Problem-based Learning in Undergraduate Dental Education: Faculty Development at the University of Southern California School of Dentistry

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The University of Southern California School of Dentistry (USCSD) seeks to educate oral health professionals with a balanced curriculum covering health promotion, risk assessment and disease prevention, diagnostics, treatments, and therapeutics. Based on critical analyses of a 5-year educational demonstration project, the USCSD proposed to use problem-based learning (PBL) to achieve its goals. Among the many changes required to convert a traditional dental educational curriculum to PBL, none is more important than that of faculty development. To achieve this, the USCSD Curriculum Subcommittee on Faculty Development, Mentoring, and Evaluation has designed and implemented a series of workshops to train its faculty as facilitators. There are four Core Skills Workshops: PBL Process Workshop, Facilitation of Learning Workshop, Student Assessment and Feedback Workshop, and PBL in the Clinical Environment.

J Prosthodont 2007;16:394-399.

INDEX WORDS: undergraduate dental education, problem-based learning

As a professional oral health learning organization, the University of Southern California School of Dentistry (USCSD) seeks to improve critical thinking and the biological and behavioral foundations of clinical care for individuals, families, communities, and populations in a multicultural environment. The USCSD seeks to educate oral health professionals with a balanced curriculum covering health promotion, risk assessment and disease prevention, diagnostics, treatments, and therapeutics. Based on critical analyses of a 5-year educational demonstration project, the USCSD proposed to use problem-based learning (PBL) to achieve its goals.[1] This pedagogy emphasizes student-centered, inquiry-based strategies of learning, with learners who address developmentally appropriate patient-based problems. In PBL, learners work in small groups, which usually consist of six to eight students as indicated by literature to be the optimal size for a group.[2,3] These small groups require full participation and use faculty as facilitators or skill experts. The PBL model emphasizes critical thinking, self-assessment and evaluation, small group learning, and early introduction to clinical dentistry with vertical group practices. The PBL model provides a learning approach resulting in clinical excellence; life-long learning habits; and a keen interest in leadership, science, and innovations in clinical dentistry.[4]

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Accepted April 3, 2006

Presented before the Academy of Prosthodontics, Niagara Falls, ON, Canada, May 4–8, 2004

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1059-941X/07

doi: 10.1111/j.1532-849X.2007.00216.x

Problem-Based Learning

Problem-based learning originated in medical education in the 1960s at McMaster University, Ontario, Canada, and was originally promoted as a novel learning strategy in which students would be enabled to escape traditional textbook- and lecture-based teaching styles, which were vilified as promoting rote memorization, in favor of a small group, problem-oriented approach

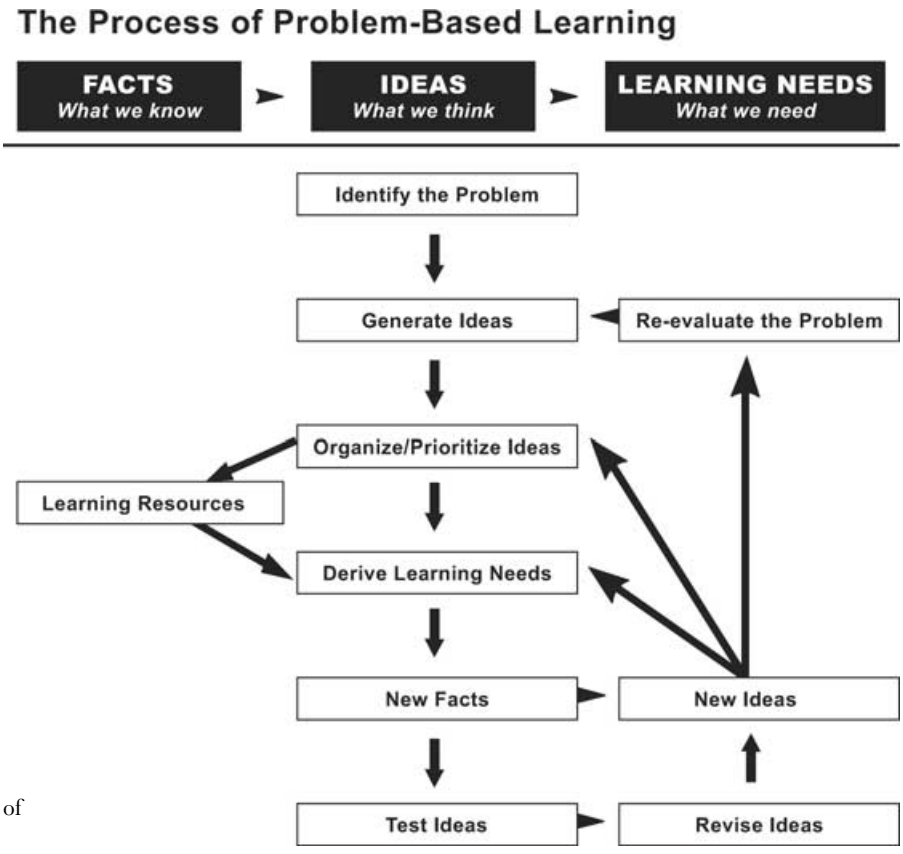


Figure 1. The process of problem-based learning.

that would better develop general problem-solving skills. Currently, the PBL pedagogy has been applied in most medical schools in the United States.[1] Medical education literature has shown that students who were enrolled in medical schools using PBL were more prepared for clinical patient care, since they learned the material in a context similar to the final application. It has been stated that "the closer the resemblance between the situation in which something is learned and the situation in which it is to be applied, the better the performance. This phenomenon is called encoding specificity. It is practiced during clinical lectures or clerkships, where students acquire knowledge related to patient problems that have characteristics in common with what students will encounter in later professional life".[5]

Although educational research indicates that students in PBL environments master material at a much higher level and in a manner more appropriate to patient evaluation and care, dental educators have been slow to adapt teaching programs to this paradigm.[6] In North America interest in a PBL-based curriculum was further promoted by the 1995 Institute of Medicine Report, *Dental Education at the Crossroads*, which strongly urged a reassessment of current dental curriculum.[7] Subsequently, the USCSD committed to a strategy of using a student-centered, inquiry-based PBL pedagogy for both the basic and clinical sciences.[6]

Working in small groups, students/learners investigate a problem following a specific process under the guidance of a faculty facilitator. In the PBL process, the students first identify the facts related to the problem, that is, those pieces of information known to be true (Fig 1). Based on the facts of the problem, the students engage in a stage of critical thinking to generate their ideas about the nature of the problem. The ideas, which can be prioritized from most likely to least likely, represent what the group thinks about the case. Likewise, these ideas help establish the group's learning needs – those pieces of information that need to be discovered. The discovery of new facts based on the content of the resources applied to the learning can be used to evaluate the ideas and refine the group's thinking about the problem. Through group discussion, the students master the learning needs and advance

PBL PROCESS WORKSHOP (full-day)

Description: How students use the PBL process and the small group environment to learn, to apply knowledge, to assess limits of knowledge, and to perform self and peer evaluations *(designed for those with limited to no PBL case facilitation).*

Format: PBL experience via role play

Participant Objectives:

- To increase understanding of how facts are distinguished, ideas based on facts are generated and appropriately defined, and learning issues are defined by learners going through a PBL case
- To increase understanding of how students use resources to generate learning needs relevant to the case and their group's ideas
- To increase awareness of how students gauge their limit of understanding from a PBL case
- To increase understanding of the importance of reviewing case outcomes and defining unresolved learning issues
- To increase understanding of the importance of conducting self and peer review
- To increase understanding of the inquiry-based, student-centered learning approach used in the problem-based learning program

Figure 2. PBL process workshop.

their individual knowledge base, essential to developing those competencies associated with the new graduate dentist.[8] The learning needs serve as the curricular content of the dental educational program. The problems presented over 4 years of dental education contribute to the knowledge base required to better prepare the student to be a beginning general practitioner.[1,3,9]

While the curricular content of this student-centered, inquiry-based PBL pedagogy appears to be unstructured, it is, in fact, quite structured, although largely hidden from the student. Four themes, namely human structure, human function, human behavior, and human clinical dentistry, are the focus of the 4-year program, providing a vertical integration of curricular content

FACILITATION OF LEARNING WORKSHOP (half-day)

Description: How to guide students through the PBL process and interpersonal problems using facilitation skills, as well as how to explore the roles and responsibilities of the facilitator.

Format: Moderated scenario discussion, mock group observation, role play

Participant Objectives:

- To understand the skills necessary to facilitate student groups
- To understand and be able to identify student behavior that would prompt intervention by the facilitator
- To understand the roles and responsibilities of the facilitator in the student group

Figure 3. Facilitation of learning workshop.

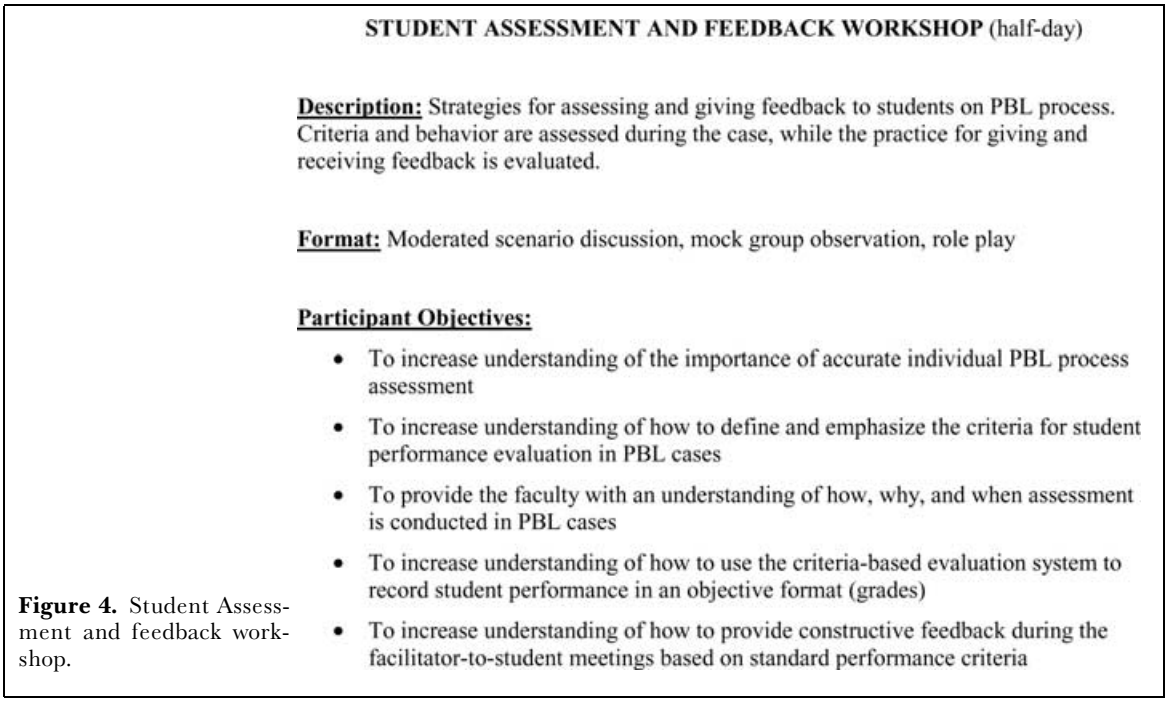


Figure 4. Student Assessment and feedback workshop.

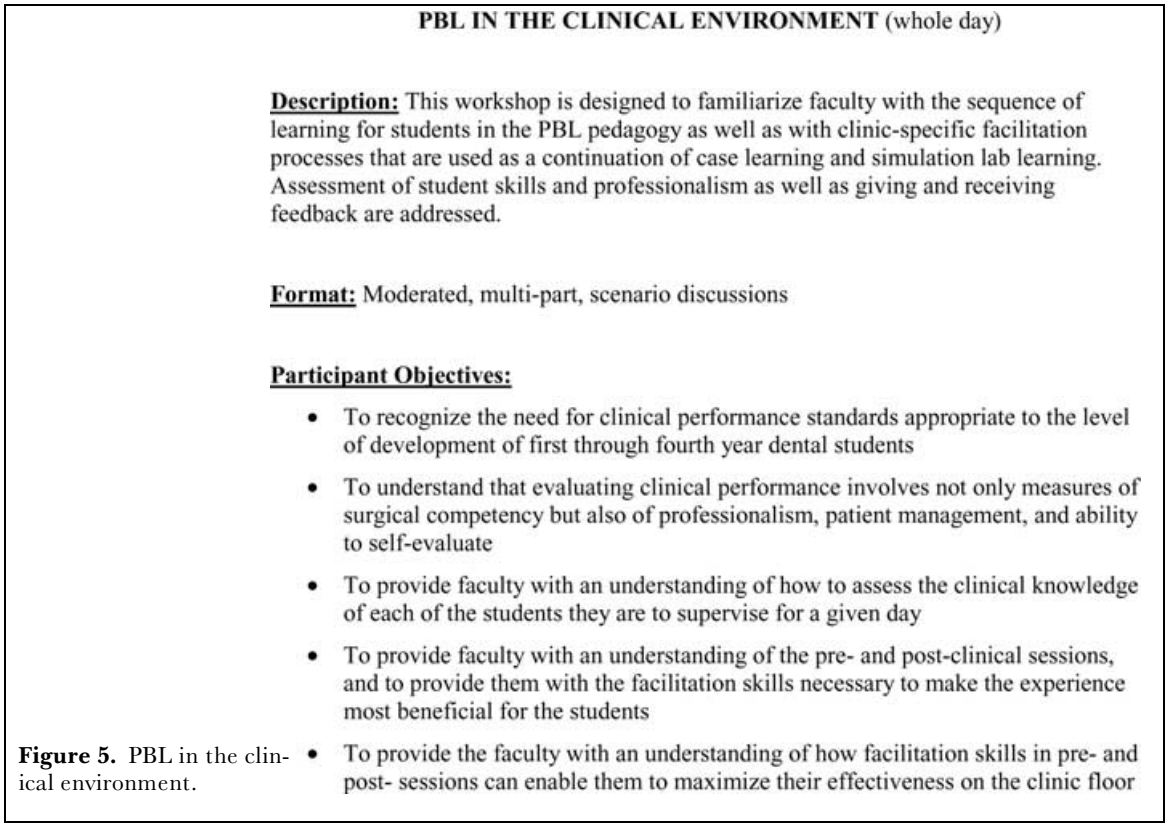
that seeks to avoid any segregation into preclinical and clinical components. These four themes extend throughout the course of the program, although the proportions of each do change. Thus, while structure and function dominate the earlier trimesters, behavior and dentistry dominate the later trimesters.[9]

Faculty Development

Among the many changes required to convert a traditional dental educational curriculum to PBL, none is more important than that of faculty development.[3] Faculty must adapt from their traditional role as teacher/instructor to that of a facilitator of learning for student groups. In a PBL curriculum, the faculty facilitator works directly with the student group to explore the problem, extract the relevant facts, generate hypotheses, and identify the learning needs the students are required to research to better evaluate their hypotheses. In all of this, the facilitator does not act as a teacher or as a content expert but seeks to help the students work with the problem (case) to gain maximum benefit from their learning. If the facilitator instead guided the students through discussion, facilitator-to-student exchange would predominate, thereby decreasing student-to-student exchange, ultimately hindering student-centered learning, one of the key elements of PBL.[10,11] This is a demanding new role for many faculty and will require both prior learning, sensitization, and practice before proficiency can be achieved.[3,12-16] To this end, the USCSD Curriculum Subcommittee on Faculty Development, Mentoring, and Evaluation has designed and implemented a series of workshops to train its faculty as facilitators.[17] There are four Core Skills Workshops, including the PBL Process Workshop (full-day), Facilitation of Learning Workshop (half-day), Student Assessment and Feedback Workshop (half-day), and PBL in the Clinical Environment (full-day).

The *PBL Process Workshop* demonstrates, through role-playing, how students use the PBL process and the small group environment to learn, to apply knowledge, to assess limits of knowledge, and to perform self- and peer- evaluations. The faculty objectives are listed in Fig 2.

The *Facilitation of Learning Workshop* describes how to guide students through the PBL process and interpersonal problems using facilitation skills, as well as how to explore the roles and responsibilities of the facilitator. The faculty objectives are listed in Fig 3.



PBL IN THE CLINICAL ENVIRONMENT (whole day)

Description: This workshop is designed to familiarize faculty with the sequence of learning for students in the PBL pedagogy as well as with clinic-specific facilitation processes that are used as a continuation of case learning and simulation lab learning. Assessment of student skills and professionalism as well as giving and receiving feedback are addressed.

Format: Moderated, multi-part, scenario discussions

Participant Objectives:

- To recognize the need for clinical performance standards appropriate to the level of development of first through fourth year dental students
- To understand that evaluating clinical performance involves not only measures of surgical competency but also of professionalism, patient management, and ability to self-evaluate
- To provide faculty with an understanding of how to assess the clinical knowledge of each of the students they are to supervise for a given day
- To provide faculty with an understanding of the pre- and post-clinical sessions, and to provide them with the facilitation skills necessary to make the experience most beneficial for the students
- To provide the faculty with an understanding of how facilitation skills in pre- and post- sessions can enable them to maximize their effectiveness on the clinic floor

Figure 5. PBL in the clinical environment.

The *Student Assessment and Feedback Workshop* explains strategies for assessing and giving feedback to students on the PBL process. Additionally, student behavior is assessed during the case, while giving and receiving feedback is evaluated. The faculty objectives are listed in Fig 4.

The fourth workshop, *PBL in the Clinical Environment*, seeks to familiarize faculty with the sequence of learning for students in the PBL pedagogy as well as with clinic-specific facilitation processes used as a continuation of case learning and simulation lab learning. Assessment of student skills and professionalism, as well as giving and receiving feedback are addressed. The faculty objectives are listed in Fig 5.

Conclusion

Responding to the Institute of Medicine's study, *Dental Education at the Crossroads*, former USCSD dean Howard M. Landesman, DDS, MEd, initiated a strategic plan embracing a PBL curriculum, the culmination of which has been overseen by Dean Harold C. Slavkin, DDS. The USCSD has embarked on an educational pedagogy that has taken the school into the 21st century. PBL most closely simulates the future practice environment and encourages students to adopt professional behaviors and approaches to patient care that model the very best in the profession. Future articles will further examine the impact PBL has had on USCSD and its students.

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