

Problem-based Learning in Dentistry

An introduction to undergraduate problem-based learning (PBL) at the **HKU Faculty of Dentistry**





**FACULTY OF DENTISTRY
UNIVERSITY OF HONG KONG**



THE PRINCE PHILIP DENTAL HOSPITAL

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Introduction

Dear Reader

We hope you enjoy reading this brochure, which gives an introduction to **problem-based learning** in the Bachelor of Dental Surgery (BDS) degree at the HKU Faculty of Dentistry—the sole provider of university dental education in Hong Kong and the only dental school in China that uses English as the medium of instruction.



We are confident of the high quality of education our undergraduate students receive at our Faculty. Since 1998, our widely acclaimed BDS degree has integrated **problem-based learning** to enable students to acquire and retain knowledge effectively, develop good learning habits, and foster teamwork skills—all qualities of a good dentist.

The Faculty's mission is **“to serve the people of Hong Kong and the region by advancing their oral health and well-being through excellence in learning, discovery, patient care, and engagement”**. We believe the design of our BDS degree curriculum is key to fulfilling this mission, as it aims to produce well-rounded, globally aware dental graduates who are critical thinkers, life-long learners, and compassionate health care professionals.

Prof Thomas Flemmig
Dean, Faculty of Dentistry
The University of Hong Kong

1 July 2014

What Is PBL?

Problem-based learning (PBL)

The Bachelor of Dental Surgery (BDS) degree curriculum at the HKU Faculty of Dentistry is learning-centred and student-centred, and encourages students to take responsibility for their own learning.

In particular, students take part in regular, small-group discussion sessions, where they are given a series of carefully designed, integrated, and interesting dental “problems” as short accounts of possible real-life situations. This contextualised approach allows students to be exposed to the main elements of dental, biomedical, behavioural, and social sciences that underpin dental surgery. Each student actively contributes to the learning process during group discussions of the problems.

These PBL principles, which are echoed in the other elements of the BDS degree, make it easier to acquire and retain knowledge across different disciplines, instil life-long learning habits, foster teamwork skills, and train students to deal with complex, real-life situations. After all, in the real world, dentists need to bring together knowledge from many different disciplines in order to manage patients’ problems holistically.

Our undergraduate dental degree curriculum prepares graduates for their new careers, so that they will be able to effectively:

- Understand, care about, and be sympathetic to the needs of others
- Serve the community
- Think logically, critically, and creatively
- Work with others in teams and be team leaders
- Communicate well with others
- Contribute to advancement of knowledge and the dental profession



The PBL Advantage

Benefits of PBL

Educators worldwide have long advocated revising the approach to university dental education in order to avoid emphasis on simply transferring factual knowledge from teacher to student. Instead, new information can be better understood, retained, and applied if the learning experience is based on situations resembling real life, so students can learn by recalling and building on previous knowledge.

Around the world, more and more universities are making use of PBL to teach medicine and dentistry, as well as other subjects, owing to the following recognised benefits:



- PBL promotes self-motivation and self-responsibility to learn
- PBL facilitates more enjoyable and more effective learning
- PBL encourages learning from experience, allowing students to use and organise what has been learnt to understand problems
- PBL integrates knowledge with practice
- PBL nurtures the ability to analyse problems and to identify and acquire knowledge and skills needed to deal with real-life situations
- PBL develops teamwork, communication, and research skills
- PBL trains students to be reflective and assess their own and others' work
- PBL cultivates independence, curiosity, and skills for self-directed, life-long learning



Impact of PBL in dentistry

Since 1998, the HKU Faculty of Dentistry has fully integrated PBL into the undergraduate degree curriculum. We are now considered to be one of the world leaders in the field of dental PBL.

The aim of the HKU BDS degree is to educate students to become caring, competent dental practitioners who are capable of life-long independent learning. Accordingly, the Faculty's BDS degree is student-centred and clinically focused. It integrates knowledge and skills across all relevant disciplines so that graduates are able to provide the highest standards of oral health care in a professional, proficient, ethical, and caring manner.

Through our undergraduate dental degree curriculum, students gain competence in the following areas:

- Professionalism
- Ethics and jurisprudence
- Communication
- Knowledge base and information handling
- Patient assessment and diagnosis of disease
- Treatment planning
- Delivery of oral health care
- Management of dental and medical emergencies and complications arising from the delivery of oral health care
- Oral health promotion and health education
- Oral health care in the community of the Hong Kong Special Administrative Region and China

PBL in the HKU Undergraduate Dental Degree

The BDS degree curriculum

For more than a decade, the HKU Faculty of Dentistry has offered a BDS degree that is fully grounded in PBL principles. Our widely acclaimed degree uses innovative ways of inspiring students to learn effectively. Through our curriculum, students gain the knowledge, skills, and attributes that a dentist needs to meet the challenges of an ever-changing world.

The HKU BDS degree curriculum provides a wide range of activities, environments, and opportunities to nurture self-directed, life-long learning. The curriculum also enables students to develop skills in interacting with colleagues, other professionals, patients, and the wider community.

The curriculum includes the following learning activities:

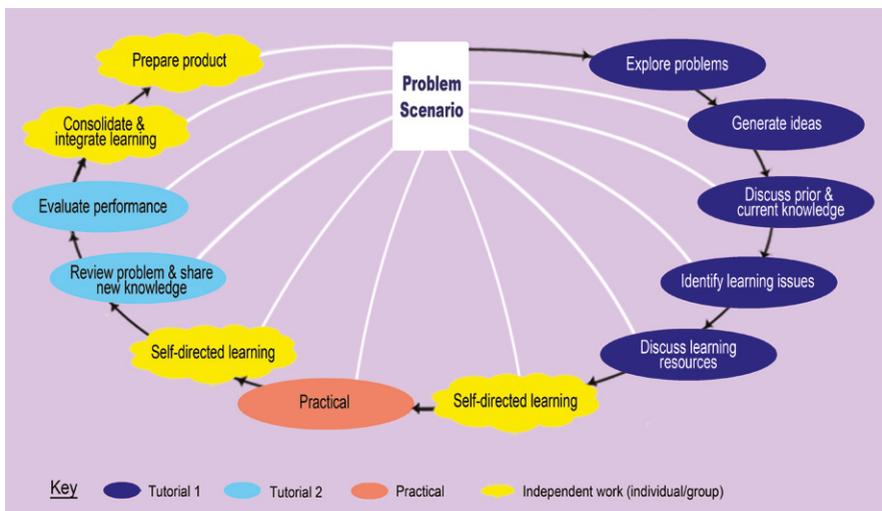
- PBL group tutorials
- Self-directed learning
- Critical self-reflection
- Resource sessions (large-group discussions)
- Key topics sessions
- Laboratory practicals
- University Common Core Courses
- First-year Induction Programme
- Clinical Induction Programme
- Community Health Projects
- Final-year overseas electives
- Simulation Laboratory and dental technology classes
- Dental, medical, and surgical clinic sessions
- Medical case-based extension learning
- Dental practice management workshops
- Private dental practice visits
- Journal-based learning
- Language enhancement for professional purposes
- Communication skills workshops

PBL in the curriculum

The BDS degree curriculum extends over 5 years (6 years from 2012, for entry based on Hong Kong Diploma of Secondary Education Examination results), and PBL principles are implemented throughout to encourage independent, creative thinking and to enhance personal development.

The main mode of learning in the early years of the programme is through activities associated with PBL problems. The time spent on PBL activities decreases gradually throughout the curriculum, while the time devoted to other activities, such as clinical training and patient interaction, increases.

An important feature of the curriculum is that PBL problems are integrated with other components of the programme. A typical PBL “problem cycle” is shown in the diagram below.



The problem cycle in dental education in Hong Kong

The PBL Process

PBL tutorials

Learning during the HKU undergraduate dental degree is achieved through PBL tutorials and various related activities, rather than merely through traditional lectures. The focus of each set of PBL tutorials is a real-life situation or “problem” that is addressed by the students themselves. The problem acts as a “trigger” to activate existing knowledge and identify learning issues, which will form the basis for research and understanding of new, relevant content knowledge. As in real life, the problem may be open-ended and have no fixed, easy, correct answer.

The basic format of the PBL process is as follows:

- **The first tutorial**, where the problem is presented and discussed, and areas of exploration are identified
- **Self-directed learning**, during which students seek information to address learning issues related to the problem
- **The second tutorial**, where the group meets to discuss the information gathered by each member, and to discuss how this contributes to a better understanding of the problem and possible solutions
- **Creation of a “product” (group assignment)**, to consolidate learning and bring the problem to a conclusion

Tutorials take place in special, purpose-built classrooms that are equipped with electronic interactive whiteboards, basic reference books, and wireless Internet access. Each student is expected to take part in the group discussion and to critically respond to classmates’ contributions. Once comfortable with this environment, students enjoy the experience, become more confident, and build valuable teamwork and analytical skills.



The first tutorial

Each PBL problem is dealt with in a pair of tutorials held a few days apart. In the first of these, a statement of a situation reflecting a real-life scenario is presented with supporting materials, which may include photographs, clinical records, videos, etc. Any new terms or unfamiliar words are looked up in the reference books in the room. Then, the important facts about the problem are discussed among the students while a clerk appointed by the group records what is discussed on the whiteboard.

The whiteboard is divided into three columns with the following headings:

- **Facts**—important facts are identified in the problem and written in note form
- **Ideas**—possible ideas or hypotheses are generated to explain the situation presented in the problem, and all angles (biological, psychological, social, ethical, legal, etc) are considered during this brainstorming; ideas are then refined and their possible relevance to a resolution of the problem is discussed
- **Learning issues**—areas of limited understanding or uncertainty are recorded as learning issues that require further research; at the end of the tutorial, the list of learning issues is consolidated and prioritised

The teacher’s role throughout the process is not as an expert presenting on the topics being discussed, but as a “Facilitator” who has been specifically trained to help students get the most out of the group tutorial. Instead of providing factual information, the Facilitator ensures that the group maintains focus on the discussion and that each student participates in the discussion appropriately.



Self-directed learning

Self-directed learning takes place over a few days, during which students work both individually and collaboratively on the learning issues identified in the first tutorial. A practical class involving topics relevant to the problem in hand is also scheduled in this period.

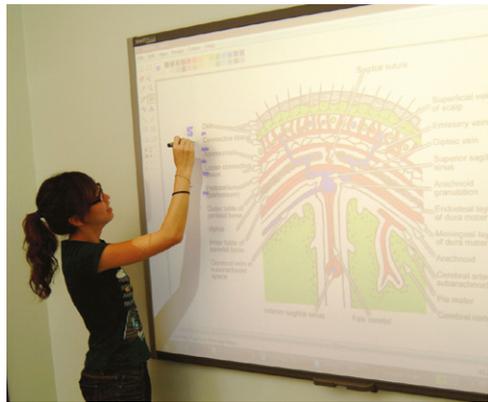
Students study relevant texts, articles, and other material, ready to report back to the rest of the group at the second tutorial, when the new information will be applied back to the problem.

Each student works on the full set of learning issues identified in the first tutorial. However, each student also takes on responsibility for studying one of the learning issues in greater depth so that he or she may lead the discussion on that topic in the second tutorial.

Resources

A wide range of sources of information, including Internet resources, are used during self-directed learning, and staff experts in the topics covered may be contacted for advice via our dedicated e-learning website. Students are encouraged throughout to critically evaluate their sources with respect to reliability, relevance, appropriateness of depth, and so on.

The HKU Faculty of Dentistry has one of the most well-equipped dental libraries in the world, providing a full range of books, journals, and web-based resources; soundproof study rooms suitable for collaborative learning; and computer terminals for students to access online information. In addition, students have access to the Faculty Computer Laboratory. Students are also encouraged to consult other staff members and experts in the professional community.



The second tutorial

At the second tutorial, students present and critically discuss the new information that they have gathered. They then review the problem again in the light of the new knowledge acquired.

Students are encouraged to illustrate their ideas on the whiteboard in diagram form, and copies of relevant notes made during self-directed learning are shared. Information sources (eg, textbooks) may also be brought into the second tutorial and referred to in the discussion.

If any unaddressed learning issues remain, or new ones arise, the group will decide how to fill these gaps in knowledge and may decide to meet up again after further self-directed learning. Finally, students summarise what they have learnt and reassess how this relates to the problem and to their prior knowledge in the relevant areas.

Creation of a “product”

In the week following the second tutorial, members of the group work together to create a “product” that will bring the problem to a conclusion. This may take the form of a report, poster, summary diagram, role-play, or presentation, for example. The product will help students to review and consolidate what they have learnt from the problem.

Assessment

Assessment methods

A wide range of methods are used to assess progress throughout the BDS degree. Assessment results are used to provide students with advice and support, which will help them to develop as effective, critical learners.

At each PBL tutorial, the Facilitator makes an evaluation of individual student performance. Students are provided with individual feedback to help them to deal with any difficulties and to maximise their learning experience.



Formal assessments involving written papers and practical evaluations are also conducted in designated periods throughout the degree. Individual feedback and support are provided to students at appropriate times.

Student support

In addition to providing support for individual students on the basis of assessment results, the Faculty assigns each student a Personal Tutor for the whole period of study. The Personal Tutor regularly meets with the student to discuss his or her performance, and acts as a mentor and guide. Students are also welcome to call on their assigned Personal Tutor for advice throughout the degree.

PBL and Clinical Learning

Integration of learning

Traditional curricula of undergraduate dental degrees involve attendance at a series of courses in pre-clinical and clinical disciplines, and knowledge tends to be acquired in a fragmented manner. This approach may lead to difficulties in the proper appreciation of the important inter-relationships between subjects and their practical applications. By its very nature, the PBL process in the HKU undergraduate dental degree curriculum allows students to acquire knowledge of both clinical (medical and dental) and supporting (eg, biomedical, social, and behavioural) sciences in an integrated manner.

As the undergraduate degree progresses into the more senior years, students spend an increasing amount of time on developing clinical dental skills through practical classes in the Simulation Laboratory (with simulated patients) and Haptics Unit, and in clinics (with real patients). The PBL problems are designed and timed to closely align with the clinical topics that will be encountered at each stage in the degree to promote further integration of knowledge.

Throughout both PBL and clinical learning activities, students are encouraged to learn through critical self-reflection.

Programme development

Regular staff and student appraisals of Facilitators, PBL problems, and the degree in general are taken into account when the Faculty Curriculum Development Committee meets to discuss ways to develop the curriculum for future students.



Comments from Staff, Students, and Graduates



Comments from staff

“I have noticed that PBL has changed our students from being passive recipients of information into active learners. During the PBL process, students learn how to look for pieces of information from diverse sources, how to weed out the irrelevant and incorrect ones, and how to integrate the useful ones into their current knowledge. This is high-level learning that requires logical and critical thinking. The benefits are immense and long-lasting.

To be a good Facilitator, I have had to guide students to discover their own strengths and weaknesses. And I enjoy that challenge very much.”



Prof Edward CM Lo
*Clinical Professor in
Dental Public Health*



Prof W Keung Leung
*Clinical Professor in
Periodontology*

“PBL has changed our dental curriculum from a teacher-centred one to a student-centred and ‘real-world’ one. In practice, this has meant a high level of Facilitator training so that staff can empower and motivate students to identify their own learning needs, acquire knowledge effectively and efficiently, critique new information, and integrate old and new knowledge into their dental practice. Staff have had to learn to be receptive to change in their practice and values, as well as to new ways of assessing students. In addition, the Faculty has had to establish a reliable information technology infrastructure to allow students to learn to use all possible platforms.

Our programme prepares students to fit into the current ‘knowledge-based economy’, while training them to respect ideas of others and to work effectively in a team. These are very important skills for successful practising dentists.”



Dr Peter CS Tsang
*Clinical Assistant
Professor in Oral
Rehabilitation*

“When I was first introduced to the concept of PBL about 10 years ago, like many other Facilitators and students, I was skeptical about this pedagogy. But since we are now living in an era of information technology, we are constantly bombarded with information through the Internet. We have to find an effective way to handle this resource.

I believe PBL is one of the most effective ways of both obtaining and retaining knowledge. PBL’s student-centred and collaborative approach allows our students not only to develop social and cognitive competencies, but also to effectively deal with problems in a real-world professional context.”

Comments from students

“As a BDS I student, I’ve found that PBL provides great freedom for acquiring knowledge. Compared with high-school education, students using the PBL approach can organise their time in their own way, according to their own learning styles.”—**Gordon Hui, BDS II**



“PBL has helped me develop logical thinking skills through dynamic discussion, and it has sharpened my ability to select information to facilitate learning. PBL makes learning more interactive and encourages students to develop uniqueness as well as initiative.”—**Cherrie Hung, BDS III**

“I enjoy PBL’s dynamic interaction in small-group discussions while building ‘soft’ and transferable skills. Self- and peer-evaluation also enables reflection and improvement in performance. I believe PBL prepares us to become self-motivated learners and ultimately competent dentists capable of handling diverse clinical situations.”—**Melissa Fok, BDS IV**



“Thanks to the PBL curriculum, I’ve learnt to study independently and discover various learning resources, which are useful life-long skills. In PBL tutorials, I especially enjoy sharing the new knowledge gained and discussing problems that arose during the private study session.”—**Candy Ma, BDS V**

Comments from graduates

“One of the best things about PBL is that our knowledge retention was increased. This is because PBL is student-centred. During the BDS programme, we had to actively search, analyse, and discuss new information. This process actually helped us consolidate our knowledge. PBL was challenging at first but after putting effort into it, we eventually noticed its benefits.”

—**Dr Karen KY Yung**, *BDS 2009*



“Our Faculty’s PBL system is very different from the traditional learning system at secondary school. It took time to adapt to the new system. But once I got used to it, it was useful during the 5 years of BDS life, and it will also be useful for my whole life. The PBL system has trained me to be a life-long learner, so I’m now able to face everyday challenges and maintain my competency in the dental profession.”—**Dr Calvin WK So**, *BDS 2010*



“It was difficult to adapt to PBL techniques at the beginning and it took more time to study than traditional learning methods. However, I found it useful when I got used to it. Through PBL, I learnt how to find different resources and analyse information critically. This is very useful today when I encounter problems.”—**Dr Anna ON Sia**, *BDS 2011*





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Acknowledgements

First Edition: Dr John Dyson, Prof Cynthia KY Yiu, Prof Lakshman Samaranayake, Dr Susan Bridges, Dr Trevor Lane, Ms Joyce Chan, Ms Sau-wan Cheng, Mr Raymond TC Leung
Second Edition: Prof Cynthia KY Yiu, Dr Susan Bridges, Prof Lakshman Samaranayake, Dr Trevor Lane, Ms Sau-wan Cheng

Edited by Dr Trevor Lane. Produced by the Knowledge Exchange Unit, Faculty of Dentistry, The University of Hong Kong:

Dr Trevor Lane, Publishing Manager; Ms Sau-wan Cheng, Knowledge Exchange Officer.

Printed in Hong Kong.

First Edition, 2008; Second Edition, 2011; Reprinted, with revisions, September 2012. Third Edition, July 2014.

This brochure refers to aspects of the undergraduate curriculum offered by the HKU Faculty of Dentistry. The information set out is an expression of intent only and should not be taken as a firm offer or undertaking. The Faculty and the University accept no responsibility for errors or omissions. The HKU Faculty of Dentistry reserves the right to make alterations to any information contained within this publication without notice.



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