at introducing it. There is far less information available about the extent and the scope of PBL in dental education than in medical education. The International Dental Problem-Based Learning Network (IDPBLN) is an informal group of dental educators interested in or involved with PBL. Representatives of the Network surveyed the deans of 10 Canadian and 55 U.S. dental schools to determine the extent of PBL in dental education. The survey included a clear definition of PBL to help ensure that the term was interpreted the same way by all respondents. The deans were asked if PBL was already used in the curriculum or if they intended to begin using it. For institutions where PBL was already in place, respondents were asked about the extent to which PBL was used in the curriculum. A total of 49 institutions responded to the survey (9 Canadian and 40 U.S.). Twenty-two institutions reported that PBL was being used, and 6 of the remaining 27 indicated that they planned to use PBL in the future. For the most part, PBL was used only in certain parts of the curricula, most commonly during the early years.

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Since the introduction of problem-based learning (PBL) in the health sciences by the medical school at McMaster University in Hamilton, Ontario,¹ many medical schools around the world have adopted this pedagogical method. More recently, several dental schools, including schools in North America, have adopted PBL as one of their primary educational settings.²⁻⁹ Although the literature suggests that PBL is not common in dental education, little is actually known about the extent to which it is used in this context.

The American Association of Dental Schools (AADS) created a special interest group for PBL in the mid-1980s. This group remained active until the mid 1990s. However, the AADS, now called the American Dental Education Association, routinely schedules concurrent sessions during its annual meetings, which made it difficult for interested persons to attend both meetings of the PBL special interest group and other scheduled sessions of interest to them. Moreover, interest in PBL in dental education is international in scope, and many international dental educators are often unable to attend meetings held in the United States. For these and perhaps other reasons, the PBL special

interest group has not programmed sessions for a number of years. In part to fill this void, a group of dental educators at the University of Southern California sponsored an international symposium on the topic in 1998. The meeting was attended by nearly 100 academics from all over the world. The energy and enthusiasm generated during the symposium led to several follow-up meetings. The group has created an informal network of dental educators, the International Dental Problem-Based Learning Network (IDPBLN), which shares ideas, cases, information and research interests. The survey described here was a Network initiative intended as a prelude to similar surveys in other parts of the world.

The purposes of the survey were to determine whether undergraduate dental institutions in Canada and the United States are using or intending to introduce PBL and, for those institutions where PBL is already in place, to determine the extent to which this pedagogical method is used in the curriculum. Additional information was sought to determine the perceived obstacles to planning, adopting and implementing PBL, although there was no attempt to determine the reasons why PBL is not being planned at

institutions that indicated no intention of adopting this form of teaching. The IDPBLN acknowledges that PBL is a teaching approach that is new to dentistry and that adoption of this method is not necessarily a determinant of effective learning.

Methods

After a meeting of the International Association of Dental Research in Vancouver, British Columbia, in 1999, a self-selected group of IDPBLN members, including 5 members from outside North America, met to consider future activities and research initiatives. One of the outcomes of that meeting was development of a questionnaire to survey undergraduate dental institutions in Canada and the United States about the use of PBL (Table 1). Final review and editing of the instrument was done by e-mail. This paper presents the combined results of Canadian and American responses. Similar surveys of other countries represented within the IDPBLN are planned but have not yet been completed.

The survey was sent to the deans of all 10 Canadian and 55 U.S. undergraduate dental institutions. The questionnaire was distributed electronically, and a large proportion of responses were received the same way. Several follow-up electronic mailings were distributed to nonrespondents, and paper copies were eventually sent by regular mail. Finally, all non-responding institutions were contacted by telephone to encourage response. We were unsuccessful in acquiring information from a number of institutions.

Because of confusion about and apparent misuse of the term "PBL," there was concern that respondents might misrepresent their curricula. To avoid this possibility, the IDPBLN included the following definition of PBL with the survey:

- PBL is defined as **learning** initiated through problem investigation rather than through lectures that precede the application and integration of knowledge.
- In PBL the **problem** comes first and is the vehicle for learning.
- PBL is **student-centred** such that students define the problem and establish the learning objectives necessary to understand the problem in greater depth, in contrast to case-based education, in which the learning objectives are presented prior to a problem-solving activity.
- PBL is based on **small groups** of students working together in a cooperative environment to integrate across disciplines to accomplish understanding.

Each returned questionnaire was assigned a unique identification number in an attempt to keep confidentiality. Numerical information was coded for data entry. The final section of the questionnaire offered respondents an opportunity to enter text responses and commentaries on

Table 1 Questionnaire concerning problem-based learning (PBL) sent to deans of Canadian and U.S. undergraduate dental institutions

1. Are you currently using PBL in any areas of your curriculum?
2. Do you intend to introduce PBL into your curriculum?
3. When do you intend to introduce PBL?
4. Will PBL be used for all or part of the curriculum?
5. What other changes do you envisage will be needed to facilitate implementation of PBL?
 - a. Increased professional development for staff
 - b. Increased financial support
 - c. Administrative changes within the institution
 - d. Changes in physical plant
 - e. Financial resources
 - f. Leadership
 - g. Changes in admissions policies and procedures
 - h. Changes in student assessment and feedback methods
 - i. Orientation of students to PBL
 - j. Changes in promotion schemes for faculty
 - k. Other
6. If you are currently using PBL in your curriculum, please consider the following statements about the relative use of PBL in your curriculum compared with other modalities and indicate with an X those that apply. Our curriculum is:
 - a. All PBL-based
 - b. Predominantly PBL with a limited amount of traditional teaching
 - c. PBL and traditional teaching have an approximately equal emphasis
 - d. Predominantly traditional with a limited amount of PBL
7. Please note in which years of the course PBL is used.
8. What is the relative percentage of time spent on the following activities in an average week?
 - a. PBL tutorials for didactics
 - b. Scheduled independent study
 - c. Pre-clinical/dental labs
 - d. Basic science labs
 - e. Clinical contact/observation
 - f. Lecture
 - g. Seminar
9. What is the minimum level of educational accomplishment for students to be admitted to your dental school?
10. As well as a minimum level of educational accomplishment, what are the requirements for admission to your dental school?
11. Please list any subject prerequisites for entry into dental school.
12. Is participation in a PBL session a feature of your admission procedure?
13. Requirements for licensure/registration in your country/state.
14. Do you have any other comments about PBL in dental education?

particular questions; text from this section was retrieved and coded by the authors.

Results

The deans from 9 Canadian and 40 U.S. institutions responded. Twenty-two of the respondents (1 Canadian and 21 U.S.) indicated that PBL was used at their institutions. Of these 22, only one dean reported that PBL was the sole didactic methodology. In reality, at this institution PBL represents a parallel track within an otherwise "traditional"

curriculum and is not used throughout the undergraduate institution. Nonetheless, this institution plans to begin using PBL throughout the institution in 2002. Twenty-seven deans reported that PBL was not being used; however, 6 of these (none in Canada) intended to introduce PBL within the next few years. Thus, almost half of the dental schools in Canada and the United States combined will be using PBL to some degree in the near future. For Canada only, the proportion is much smaller.

Respondents indicating plans to adopt PBL were asked what other changes they thought would be needed to facilitate implementation of PBL (Table 2). All of these respondents indicated a perceived need for faculty development, which may explain in part the perceived need for increased financial support expressed by the respondents. Half the deans foresaw a need to change the institution's administrative structure to accommodate PBL. Several respondents recognized the need to change the physical plant and student assessment systems, findings that reflected their understanding of PBL. Of interest was the paucity of respondents who realized that promotion and tenure considerations might well need to be rethought before implementation of PBL.

Where PBL was already in place, it was used most commonly in the basic and clinical sciences. The breakdown of

Table 2 Responses of the 6 institutions intending to use problem-based learning (PBL) to the question, "What other changes do you envisage will be needed to facilitate implementation of PBL?"

Increased professional development for staff	6
Increased financial support	6
Administrative changes within the institution	3
Changes in physical plant	4
Leadership	4
Changes in admissions policies and procedures	0
Changes in student assessment and feedback	6
Orientation of students to PBL	5
Changes in promotion schemes for faculty	1

Table 3 Median hours spent per week in various educational settings by dental students in 49 Canadian and U.S. undergraduate programs

Type of session	Year 1	Year 2	Year 3	Year 4
PBL tutorials for didactics	6	5	3	2
Scheduled independent study	5	4	2	1
Pre-clinical/dental labs	9	13	4	0
Basic science labs	6	2	0	0
Clinical contact/observation	3	4	26	32
Lecture	18	14	9	4
Seminar	1	2	2	4

PBL = problem-based learning.

hours spent in various learning environments are detailed in Table 3. The number of hours devoted to PBL decreased over the 4 years of the undergraduate dental program. A median of about 5 to 6 hours per week was allocated to PBL in the first 2 years of the 4-year program, but this dropped to just under 2 hours in the fourth year. It appeared that students in all years were given less time for independent study than they spent in PBL tutorials.

Totals for the columns in Table 3 reveal that students are typically scheduled for more than 40 hours per week. Respondents also indicated that the number of hours devoted to lectures was about 3 times the number of tutorial hours for all years.

Discussion

The move toward PBL at some institutions may be a response to the 1995 Institute of Medicine report, which recommended that dental education "shift more curriculum hours from lectures to guided seminars and other active learning strategies that develop critical thinking and problem-solving skills."¹⁰ Many dental schools are paying heed to these recommendations, but they may do so in different ways. Some excellent yet traditional institutions may be content with their current teaching approach, as evidenced by the survey finding that many dental schools have no plans to introduce PBL. However, PBL does not simply represent a way of doing the same things better. Rather, it is an attempt to accomplish something different. For this reason, PBL and other forms of educational innovation may not be suitable for all schools. Institutions need to recognize their identity and realize what they do best. Some institutions are leaders in dental research, and many provide exceptional service to their communities, although they may not embrace new teaching methods.

Some of our results indicate confusion about the term "PBL," despite our attempts to control this potential problem. One text response suggested that much of what is regarded as PBL is in fact case-based methodology. In fact, many of the responses suggested that respondents were misrepresenting their pedagogical methods. For example, one respondent stated that, "we use hybrid case-based PBL in some courses but it does not fit your definition." The following text response also reflects this situation: "We have introduced PBL as a treatment-planning course between the junior and senior years." Thus it seems that "PBL" is being used as the descriptor for a teaching method that is much more akin to case-based learning than to true PBL.

Other responses indicated that curricular change is being considered and that PBL represents one method of achieving a desired outcome. One respondent stated, "We do not anticipate converting the entire curriculum to PBL. However, we do anticipate the introduction of a great deal of active learning into the curriculum, especially case related." Another comment reflected a common approach to the

use of PBL: "Our plan is for hybrid PBL in which problem-based learning will be a component of the educational institution rather than the sole curriculum."

A search of the literature failed to identify any comparison of learning outcomes between case-based and PBL methods. The IDPBLN believes that, conceptually, PBL holds certain advantages over case-based learning, but we recognize that case-based seminars have been and will continue to be an effective learning environment. This method brings students and facilitators together in an interactive environment, and, given good cases and appropriate facilitator training and experience, can integrate the different disciplines within dentistry and the health sciences.

Although we did not pursue the reasons why some institutions were not contemplating the implementation of PBL, some respondents offered ideas about the barriers to this type of curriculum innovation. One suggested that "the use of PBL is limited at this point by the commitment it would require for small group teaching (number of faculty, small seminar rooms, and faculty training for facilitating small groups)." Another stated that "PBL is one way to educate. It is hard to do with large class sizes. We are increasing their case-based learning, and have already many seminar opportunities." Another respondent offered the following perspective: "What is PBL? We offer it, but frankly I do not believe we really deliver it. Can PBL be offered as 10% of a curriculum without dedicated study time for PBL activities, and maintain progress in a heavy traditional curriculum? PBL is a great teaching idea, but can schools afford to offer it financially, as financial burdens are increasingly placed on the schools? It seems to be a more expensive teaching method. Retraining of faculty is a major effort, and cannot be underestimated."

The personal experience of members of the IDPBLN indicates that PBL is used in undergraduate teaching where a single educator or a group of faculty have taken the initiative to develop and implement the method, often in individual subjects or courses. In contrast to these innovators, many dental educators see no particular advantage to PBL; these people often hold particular views about teaching and learning, attitudes that may be resistant to change.¹¹ Such attitudes may be a factor where consideration is being given to introducing PBL across an entire curriculum. For many institutions, such dramatic change may be impossible. Perhaps as a consequence, only a few institutions in Canada and the United States use PBL beyond a single subject or course.

It can be difficult for one undergraduate dental institution to learn from the experiences of other similar institutions. Educational facilities are busy places, where staff try to address the many issues surrounding service, research and education. For these and other reasons, there is little communication among educational institutions. This lack

of communication is perhaps especially true with regard to PBL in dental education, at least in North America. For example, the special interest group of the American Dental Education Association is no longer active, and there is really no time during the annual meeting of this association when such a special interest group could meet. So, PBL in dentistry has been left to organize itself — a tall challenge.

We encountered little concern about the implications for admissions policies of developing a PBL-based curriculum. This apparent lack of concern may reflect a degree of comfort and confidence in the current process or it may reflect uncertainty about the changes in admissions policies that might be needed if an institution were to implement PBL. Just one institution, the University of Southern California, uses a PBL case to assist in the selection of students for its PBL track.

A more global problem in undergraduate education that is also seen in dental institutions relates to the value placed on teaching skills. For example, the tutor in a PBL program does not have the same responsibilities as the course coordinator in a traditional curriculum. Documenting excellence in teaching in a fully PBL-based curriculum is entirely different from the same process in a traditional educational environment. For example, in PBL much of the planning, organization and direction of the curriculum is done by committee, compared to the old model, where course coordinators would plan and organize teaching. In the PBL setting, senior administrators must pay particular attention to junior staff and their career development, where teaching responsibilities are often very different from those in the traditional setting.

Although the results of this survey suggest that a small number of institutions are planning to adopt some PBL into their curricula, the long-term growth of PBL in dental education cannot be predicted on the basis of our findings. However, as educators look for different outcomes for students, our approach to education will be tested and will necessarily change. Such shifts in approach have characterized innovation in the past and will likely do so in the future. As more institutions consider curricular reform, it is perhaps wise to remember the words of Stephen Abrahamson, professor emeritus of medical education at the University of Southern California: "Curriculum planning is seldom educational or logical; it is almost always emotional and political."¹² ♦

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