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Graduates' Perceived Preparedness for Dental Practice from PBL and Traditional Curricula

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Abstract: The objective of this study was to compare dental graduates' perceived preparedness for practice after being educated in a problem-based learning (PBL) curriculum with those who graduated from a traditional undergraduate curriculum, both at the University of Hong Kong. A cohort of graduates from the traditional dental curriculum (1997–2001) and a cohort of graduates from the PBL curriculum (2004–08) rated their self-perceived preparedness for dental practice in fifty-nine aspects of dentistry across nine domains. Perceived preparedness for dental practice was compared at domain and item levels (accounting for multiple comparisons) using chi-square statistics. Both cohorts felt well prepared for the “bread and butter” aspects of dentistry, but less so for specific specialty disciplines. There was no significant difference between PBL and traditional graduates' self-perceived preparedness in eight of the nine domains of dental practice ($P > 0.05$). However, in the area of orthodontics, both cohorts felt ill-prepared for practice and more so among the PBL cohort ($P < 0.01$). For the most part, regardless of curriculum design, these dental graduates perceived themselves to be well prepared for dental practice.

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The Faculty of Dentistry was established at the University of Hong Kong (HKU) in 1980. The first dental curriculum was four and a half years in duration. A five-year curriculum was introduced at the start of the 1990s; it built upon features of the earlier curriculum and incorporated an integrated final year of clinical learning in Family Practice Clinic to consolidate discipline learning from the preceding four years. The first two Bachelor of Dental Surgery (B.D.S.) models used a traditional curriculum design that was lecture-based and teacher-led and allowed very limited integration between dental disciplines. In 1996, following a university-led review, the Faculty of Dentistry decided to change the B.D.S. curriculum to a student-centered, fully integrated problem-based learning (PBL) curriculum, which emphasizes horizontal and vertical integration across the various disciplines. The study of basic biomedical, social, and behavioral sciences occurs

alongside the study of clinical dental sciences and professional practice in the integrated curriculum. Hence, the underlying sciences are learned in their appropriate context.

Implemented in 1998, this integrated PBL curriculum aims to encourage collaborative and interactive learning and to produce well-rounded, competent, and caring dental practitioners who are able to think independently and critically and respond quickly and appropriately to patients with complex problems. Approximately fifty-five students are admitted each year into the five-year program. The PBL program extends over five academic years, each of which is divided into two integrated semesters (September to December and January to April) with two clinical skills blocks in May and July and an examination period in June. In the integrated semesters, problem-based tutorials that foster knowledge building are integrated with simulation laboratory

learning and clinical practice. The clinical skills blocks provide a dedicated period of clinical contact with no PBL. Learning activities include case-based learning, a workshop on clinical skills, and supervised patient care.

During each PBL tutorial, students generate learning issues that they research independently, supported by practical online resource materials and staff. The PBL curriculum emphasizes early clinical exposure, and the development of psychomotor and clinical skills increases progressively across the five years. Preclinical learning is facilitated through an advanced Simulation Laboratory and, where possible and appropriate, is integrated with problems encountered in problem-based tutorials. As the B.D.S. curriculum progresses, an increasing proportion of time is devoted to clinical practice. Integrated clinical practice of dental care for adults occurs in the multidisciplinary polyclinic: operative dentistry, oral rehabilitation, periodontology, and endodontics. Clinical learning also occurs in the discipline clinic of oral and maxillofacial surgery, and pediatric dentistry is learned in the pediatric dentistry clinic. Research skills are developed with opportunities to become involved in faculty research projects as well as in the conduct of community health projects. Journal-based learning replaces PBL in the final year, providing a transition to further studies and continuing professional education. The fifth-year elective provides an opportunity to experience and learn from different clinical contexts.

PBL is a teaching-learning methodology that has been shown to improve the academic results of dental students.^{1,2} Implementation of PBL at the Harvard School of Dental Medicine was effective at increasing National Board Dental Examination Part I scores, graduation rates, and percentage of graduates entering postdoctoral education programs, as well as decreasing the attrition rate.^{3,4} Moreover, PBL training provided dental graduates with enhanced abilities in independent learning as well as communication and cooperation skills during their postdoctoral training.⁵ Apart from enhancing interpersonal and cognitive domains, PBL has also been shown to improve more general task-supporting competencies, such as the ability to work and plan efficiently, which is important for successful professional practice.⁶ However, in a recent systematic review comparing the effect of two types of intervention (whole curricula comparisons or single educational intervention of shorter duration) on PBL and conventional teaching, no clear difference was observed between the two

teaching methods in randomized controlled trials and comparative studies of whole curricula. Only comparative studies of a single PBL intervention in a traditional curriculum yielded results that were consistently in favor of PBL.⁷

In a survey of dental graduates (1997–2001) from HKU's traditional B.D.S. curriculum conducted in 2002, McGrath and Corbet⁸ reported that graduates generally perceived themselves to be well prepared for dental practice. Nevertheless, in some specialist aspects of dentistry, the graduates felt poorly prepared. The first class of dentists graduated from HKU's fully integrated PBL dental curriculum in 2003. Information on the perceived preparedness of graduates from the PBL curriculum has not previously been systematically gathered, reviewed, or compared with that of graduates from the traditional curriculum.

Responding to major educational reforms approved by the Government of the Hong Kong Special Administrative Region, HKU will introduce a new six-year B.D.S. curriculum in 2012. Our study aimed to compare the self-perceived preparedness of HKU dental graduates from the integrated PBL curriculum (graduation years 2004–08) with graduates from the traditional curriculum (graduation years 1997–2001) and to collect graduates' views of the integrated PBL curriculum. Results of the survey will help to identify strengths and weaknesses in the existing five-year PBL B.D.S. curriculum to inform design of the new six-year curriculum, while adding to the body of knowledge regarding long-term PBL effectiveness.⁸

Methods

All (241) graduates who qualified from the HKU Faculty of Dentistry's B.D.S. program between 2004 and 2008 were sent a survey pack containing a cover letter explaining the purpose of the project and assuring them of the confidentiality of their replies, together with an anonymous questionnaire and a stamped addressed return envelope. Addresses were obtained from the HKU Dental Alumni Association and the List of Registered Dentists in the website of the Dental Council of Hong Kong (www.dchk.org.hk). The packs were first mailed in July 2009; second and third mailings were sent to nonrespondents in August and September 2009, respectively. This study followed the same protocol employed in assessment of graduates' preparedness for dental practice from the traditional dental curriculum conducted in 2002.⁸

The self-administered postal questionnaire used a mixture of quantitative and qualitative methods to retrospectively assess HKU's integrated PBL dental curriculum. The first section of the questionnaire asked questions about each dentist's personal and practice characteristics. The second section asked respondents to rate their self-perceived preparedness on a four-point rating scale (very well=4, well=3, poorly=2, and very poorly=1), using the wording "The objective of this section is to evaluate how well prepared you are at performing the following," followed by a list of fifty-nine items (competencies). These items have been used previously in graduate questionnaire surveys in Australia,⁹ Canada,¹⁰ and Hong Kong.⁸ The same questionnaire from the previous Hong Kong study consisted of fifty-nine items covering the following nine aspects (domains) of dental practice: general patient management, practice management, periodontology and dental public health, conservative dentistry, oral rehabilitation, orthodontics, managing children and patients with special needs, oral and maxillofacial surgery, and drug and emergency management. The third section of the questionnaire was a new section for the PBL graduates. It consisted of two open-ended questions asking respondents to provide their opinions regarding the strengths and weaknesses of their undergraduate dental education.

The data were analyzed using the Statistical Package for the Social Sciences (Windows version 16.0, SPSS Inc., Chicago, IL, USA). The responses to items within the nine domains of dental practice were tabulated as frequency distributions for the four ratings. Ratings were then dichotomized into well prepared (very well and well prepared) and poorly prepared (very poorly and poorly prepared). Domain scores were obtained by averaging the proportion of respondents who scored well prepared/very well prepared by the total number of items.¹¹ A comparison of the traditional and PBL graduates' self-perceived preparedness for dental practice was conducted for each of the nine domains using chi-square statistics. Statistical significance was set at $P < 0.01$. In addition, perceived preparedness for practice among the two cohorts at each item level was conducted from multiple comparisons using the Bonferroni correction method. Statistical significance was set at $P < 0.001$. Proportion test was used to assess the difference in demographic items (gender, year of graduation, type of current dental practice, whether they have changed job, and nature of current practice), with

statistical significance set at $P < 0.05$. Comments from the two open-ended questions of the PBL graduates were transcribed into a spreadsheet. Qualitative data were read and reread to analyze for patterns by two investigators, and common themes were identified. Similar comments were then grouped under themes. The frequency of comments received under each theme was expressed as a percentage of total number of comments received.

Results

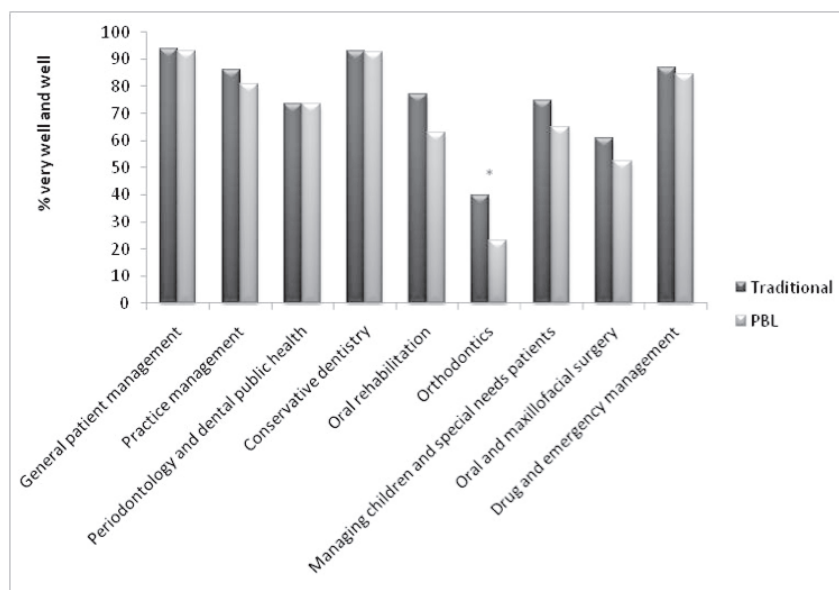
A total of 159 of the 241 questionnaires were received within the study period, producing an overall response rate of 66 percent, which was higher than the previous survey in 2002 of 1997–2001 HKU B.D.S. graduates (45 percent; 104/230). The profiles of the two sets of graduates were similar in terms of gender, type of current dental practice, and whether or not it was a solo practice. Graduates of the traditional curriculum had more frequently changed practice type since graduation compared to the PBL graduates (59 percent vs. 29 percent; $P < 0.001$; Table 1).

Graduates' self-perceived preparedness across the nine domains of dental practice are presented in Figure 1. For the most part, graduates of both cohorts felt well prepared for dental practice except for the specialty areas of dental practice, such as orthodontics. There was no statistically significant difference between traditional and PBL curriculum graduates' self-perceived preparedness in eight of the nine domains of dental practice: general patient management (traditional=93 percent vs. PBL=90 percent, $P=0.350$), practice management (traditional=83 percent vs. PBL=81 percent, $P=0.749$), periodontal and dental public health (traditional=73 percent vs. PBL=71 percent, $P=0.723$), conservative dentistry (traditional=92 percent vs. PBL=89 percent, $P=0.417$), oral rehabilitation (traditional=74 percent vs. PBL=63 percent, $P=0.060$), managing children and patients with special needs (traditional=72 percent vs. PBL=65 percent, $P=0.214$), oral and maxillofacial surgery (traditional=59 percent vs. PBL=52 percent, $P=0.304$), and drug and emergency management (traditional=85 percent vs. PBL=83 percent, $P=0.732$). However, a statistically significant difference was observed in self-perceived preparedness in orthodontics (traditional=38 percent vs. PBL=23 percent; $P=0.007$), with the graduates from the PBL curriculum feeling less well prepared.

Table 1. Demographic characteristics of respondents from traditional and PBL curricula

Characteristics		Traditional	PBL	
		Number (%)	Number (%)	
Gender		55 (53%)	Male	87 (55%)
		49 (47%)	Female	72 (45%)
Year of graduation	1997	10 (10%)	2004	29 (18%)
	1998	15 (14%)	2005	32 (20%)
	1999	19 (18%)	2006	35 (22%)
	2000	30 (29%)	2007	33 (21%)
	2001	30 (29%)	2008	30 (19%)
Type of current dental practice	Associate	72 (69%)		86 (54%)
	Partnership	8 (8%)		3 (2%)
	Principal	5 (5%)		8 (5%)
	Postgraduate training	5 (5%)		8 (5%)
	University	4 (4%)		3 (2%)
	Public hospital	3 (3%)		8 (5%)
	Private hospital	0		1 (1%)
	Government	3 (3%)		33 (21%)
	Others	3 (3%)		9 (6%)
Worked in different types of practice	No	43 (41%)		113 (71%)*
	Yes	61 (59%)		46 (29%)
Nature of current practice	Non-solo	56 (54%)		92 (58%)
	Solo	48 (46%)		67 (42%)

*P<0.001



*P<0.01

Figure 1. Domain level comparison of graduates' perceived preparedness for dental practice: traditional vs. PBL curriculum

Comparison of self-perceived preparedness of graduates from traditional and PBL curricula within each domain of general practice showed significant differences in five of fifty-nine competencies, accounting for multiple testing (Table 2). When compared with graduates from the traditional curriculum, graduates from the PBL curriculum felt significantly

less well prepared in “replacing teeth with complete dentures” (traditional=100 percent vs. PBL=57 percent; $P<0.001$); “reestablishing an occlusal vertical dimension” (traditional=66 percent vs. PBL=33 percent; $P<0.001$); “performing minor tooth movement” (traditional=50 percent vs. PBL=23 percent; $P<0.001$); “recognizing, reporting, and following up

Table 2. Item level comparison of graduates’ perceived preparedness for dental practice: traditional vs. PBL curriculum

How well prepared do you feel to . . .	Traditional very well and well Number (%)	PBL very well and well Number (%)
A. General Patient Management		
Take and interpret medical, social, and dental history	100 (96%)	156 (98%)
Communicate effectively with patients	100 (96%)	153 (96%)
Discuss treatment plans and get informed consent	101 (97%)	154 (97%)
Discuss fees and payment options with patients	88 (85%)	120 (75%)
Develop a sequential treatment plan	94 (90%)	144 (91%)
Interpret tests and history to make a diagnosis	98 (94%)	153 (96%)
Identify and address patients’ chief complaints	103 (99%)	157 (99%)
B. Practice Management		
Maintain accurate confidential patient records	100 (96%)	150 (94%)
Communicate effectively with practice staff	94 (90%)	152 (96%)
Communicate effectively with colleagues	95 (91%)	154 (97%)
Manage dental staff	92 (88%)	119 (75%)
Deal with finances of your clinic	75 (72%)	88 (55%)
Select and monitor infection control procedures	86 (83%)	123 (77%)
Prevent dental workplace hazards	93 (89%)	128 (81%)
Write laboratory prescriptions and evaluate laboratory work	101 (97%)	147 (92%)
Critically evaluate dental literature to inform dental practice and policy	74 (71%)	113 (71%)
Apply evidence-based dentistry	85 (82%)	114 (72%)
C. Periodontology and Dental Public Health		
Treat early periodontal disease	104 (100%)	153 (96%)
Perform deep scaling and root planing	94 (90%)	148 (93%)
Perform periodontal surgery for pocket management	37 (36%)	62 (39%)
Perform periodontal surgery for crown lengthening	42 (40%)	36 (23%)
Perform oral hygiene instruction and diet analysis	93 (89%)	151 (95%)
Provide and monitor preventive treatment	89 (86%)	151 (95%)
D. Conservative Dentistry		
Restore teeth with amalgam restorations	104 (100%)	157 (99%)
Restore teeth with resin composite restorations	101 (97%)	153 (96%)
Perform root surface restorations	86 (83%)	148 (93%)
Perform single-root canal treatment	104 (100%)	157 (99%)
Perform multi-root canal treatment	83 (80%)	115 (72%)
Restore teeth with single crowns	104 (100%)	157 (99%)
Restore teeth with post-and-core crowns	95 (91%)	142 (89%)
E. Oral Rehabilitation		
Replace teeth with partial dentures	103 (99%)	154 (97%)
Replace teeth with complete dentures	104 (100%)	91 (57%)*
Replace teeth with implants (prosthetics)	27 (26%)	49 (31%)
Replace teeth with conventional bridges	94 (90%)	131 (82%)
Replace teeth with resin-bonded bridges	84 (81%)	121 (76%)
Reestablish an occlusal vertical dimension	69 (66%)	53 (33%)*

(continued)

neglect and abuse cases” (traditional=63 percent vs. PBL=33 percent; $P<0.001$); and “extracting impacted third molars” (traditional=85 percent vs. PBL=62 percent; $P<0.001$).

The final section in the 2009 survey requested open-ended responses, which were grouped into predominant themes (Figures 2 and 3). Sixty-five percent ($n=103$) of the respondents wrote a reply for Question 1: “What were the strengths of your undergraduate dental education?” A total of 166 responses were received. Frequently expressed strengths of the PBL education were good clinical experience (45 percent), the opportunity to develop self-directed and lifelong learning skills (23 percent), problem-solving and critical thinking skills (13 percent), and communication skills (8 percent). Seventy-two percent ($n=115$) of the graduates wrote a reply for Question

2: “What were the weaknesses of your undergraduate dental education?” A total of 233 responses were received. Frequently expressed weaknesses of the PBL education were insufficient clinical exposure, particularly oral surgery such as surgical third molar extraction, orthodontics, and prosthodontics such as complete dentures (57 percent), lack of basic science knowledge (16 percent), lack of guidance in learning (6 percent), and inadequate dental practice management experience (5 percent).

Discussion

This study is the first large-scale survey comparing self-perceived preparedness for practice among dental graduates from PBL and traditional curricula. Its findings are of benefit to quality-control

Table 2. Item level comparison of graduates’ perceived preparedness for dental practice: traditional vs. PBL curriculum (continued)

How well prepared do you feel to . . .	Traditional very well and well Number (%)	PBL very well and well Number (%)
F. Orthodontics		
Perform orthodontic treatment planning	41 (39%)	38 (24%)
Perform space maintenance/regaining	56 (54%)	53 (33%)
Perform minor tooth movement	52 (50%)	36 (23%)*
Perform full-arch alignment	17 (16%)	19 (12%)
G. Managing Children and Patients with Special Needs		
Manage anxious dental patients	86 (83%)	106 (67%)
Manage child patients	74 (71%)	114 (72%)
Manage elderly patients	97 (93%)	145 (91%)
Manage medically compromised patients	81 (78%)	116 (73%)
Manage mentally or physically disabled patients	62 (60%)	84 (53%)
Recognize, report, and follow up neglect and abuse cases	66 (63%)	53 (33%)*
H. Oral and Maxillofacial Surgery		
Manage acute pain/infection	98 (94%)	146 (92%)
Perform simple extractions	104 (100%)	155 (97%)
Extract impacted third molars	88 (85%)	98 (62%)*
Manage complications of oral surgery	80 (77%)	92 (58%)
Manage chronic orofacial pain	48 (46%)	51 (32%)
Identify and manage oral pathology	49 (47%)	57 (36%)
Perform soft-tissue biopsies	14 (13%)	29 (18%)
Manage trauma to dentofacial complex	27 (26%)	36 (23%)
I. Drug and Emergency Management		
Administer local anesthetics (LA)	104 (100%)	159 (100%)
Prescribe drugs	96 (92%)	151 (95%)
Prevent and manage LA complications	98 (94%)	138 (87%)
Manage medical emergencies	63 (61%)	99 (62%)
Prevent and manage dental emergencies	90 (87%)	126 (79%)

* $P<0.001$

Good clinical experience

- “Early exposure to clinical dentistry”
- “Habit of sharing clinical knowledge and experience with colleagues on a regular basis”
- “Able to perform and develop sequential treatment planning for patients”
- “Multi-discipline clinic is good and learned the importance of referral when out of capacity”
- “Learned to share patient case with specialist and make treatment more effective”
- “Perform simple dental procedures like restorations under plenty of practice”
- “Simple periodontal and restorative treatment, simple extraction, and simple prosthetic treatment, e.g., single crown and resin bonded bridges”

Self-directed and lifelong learning skills

- “Encourage self-motivated learning, which was a lifelong learning experience”
- “Information-searching skills based on individual problems/deficiencies faced”
- “Ability to search for dental literature and assess critically”
- “More willing to update with current technology and knowledge”

Problem-solving and critical thinking skills

- “We are well prepared to face problems in our real dental practice mentally”
- “PBL enhanced my critical thinking and promoted my eagerness to update my knowledge”
- “Develop critical thinking and ‘question everything’ approach, which is important for scientific learning”
- “Learn to think critically and look at an issue in different directions and angles”
- “Evidence-based practice with ability to critically review current literature”
- “Able to locate the problem, chief complaint of patients, and help patient to solve the problem”
- “Stimulate us to think, to ask, to discuss with colleagues”

Communication skills

- “Opportunity to develop better communication skills”
- “Better communication with patients”
- “Communicate between colleagues and other dentists”

Others

- “Excellent library services and access to latest publications”
 - “Good teachers in general”
 - “Very good nursing support”
 - “Good facilities and clinical materials”
 - “Good laboratory support”
 - “Flexible and relaxed school life; allow development of other skills/interests in the university education, e.g., interpersonal leadership”
-

Note: Sixty-five percent (103) of the respondents provided comments to this question. Individual respondents may have mentioned more than one perceived strength.

Figure 2. Strengths of PBL undergraduate education as perceived by survey respondents

monitoring and development, particularly in preparations for HKU’s new six-year dental curriculum in 2012. Among both cohorts, graduates reported being well prepared for the “bread and butter” aspects of dental practice such as general patient management, practice management, and conservative dentistry. In the field of orthodontics, graduates of both cohorts felt most ill prepared. This is in line with graduates’ perceived preparedness for practice in other countries: Australia,⁹ the UK,¹²⁻¹⁴ and Canada.^{15,16}

Across eight of the nine aspects (domains) of dental practice, graduates’ ratings of self-perceived preparedness for practice were similar. The excep-

tion was in orthodontics, which is likely to relate to a reduction of patient contact rather than the PBL process per se. In the traditional curriculum, orthodontics was covered in years 2, 3, and 4 by a total of 168 hours of clinical teaching, seminars, and lectures. Students performed minor tooth movement and space-regaining procedures in patients using simple removable appliances. In contrast, the total teaching time of orthodontics in the PBL curriculum is 116 hours, in years 3 and 5 only, and clinical teaching has been replaced by case-based learning and seminars, with no hands-on experience with patients as orthodontics practice has become more of a

Insufficient clinical exposure

- “Patient pool; lack of variety of cases, generally speaking”
- “Insufficient clinical cases for practice especially extraction, minor oral surgery, complete dentures, etc.”
- “Don’t know much about orthodontic treatment planning”
- “It would be useful if there’s more chance in learning extractions and particularly management of root fractures, etc.”
- “No hands-on orthodontic and implant cases”
- “Inadequate cases for practice; especially weak in oral surgery and orthodontics”
- “Experience of making complete dentures not enough”

Inadequate practice management experience

- “Lack of real-life-practice teaching, especially on the issue of financial matters, clinic setup/running, stocks and supplies, staff training”
- “Dealing with treatment costs and negotiation with patients, counseling treatment plan and treatment cost”
- “Different practice environment in private clinic versus the teaching hospital”
- “Lack experience in real-life clinical practice, especially in discussion on treatment fee”

Weak in basic science knowledge

- “Weak in basic knowledge about anatomy/pharmacology”
- “Foundation for basic science is weak”
- “Basic knowledge consolidation not adequate in the first 2 years”

Lack of guidance in learning

- “Inadequate guidance and reference for learning”
- “I feel there wasn’t enough guidance especially during the preclinical years. I think PBL would be more applicable after basic knowledge was obtained via lectures/tutorials”
- “Sometimes I would get confused by different school of learning”
- “Not enough lecture to reinforce knowledge gained through PBL process; confused if what I learned was right or not”
- “Sometimes didn’t know if we dug out the correct information; just gathered a bundle of information only”

Others

- “No standardized clinical teaching”
 - “In some areas, some students may learn much more and some others may learn much less”
 - “First year too free; could have more lectures and clinical workshops”
 - “Lack of organization of courses”
 - “I would love to have a senior buddy (B.D.S. buddy) who would guide me/share with me about dentistry and undergraduate life/study”
-

Note: Seventy-two percent (115) of the respondents provided comments to this question. Individual respondents may have mentioned more than one perceived weakness.

Figure 3. Weaknesses of PBL undergraduate education as perceived by survey respondents

postgraduate field of study. This was only one aspect (item). There are of course other qualitative factors related to content of the curricula that may explain the difference between the two cohorts; identifying those would require further investigation.

At specific aspects of dental practice (item level), there was difference between traditional and PBL graduates’ perceived preparedness. For example, in oral rehabilitation, graduates from the PBL curriculum felt less well prepared than those from the traditional curriculum in replacing teeth with complete dentures and reestablishing an occlusal vertical

dimension for partially or totally edentulous patients. In recent years, there have been a limited number of edentulous patients in our patient pool, which reflects the fact that, increasingly, people are retaining their natural teeth in later life.¹⁷

In the area of oral surgery, PBL graduates felt more ill prepared to extract impacted third molars than graduates of the traditional curriculum. It is increasingly recognized that surgical extraction of impacted third molars should be limited to specialists in the field or those with further or postgraduate training.¹⁸ In Hong Kong, over the past decade consider-

able development has occurred in postgraduate training in the field of oral and maxillofacial surgery to serve the community, including third molar surgery.

There was also disparity between the two graduate cohorts in perceived ability to recognize, report, and follow up neglect and abuse cases, with PBL graduates faring worse. Suspected cases of child abuse and neglect in Hong Kong are usually reported by families to the Police or Social Welfare Department. Dentists in Hong Kong are therefore less likely to encounter abuse and neglect cases than perhaps dentists elsewhere. However, child and elder abuse is receiving increased attention globally, and it is important that all graduates gain knowledge of the signs and symptoms of abuse as well as their legal obligations in reporting such cases.^{19,20} This is an important and often-neglected issue that needs to be addressed in the undergraduate and continuing education. Plans are under way to develop new PBL problems including child and elder abuse as learning issues.

The open-ended replies generally correlated with the quantitative findings of this study. In general, graduates were positive about the integrated PBL curriculum because of the opportunity for them to gain multidisciplinary clinical experience and develop transferable independent skills such as problem-solving, communication, and organizational and interpersonal skills. These results are encouraging because the integrated PBL program is designed to allow students to develop a multidisciplinary approach to patient care under the supervision of different specialists in the polyclinic. Furthermore, graduates from the PBL curriculum were found to both value communication skills and feel well prepared in communicating effectively with patients, colleagues, and practice staff, which were also some of the Faculty of Dentistry's aims of implementing PBL. These findings are similar to those from the University of Western Australia regarding medical PBL graduates' interpersonal skills.⁶

Among the perceived weaknesses of the PBL curriculum, however, was inadequate exposure to orthodontics and several clinical procedures such as surgical extraction of third molars and fabrication of complete dentures. The development of clinical skills by students remains a critical element of any PBL dental program.²¹ At HKU, the total time assigned to clinical training is similar in the PBL program as to what it was for the traditional curriculum. Hence, perceived insufficient clinical exposure is related to neither the PBL curriculum per se nor the time available for clinical training, but to the patient pool

and the organization of training in the various clinics. Ongoing developments are under way to expand the patient pool and improve the organization of polyclinics.

Some graduates expressed concerns about their perceived level of knowledge in basic science, such as anatomy. This is a well-documented concern in the literature on PBL, but one that is not directly linked to the PBL philosophy.^{22,23} Students' actual knowledge of clinical anatomy has been shown not to depend on the didactic approach.²³ Moreover, another study reported that overall knowledge recall in anatomy, biochemistry, oral biology, and physiology among dental students did not differ according to whether PBL or conventional didactic courses were followed.²⁴

Finally, graduates cited inadequate practice management instruction as a program weakness. In the traditional curriculum, practice management was mainly covered in lectures, whereas in the PBL curriculum workshops, seminars, and lectures were delivered by part-time teachers, full-time teachers, and representatives from professional societies and organizations to provide the final-year students with a basic understanding of the issues facing new graduates entering general dental practice. The final-year students are also required to undertake dental practice visits to broaden their exposure to practice management. However, students do not have actual hands-on experience to implement administrative and financial theories of practice management until after qualifying. Further development of the practice management component could include seminars with invited alumni or business practitioners.

There are several limitations in our study. First, the response rate to the survey was less than ideal and better for PBL graduates (66 percent) than traditional curriculum graduates (45 percent). Thus, aspects of non-response bias may need to be considered in the interpretation of results. Graduates who chose not to return the questionnaire might have a low (or high) self-perceived preparedness for dental practice. Another limitation is the self-reported nature of the data, which may not accurately reflect the clinical competence of the graduates. In a recent systematic review of accuracy of physician self-assessment, the physicians were found to have limited ability to accurately self-assess with little or no associations between their self-rated assessment and external assessment.²⁵ Finally, the length of time since graduation and work experience may affect the interpretation and response to the surveys. Recent graduates may have a fresher memory of their undergraduate education.

Conclusions

Within the limitations of this study, it may be concluded that

- Dental graduates of HKU, both PBL and traditional curricula graduates, for the most part perceive themselves to be well prepared for dental practice.
- Graduates of the PBL and traditional curricula perceive themselves to be similarly well prepared for dental practice, except in the specialist field of orthodontics.

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REFERENCES

1. Rich SK, Keim RG, Shuler CF. Problem-based learning versus a traditional educational methodology: a comparison of preclinical and clinical periodontics performance. *J Dent Educ* 2005;69(6):649–62.
2. Moreno-López LA, Somacarrera-Pérez ML, Díaz-Rodríguez MM, Campo-Trapero J, Cano-Sánchez J. Problem-based learning versus lectures: comparison of academic results and time devoted by teachers in a course on dentistry in special patients. *Med Oral Pathol Oral Cir Bucal* 2009;14(11):e583–7.
3. Susarla SM, Medina-Martinez N, Howell TH, Karimbux NY. Problem-based learning: effects on standard outcomes. *J Dent Educ* 2003;67(9):1003–10.
4. Susarla SM, Bergman AV, Howell TH, Karimbux NY. Problem-based learning and research at the Harvard School of Dental Medicine: a ten-year follow-up. *J Dent Educ* 2004;68(1):71–6.
5. Thammasitboon K, Sukotjo C, Howell H, Karimbux N. Problem-based learning at the Harvard School of Dental Medicine: self-assessment of performance in postdoctoral training. *J Dent Educ* 2007;71(8):1080–9.
6. Schmidt HG, Vermeulen L, van der Molen HT. Long-term effects of problem-based learning: a comparison of competencies acquired by graduates of a problem-based and a conventional medical school. *Med Educ* 2006;40(6):562–7.
7. Polyzois I, Claffey N, Mattheos N. Problem-based learning in academic health education: a systematic literature review. *Eur J Dent Educ* 2010;14(1):55–64.
8. McGrath C, Corbet E. Do dental graduates of the University of Hong Kong (1997–2001) perceive themselves prepared for dental practice? *Hong Kong Dent J* 2005;2:85–91.
9. Greenwood LF, Lewis DW, Burgess RC. How competent do our graduates feel? *J Dent Educ* 1998;62(4):307–13.
10. Greenwood LF, Townsend GC, Wetherell JD, Mullins GA. Self-perceived competency at graduation: a comparison of dental graduates from the Adelaide PBL curriculum and the Toronto traditional curriculum. *Eur J Dent Educ* 1999;3(4):153–8.
11. Razak IA, Rj RL, Jaafar N, Mi AH, Ab Murat N. Assessing the competency of University of Malaya dental graduates: employers' and graduates' perceptions. *J Dent Educ* 2008;72(3):364–9.
12. Murray FJ, Blinkhorn AS, Bulman J. An assessment of the views held by recent graduates on their undergraduate course. *Eur J Dent Educ* 1999;3(1):3–9.
13. Bartlett DW, Coward PY, Wilson R, Goodson D, Darby J. Experiences and perceptions of vocational training reported by the 1999 cohort of vocational dental practitioners and their trainers in England and Wales. *Br Dent J* 2001;191(5):265–70.
14. Patel J, Fox K, Grieveson B, Youngson CC. Undergraduate training as preparation for vocational training in England: a survey of vocational dental practitioners' and their trainers' views. *Br Dent J* 2006;Suppl:9–15.
15. Ryding HA, Murphy HJ. Assessing outcomes of curricular change: a view from program graduates. *J Dent Educ* 2001;65(5):422–6.
16. Gerrow JD, Murphy HJ, Boyd MA. Competencies for the beginning dental practitioner in Canada: a validity survey. *J Dent Educ* 2006;70(10):1076–80.
17. Department of Health. Oral health survey 2001. Hong Kong: Dental Service Head Office, Department of Health, 2002:37–60.
18. Ventä I, Lindqvist C, Ylipaavalniemi P. Malpractice claims for permanent nerve injuries related to third molar removals. *Acta Odontol Scand* 1998;56(4):193–6.
19. Wiseman M. The role of the dentist in recognizing elder abuse. *J Can Dent Assoc* 2008;74(8):715–20.
20. McDonald KC. Child abuse: approach and management. *Am Fam Physician* 2007;75(2):221–8.
21. Winning T, Townsend G. Problem-based learning in dental education: what's the evidence for and against . . . and is it worth the effort? *Aust Dent J* 2007;52(1):2–9.
22. Prince KJ, Van De Wiel M, Scherpbier AJ, Can Der Vleuten CP, Boshuizen HP. A qualitative analysis of the transition from theory to practice in undergraduate training in a PBL-medical school. *Adv Health Sci Educ Theory Pract* 2000;5:105–16.
23. Sweeney G. The challenge for basic science education in problem-based medical curricula. *Clin Invest Med* 1999;22:15–22.
24. Prince KJ, van Mameren H, Hylkema N, Drukker J, Scherpbier AJ, van der Vleuten CP. Does problem-based learning lead to deficiencies in basic science knowledge? An empirical case on anatomy. *Med Educ* 2003(1);37:15–21.
25. Last KS, Appleton J, Stevenson H. Basic science knowledge of dental students on conventional and problem-based learning (PBL) courses at Liverpool. *Eur J Dent Educ* 2001;5(4):148–54.