

Review of the Kamijo Grant Prize Lecture, 2011

Introduction of Learner-centered Education at Showa University School of Dentistry

Masanori NAKAMURA

*Department of Oral Anatomy and Developmental Biology, Showa University School of Dentistry
1-5-8 Hatanodai, Shinagawa-ku, Tokyo, 142-8555 Japan*

Abstract: Problem-based learning (PBL) derives from the principle that problems can be used as the starting point for acquiring new knowledge. In 2003, this method was introduced to dental education in Showa University School of Dentistry, as part of a wave of dynamic changes to the educational style, from teacher- to learner-centered education. Faculty members invested substantial time and effort in adopting and integrating PBL into the dental curriculum, and PBL is now used as the major method for the interdisciplinary education of first- to sixth-year students of 4 schools (Medicine, Dentistry, Pharmacy, and Nursing and Rehabilitation Sciences). In this review, I first describe the history of PBL in Showa University School of Dentistry, and then evaluate the role of PBL in future dental education.

Key words: dental education, PBL, interdisciplinary education

Introduction

The ethos of Showa University is “Shisei-Ikkann,” as was proposed by the founder Dr. Shusuke Kamijo. The university’s educational mission is based on this ethos: “By nurturing human resources, we can understand and cooperate with one another and make a concerted effort to acquire advanced knowledge and skills of the discipline, and learn together, transcending department boundaries and utilizing the resources of a medical university unrivalled by any other. Furthermore, we can cultivate the qualities of true healthcare professionals, who possess high morality and rich sociality, who practice healthcare with a deep sense of humanity appropriate to the profession, and who strive throughout their lives toward improving healthcare, without neglecting learning and research.” The teamwork and lifelong, self-directed learning that characterizes the healthcare profession is encapsulated in this ethos.

The aim of dental education is to train individuals to lead a team of professionals, including hygienists, dental assistants, and dental technicians; to recognize the importance of prevention and primary care through

the commitment of hygienists and the dental team; to perform oral health care in the community; to understand that oral health is an integral part of total health, and that oral health care is an integral part of overall health care; to be highly skilled in all aspects of dental service; and to actively pursue lifelong learning. This mission is well correlated to the ethos of the university, and supports the shift from authoritative and teacher-centered to learner-centered education.

Problem-based learning (PBL), first expounded by John Dewey,^{1,2)} is directed toward learner-centered education. According to this methodology, students learn about a subject in the context of complex, multifaceted, and realistic problems.^{3,4)} The goals of PBL are to help the students develop flexible knowledge, intrinsic motivation, and the skills required for effective problem solving, self-directed learning, and collaboration.⁵⁾ PBL was first introduced into the medical program at McMaster University in Canada in the 1960s, and into dental education in the 1990s. Since this period, it has been introduced into medical and dental institutions across the world.^{6,7)}

Integrating PBL into Showa University School of Dentistry

In 1998, the Ministry of Education, Culture, Sports, Science and Technology published a white paper that identified the improvement of medical, dental, and pharmacological education as an urgent goal for the twenty-first century. In response to this paper, Showa University School of Dentistry initiated several curriculum reforms, which were implemented in 2003, and which included the creation of new, integrated courses: “Oral Ecosystem,” “Structure of Teeth and Oral Cavities,” “Pulp Biology,” “Orofacial Structure and Function,” “Orofacial Diseases,” and “Dental Practice & Materials and Devices.” Among these courses, we developed PBL programs for the following: “Oral Ecosystem,” for second-year students; “Orofacial Structure and Function” and “Clinical Medicine,” for third-year students; and “Risk Management” for the fifth-year students, immediately prior to their clinical dental practice. As such, our school was the first in Japan to introduce PBL into dental education.^{8~10)}

The purpose of integrating PBL in the dentistry curriculum was as follows. Almost all students in the School of Dentistry have experienced teacher-directed learning in their preparation for the university entrance examination during their senior high school career; therefore, most students feel overwhelmed when confronted by problems and/or learning issues that they have never been taught.

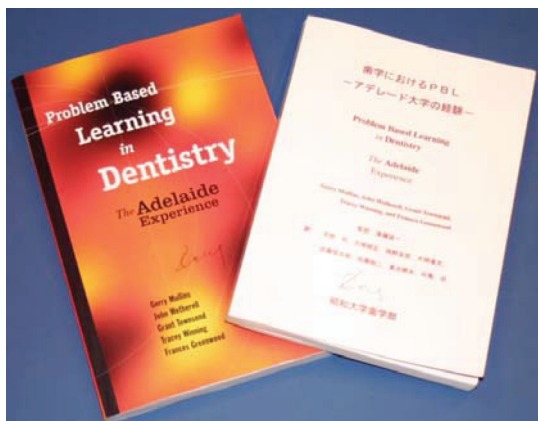


Fig. 1 “Problem-Based Learning in Dentistry, The Adelaide Experience” and its Japanese edition.

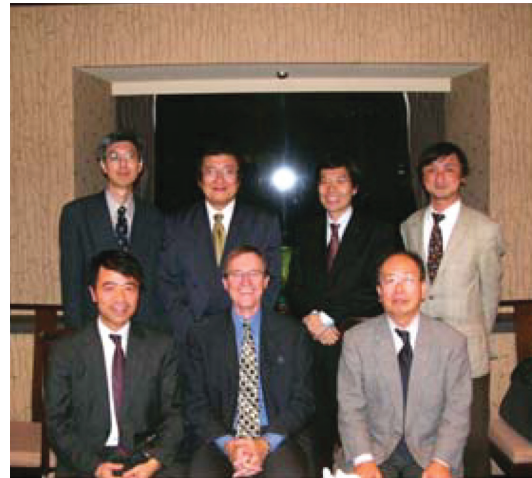


Fig. 2 Dinner with Professor Grant Townsend and faculty members, following his lecture. Professor Tomohiro Okano, Professor Grant Townsend, and Dr. Nobuichi Goto (front line, from left to right); Professor Shintaro Kondo (now Professor of Anatomy in the School of Dentistry at Matsudo, Nihon University), Nakamura, Professor Takashi Miyazaki (Dean), and Dr. Koh Nakajima (back line, from left to right).



Fig. 3 Dr. Tracy Winning and Professor Ryuta Kataoka, participating in a PBL core time session.

The chief impetus for the introduction of PBL to the new dentistry curriculum was a visit in 2001 by the former Dean, Dr. Nobuichi Goto, to the University of Adelaide, where he encountered PBL in action. Following this, several faculty members began to study PBL, by translating the book “Problem Based Learning in Dentistry, The Adelaide Experience”¹¹⁾ into Japanese (Fig 1). In 2002, we invited Professor Grant Townsend from the University of Adelaide to Showa University, and held a PBL workshop (Fig. 2). One year later, a PBL committee was established in the School of Dentistry,

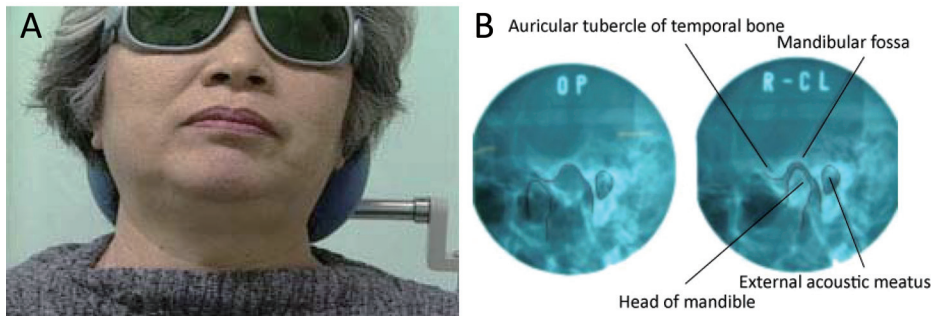


Fig. 4 Audio-visual triggers prepared for PBL in the unit “Orofacial Structure and Function.”

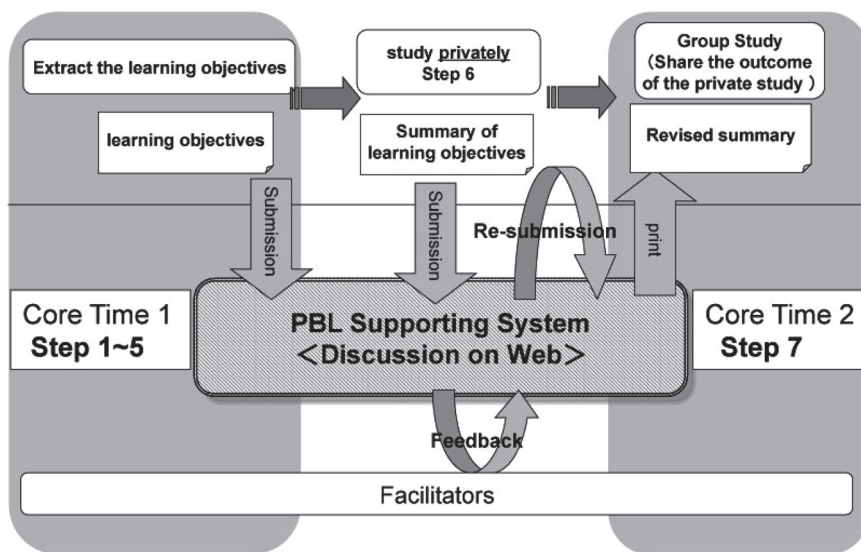


Fig. 5 Scheme of the PBL support system.

consisting of 13 faculty members. In December 2004, Dr. Tracy Winning from the University of Adelaide attended our PBL core time session, and delivered two lectures: “Development of the PBL package” and “Review and evaluation of the PBL package” (Fig. 3).

In order to ensure adequate preparation, the members of the PBL committee participated in PBL workshops at other universities, and a facilitator development workshop was held in our own school, subsequently evolving into an integrated workshop for faculty members in 4 of the schools at Showa University.

In order to create an environment receptive to PBL, we continue to try to design scenarios that will motivate students, by providing a realistic context for their learning. Our PBL packages draw on real life situations to generate learning outcomes that are reflective of

the professional knowledge, skills, and behaviors that demonstrate “thinking and acting like a dentist.” We also produce audio-visual triggers to facilitate the presentation of a realistic context (Fig. 4).¹²⁾

Our implementation of PBL also involves applying a 7-step investigation process to group projects (Table 1). Steps 1 to 5 incorporate the initial core time work of each group; step 6 entails private study, which enables students to resolve learning issues; and step 7 involves sharing the outcome of their private study with the rest of the group, in order to discover to what extent their own explanations after self-learning are justified, and what further knowledge is required, as well as to discuss the resources used to make sense of their learning issues.

One challenge to our implementation of PBL was step 7, sharing the conclusions of self-directed learning.

Table 1 Investigation Process of Problem-Based Learning.

1. Read the Scenario.	Identify and clarify all words/phrases that are unknown to you and might be unknown to other group members.
2. Look for the substantive components (cues) of the problem.	
3. Brainstorm, using the cues to identify all possible explanations.	Develop causal and consequential hypotheses.
4. Arrange the explanations into tentative solutions.	Obtain further information to test reasoning and hypotheses.
5. Define the learning issues as questions needed to test the validity of your explanations.	
6. All members of the group study privately using a wide variety of resources.	
7. Share the outcome of the private study with the group.	Observe to what extent your explanations are justified and what further knowledge is required.
	Discuss the resources used to answer the questions.

During the previous step, students interacted only rarely with other group members and their facilitators, and this lack of feedback made them uncertain about the quality of their conclusions. This issue was exacerbated further by the distance between the basic science departments and the dental hospital, which made it difficult for students to contact their facilitators, who were employed within clinical departments and usually available only at the dental hospital.

To improve this situation, we developed a web-based PBL support system, which we first implemented in December 2005 (Fig. 5).^{13,14)} About 70% of students reported that the PBL support system helped them to communicate with their facilitators. We believe that this is a useful tool for encouraging facilitator support in self-directed, multi-campus learning situations, as is supported by the recent article of Alamro and Schofield, which described the usefulness of blending online learning with PBL.¹⁵⁾ Consequently, this system has been integrated into the interdisciplinary PBL programs in each of the 4 schools of Showa University, for first-, third-, fourth-, and fifth-year students.¹⁶⁾

The future of learner-centered education in dental training

Of the many evaluations of PBL that have appeared in medical and dental education journals in recent years, most have focused on pedagogy and curriculum construction, while studies from the perspective of students have been few. The perceived disadvantages of PBL according to both students and faculty members are uncertainty about what constitutes a good learning need, and about the depth of knowledge acquired through PBL.^{17~19)} Other disadvantages articulated by faculty members include the perception that PBL is a difficult and time-consuming process, and the anxiety that lack of commitment from some group members could lead to the unequal distribution of learning responsibility.^{18~20)} Despite these perceived disadvantages, however, a comparative study conducted by Haghparast et al.,²¹⁾ evaluating student and faculty perceptions of PBL at two dental schools in different countries with dissimilar demographics, cultural norms, and educational infrastructure, demonstrated the overall satisfaction of students and faculty members with their PBL curriculum.

In Japan, many faculty members in schools of dentistry remain skeptical about the effectiveness of PBL. Koma-bayashi et al.²²⁾ compared the contents of the written exams required for dentist licensure in Japan and United States, and indicated that the Japanese examination placed more emphasis on recall, while the United States examination focused on problem solving. This difference might be a significant factor in the hesitation to change the Japanese curriculum. In recent years, the average pass rate of the NED (National Examination for Dentists) in Japan has been approximately 70 to 80%. The improvement of the NED pass rate is one important goal for dentistry teaching staff; however, we also have to remember that the purpose of dental education is to prepare students for their future profession. A shift in student learning attitudes, from passive to active, would clearly prove beneficial for students in professional life.

Although there is no one, perfect educational method to satisfy all students and staff, PBL is indubitably

effective. Several other methods have also been developed in recent years, such as team-based learning, stimulation-based learning, and multicultural education. Stimulation-based learning in particular has been proposed as an effective method for medical and dental clinical training, as a bridge between classroom learning and real life clinical experience.²³⁾ In future years, we must continue to improve the dentistry curriculum, and to offer a variety of educational methods to enable all students to acquire the knowledge, attitudes, and skills needed to function effectively as dentists in contemporary society.

Acknowledgement I am grateful to many colleagues, especially the members of the PBL committee in Showa University School of Dentistry, for devoting a tremendous amount of time and effort to the introduction of PBL in our dental school. Their names are listed individually in the reference list at the end of this review. Numerous foreign leaders in dental education also attended our PBL meetings, and offered many useful suggestions for the improvement of our PBL program: Dr. Harold C. Slavkin (former Dean, University of Southern California), Dr. Charles Shuler (Dean, University of British Columbia), Dr. Lakshman Perera Samaranayake (Dean, University of Hong Kong), Dr. Esmonde Corbet (University of Hong Kong), Dr. Suzan Bridge (University of Hong Kong), Dr. Grant Townsend (University of Adelaide), Dr. David Newble (University of Adelaide), and Dr. Tracey Winning (University of Adelaide).

References

- 1) Savery JR: Overview of problem-based learning: Definitions and distinctions. *IJPBL*, **1**: 9–20, 2006
- 2) Koschmann T: Dewey's contribution to a standard of problem-based learning practice. First European Conference on Computer-Supported Collaborative Learning (EuroCSCL), Maastricht, Netherlands, March, 2001. Retrieved on June 19, 2012 from the World Wide Web: <http://www.uni-koeln.de/ew-fak/konstrukt/didaktik/problembased/koschmann.pdf>
- 3) Fincham AG, Baehner R, Chai Y, Crowe DL, Fincham C, Iskander M, Landesman HM, Lee M, Luo W, Paine M, Pereira L, Moradian-Oldak J, Rosenblum A, Snead ML, Thompson P, Wuenschell C, Zeichner-David M, Shuler CF: Problem-based learning at the University of Southern California School of Dentistry. *J Dent Educ* **61**: 417–425, 1997
- 4) Lambros A: The what and why of problem-based learning. In Lambros A (ed.): *Problem-Based Learning in K-8 Classrooms*. Thousand Oaks, 2002, Corwin Press Inc., pp 1–10
- 5) Hmelo-Silver CE: Problem-based learning: What and how do students learn? *Educ Psychol Rev*, **16**: 235–266, 2004
- 6) Donner RS, Bickley H: Problem-based learning in American medical education: An overview. *Bull Med Libr Assoc*, **81**: 294–298, 1993
- 7) Townsend G, Winning T: Research in PBL—where to from here for dentistry? *Eur J Dent Educ*, **15**: 193–198, 2011
- 8) Kataoka R, Hasegawa T, Asari J, Okano T, Nakamura M: PBL tutorial in the integrated Course “The Basics of Dental Caries and Periodontitis”: Trial of a PBL tutorial whose main theme is dental caries for second-year students in School of Dentistry, Showa University. *J Jpn Assoc Dental Educ*, **21**: 166–175, 2005
- 9) Kataoka R, Nakamura S, Nakajima K, Isatsu K, Asari J, Mayahara M, Utsumi A, Sato Y, Okano T, Miyazaki T, Nakamura M: Educational Effect of a PBL tutorial which that was partially introduced into an integrated course. *J Jpn Assoc Dental Educ*, **24**: 190–201, 2008
- 10) Nakamura S, Kataoka R, Mayahara M, Isatsu K, Asari J, Nakajima K, Sato Y, Nakamura M, Miyazaki T: Investigation on factors affecting understanding of the learning process and the content of PBL tutorials. *J Jpn Assoc Dental Educ*, **25**: 22–29, 2009
- 11) Mullins G, Wetherell J, Townsend G, Winning T, Greenwood F: *Problem-based Learning in Dentistry. The Adelaide Experience*. Victoria, 2001, David Lovell Publishing.
- 12) Isatsu K, Kataoka R, Utsumi A, Asari J, Nakajima K, Suzawa T, Mayahara M, Nakamura S, Kimura Y, Hasegawa T, Sato Y, Okano T, Miyazaki T, Nakamura M: Effect of developing a written group summary of audio-visual triggers in PBL tutorials. *J Jpn Assoc Dental Educ*, **22**: 271–280, 2006
- 13) Nakajima K, Asari J, Kataoka R, Isatsu K, Utsumi A, Suzawa T, Mayahara M, Nakamura S, Hasegawa T, Kimura Y, Sato Y, Okano T, Miyazaki T, Nakamura M: PBL tutorial in Showa University using e-mail and a homepage. *J Jpn Assoc Dental Educ*, **22**: 161–169, 2006
- 14) Mayahara M, Kataoka R, Asari J, Utsumi A, Nakamura S, Isatsu K, Nakajima K, Iwasa F, Kimura Y, Hasegawa T, Sato Y, Okano T, Miyazaki T, Nakamura M: Development of a Web-based PBL support system to activate self-directed learning. *J Jpn Assoc Dental Educ*, **23**: 220–228, 2007
- 15) Alamro AS, Schofield S: Supporting traditional PBL with online discussion forums: A study from Qassim Medical School. *Med Teach*, **34**: S20–S24, 2012
- 16) Mayahara M, Kataoka R, Nakamura S, Asari J, Murata N, Hironaka S, Isatsu K, Nakajima K, Sato Y, Miyazaki T, Nakamura M: Educational effect of a Web-based PBL support system for self-directed-learning: Using the interdisci-

- plinary PBL tutorial for first-year students. *J Jpn Assoc Dental Educ*, **25**: 47–53, 2009
- 17) De Grave WS, Dolmans DHJM, van der Vleuten CPM: Student perceptions on critical incidents in the tutorial group. *Adv Health Sci Educ*, **7**: 201–209, 2002
 - 18) Hendry GD, Ryan G, Harris J: Group problems in problem-based learning. *Med Teach*, **25**: 609–616, 2003
 - 19) Hitchcock MA, Anderson AS: Dealing with dysfunctional tutorial groups. *Teach Learn Med*, **9**: 19–24, 1997
 - 20) McHarg J, Kay EJ, Coombes LR: Student's engagement with their group in a problem-based learning curriculum. *Eur J Dent Educ*, **16**: e106–e110, 2012
 - 21) Haghparast N, Sedghizadeh PP, Shuler CF, Ferati D, Christersson C: Evaluation of student and faculty perception of the PBL curriculum at two dental schools from a student perspective: a cross-sectional survey. *Eur J Dent Educ*, **11**: 14–22, 2007
 - 22) Komabayashi T, Bird WF: Comparison of written examinations required for dental licensure in Japan and the United States: Contents, cognitive level, and cultural implications. *J Dent Educ*, **69**: 930–936, 2005
 - 23) Nara N, Beppu M, Tohda S, Suzuki T: The introduction and effectiveness of simulation-based learning in medical education. *Intern Med*, **48**: 1515–1519, 2009