

## **Examination of Curriculum Reform in a Four-year Program of Pediatric Dentistry**

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### **Abstract:**

*Significant curriculum reform has occurred over the last decade within the context of the undergraduate dental degree program at The University of British Columbia (UBC). Competency-based dental education guides curriculum practice at the UBC Faculty of Dentistry. Competencies—a set of skills, knowledge, and values that are required of a new graduate to enter dental practice—direct implementation of integrated student learning experiences with attention to the basic sciences, problem-based learning, and community-based dental practice. This paper is a description of the curricular changes that are happening in the division of Pediatric Dentistry at UBC. Drawing on an analysis of curriculum documentation and discussions with faculty members of Pediatric Dentistry, this paper is a reflective examination of the key barriers and emergent strategies for curriculum renewal in the UBC Dentistry program context.*

### **Key Words:**

curriculum reform, dental education, basic sciences, problem-based learning, community-based dental practice.

### **Introduction**

Curriculum reform is being prioritized within and across health disciplines on a national and an international scale (Haden et al, 2010; Ho et al, 2009; Hubball & Gold, 2007; Katajavuori et al, 2009). At the University of British Columbia (UBC) Faculty of Dentistry, design and ongoing renewal of the Pediatric Dentistry curriculum aim toward learning-centred program development, implementation, and evaluation. In particular, emergent learning experiences have been oriented toward problem-based and community-service learning modules in real-life practice settings. The discipline of

Pediatric Dentistry strives for coherence with and integration of the biomedical, oral biological and behavioural sciences in a multi-disciplinary curriculum of the undergraduate dental degree program (Licari & Chambers, 2008). Multiple factors have influenced teaching and learning practices within this broad curriculum reform context.

Hubball & Burt's (2004) conceptual framework (Figure 1) for developing, implementing, and evaluating learning-centred curricula in higher education contexts will be used to analyze curriculum practices in the UBC Pediatric Dentistry program. This framework takes into account complex curriculum contexts and the iterative processes of curriculum planning, assessment, programming and evaluation in order to examine the resultant practices of curriculum reform. Drawing on an analysis of curriculum documentation and discussions within the division of Pediatric Dentistry, this paper is a



reflection on changes being made in the program.

*Figure 1. Developing, implementing and evaluating learning-centred curricula (Hubball & Burt, 2004)*

## Implementing a Learning-Centred Curriculum

**UBC Faculty of Dentistry Curriculum Context.** UBC Dentistry offers an undergraduate dental program that spans four years of professional study and leads to the degree of Doctor of Dental Medicine (D.M.D.). The curriculum learning community includes approximately 190 students over 4 years of the program, forty tenured or tenure-track and thirty professional dental educator faculty members, hundreds of

sessional clinical instructors, and seventy-five administrative and clinical support staff. The graduating class is made up of up to fifty-five students, a composite of Canadian citizens or permanent residents and graduates from international dental programs who have been admitted to the two-year International Dental Degree Completion Program. Instruction is provided by faculty members from the Department of Oral Health Sciences and the Department of Oral Biological and Medical Sciences. UBC Dentistry has a hybrid—problem-based learning (PBL) and conventional lecture/clinic style—curriculum. Many dental clinicians from the community serve as clinical instructors or as tutors to facilitate problem-based learning cases. Instruction in the basic medical sciences is provided by the faculties of Medicine and Dentistry.

Traditional approaches of content transmission and a reliance on written examinations have been entrenched in the culture of dental education (Albino et al., 2008; Licari & Chambers, 2008). A blending of basic medical and clinical sciences, and of interdisciplinary experiences has been missing. To rectify these experiences, the competency-based dental curriculum is now the widely accepted norm in North American dental schools. Competency-based dental education focuses curriculum reform in three particular areas: (1) reorganization of curricula to be interdisciplinary with a focus on disease pathophysiology; (2) problem-based learning; and (3) community-based patient care experiences.

Curriculum context strategies refer to critical implementation issues and initiatives (for example, adequate support; leadership qualities; teamwork; representative input; responsiveness, incentives and sources of reward) that empower the learning community, collectively and individually, to engage in curriculum re-design. UBC Dentistry has implemented changes and is a leader in curriculum reform amongst North American dental schools. Competency-based education provides the framework for UBC Dentistry to define core content of curriculum and assess outcomes. The document “UBC Faculty of Dentistry Competencies for the New Practitioner” (2006) outlines six domains of professional activity and responsibilities related to the general practice of dentistry—professionalism; practice organization; assessment of the patient and the oral environment; health promotion; establishment and maintenance of a healthy oral environment; and rehabilitation of form, function, and esthetics. Associated with these domains are forty-four competencies.

The process of curriculum review and reform of the four-year program with attention to competencies and issues of integration is an onerous task. It requires up to one year of advance planning and the collaboration and cooperation of module coordinators of fourteen divisions within the two departments of UBC Dentistry. Adequate administrative support, timetable clashes, and even room bookings are regular challenges. A greater need for more instructors and tutors comes with small group learning. Recruiting, training, and keeping capable clinicians from the community, has been difficult.

This has become even more problematic as class sizes have increased and clinical specialty graduate programs have been added. Three new graduate programs in Pediatric Dentistry, Orthodontics, and Prosthodontics were launched in the fall of 2010. With full-time tenured faculty bearing the responsibility of developing graduate programs, a significant portion of the undergraduate curriculum has been delegated to the relatively new group of dental educators. Generally speaking, program-level

scholarship as a critical means of addressing curricular review issues has not progressed in dental education at the rate experienced by other programs (Hubball & Burt, 2007; Katajavuori, et al., 2009; Marambe, Athuraliya, Vermunt, & Boshuizen, 2007; Ryan, Hanrahan, Krass, Sainsbury, & Smith, 2009).

**Planning Strategies.** Planning strategies refer to the development of global (overall curriculum) and specific (program-specialization) learning outcomes. Planning a learning-centred curriculum requires deliberate intention to engage and assess learners in their learning. Examples from UBC Pediatric Dentistry will be used to illustrate some specific planning strategies.

**Competencies** (standards/a set of skills, knowledge, and values that are required of a new graduate to enter practice)



**Learning Outcomes** (related to integration of biomedical, clinical, and behavioural sciences and the expectation of students to use higher order thinking skills)

- Global
- Specific



**Instructional Activities** (specifically designed to actively engage learners) e.g.

- Problem-based learning
- Simulation exercises to develop psychomotor skills
- Community service learning
- Supervised clinical practice



**Assessment** (in the classroom, small group learning environments, and the clinic) e.g.

- Problem-based learning assessment
- Objective structured clinical examination (OSCE)
- Case-based examination
- Clinical assessment

**Figure 2. Planning strategies, UBC Pediatric Dentistry**

The re-design of the module, Introduction to Pediatric Dentistry, was necessitated due to re-organization of the dental curriculum. Setting aside ample time was an important first step to develop a learning-centred syllabus, identify learning objectives, prioritize specific content, select experiential instructional activities, and match methods of formative assessment and summative evaluation. Consistent with other UBC Dentistry modules and informed by the dental competencies, both global (program level) and specific (individual learning experience) learning objectives were identified. A sample global objective reads “Students will be able to critically examine and integrate information from diverse literature sources for counseling parents on prevention of tooth decay.” A corresponding specific learning objective is “Describe the impact of tooth decay on the growing child.” Learners were expected to be able to critically assess,

apply, and integrate basic concepts related to the patient's oral health, strategies for prevention and management of early childhood tooth decay, and behaviour management techniques.

On the learning continuum in Pediatric Dentistry, students actively engage in problem-based and small group learning experiences, assist senior classmates in clinical rotations at a community dental clinic, and practice psycho-motor skills in a simulation laboratory. The final year of training in Pediatric Dentistry is largely devoted to a community service learning clinical experience where students learn to apply knowledge and build a repertoire of skills in pediatric dentistry, behaviour management of children, professionalism, and practice organization. To summarize, the learning in Pediatric Dentistry students have many experiences in which to develop and demonstrate competency in professional and ethical practice, communication skills, critical thinking, decision-making, and problem solving.

The Coordinator of the UBC Children's Dental Program has observed a growing trend to integrate learning across dental disciplines. For example, dental students now rotate to public health units where they provide first dental visits—dental examinations and oral health counselling for infants and toddlers—as part of the module, Professionalism and Community Service. Another example involves Integrated Clinical Care (general practice dentistry) and Pediatric Dentistry; use of the electronic health record and assessment instrument is now consistent. Obstacles include training part-time instructors how to navigate new technology, heavy workloads that often prohibit meaningful conversations, and a large physical space that is not conducive to informal networking.

The combined MSc and Diploma program in Pediatric Dentistry is a clinical specialty program and clinical training is divided between the university's Point Grey Campus and BC Children's Hospital. A developing area of integration involves the referral of difficult pediatric cases at UBC from the undergraduate clinic to the Pediatric Dentistry graduate program. While graduate students treat these difficult cases in their own designated clinic space and time, it will be exciting to explore how graduate and undergraduate students might work and learn together while treating complex clinical cases. Currently graduate students spend some time instructing in undergraduate clinics of Pediatric Dentistry. Planning and implementing a new graduate program demands time and effort, but there can develop reciprocity as graduate students fulfill needs in instructional roles in the undergraduate curriculum.

**Assessment Strategies.** Assessment strategies refer to the range of authentic methods and procedures used to gather data and evaluate student learning (Frye, 1999; Shavelson & Huang, 2003; Svinicki, 2004). In Dentistry, learning outcomes are assessed in the classroom, small group learning environments, and the clinical realm.

In Pediatric Dentistry preclinical learning settings, data is collected through quizzes, assignments, oral presentations, and PBL assessments. The clinical component of the curriculum is designed to enable students to experience a diverse range of Pediatric Dentistry so that the new graduate will feel comfortable treating children in a general practice. As students are supervised by clinical instructors, there is a constant exchange of verbal feedback throughout the patient-care session. Instructors are also encouraged

to provide formative feedback in end-of-day group meetings and one-minute papers (Angelo & Cross, 1993). Finally, instructors are required to provide an online assessment focused on each student's knowledge, organization, skill, professionalism, degree of difficulty, and level of independence.

A very challenging part of clinical assessment is that most clinical instructors are not formally trained as educators and not familiar with current recommended teaching and assessment practices. Inter-instructor variability and varying levels of participation in daily clinical assessments are the result. A rubric for quantitative assessment of student performance is provided, but there has been no calibration of instructors. As well, students treating patients and running overtime often tips the balance to clinical care over meaningful formative feedback to students. There is little time for faculty development, given that most clinical instructors have busy dental practices and are not rewarded well financially for serving as instructors.

While it has been reported that best practices consist of multiple methods of assessment and evaluation that integrate learning in realistic settings over an extended period of time (Albino, et al., 2008; Licari & Chambers, 2008), not all methods used in Pediatric Dentistry meet the standard. Objective structured clinical examinations (OSCE) and case-based final examinations aim to be authentic, but a count of the number of and types of clinical procedures completed only provides a quantitative assessment. Readiness for clinical practice could be assessed with some less commonly applied methods, such as competency tests that require a student to perform a clinical procedure unassisted by the instructor. However, as there is risk of harm to the patient, this is not done for ethical reasons at UBC Dentistry. Pre-graduation internships are another such option; although logistically difficult to coordinate, UBC does have a pre-graduation elective program for a very few selected students.

**Programming Strategies.** Programming strategies refer to the development and integration of diverse student learning experiences, such problem-based and community-service learning, into the curriculum. UBC Dentistry strives to integrate the bio-medical sciences, behavioural sciences, and clinical learning, as well as integrate skills, knowledge, and values from specific disciplines and apply them to complex multi-disciplinary clinical cases and problems.

In Pediatric Dentistry, an example of vertical and horizontal integration begins in the first year of training with a course on the Principles of Oral Biology. The course emphasizes knowledge acquisition on craniofacial and tooth development. Building on this, the module called "Introduction to Pediatric Dentistry" addresses some of the dental and behavioural sciences necessary to manage the oral health needs of the child. As the module is unfolding, students are also starting the Nutrition, Growth and Development block of the integrated curriculum with Medicine.

With a voluminous curriculum, it is difficult and sometimes not possible to coordinate sequencing and integration of related disciplinary content as part of the broader curriculum. Only a few people bear this time-consuming and labourious responsibility. It is the task of Year Coordinators to facilitate problem solving in these curriculum issues for each DMD class by meeting and consulting with course and module coordinators. UBC Dentistry's Curriculum and Teaching Effectiveness Committee (CTEC) also makes

suggestions on such issues as scheduling of courses/modules and examinations, integration of programs and courses/modules, identification of curricular redundancies and omissions, and modification of course/module content after reviewing student feedback. In addition to curricular challenges, overlapping content and differing faculty perspectives, for example between Medicine and Dentistry, can and have led to conflicting information presented to students. A final critique specific to Pediatric Dentistry is that themes are threaded and not continuous throughout the four-year curriculum, so if students do not review previous content at the beginning of each Pediatric Dentistry module or clinic sessions, they might falter in their progress.

## Evaluation

**UBC Faculty of Dentistry Curriculum Evaluation.** Curriculum evaluation in higher education settings should be considered from a broad and long perspective, investigating context, process, impact and long-term outcomes (Hubball, Gold, Mighty, & Britnell, 2007). For example, in the Dentistry context, little attention has been paid to curriculum evaluation and scholarship in comparison to attention to other aspects of curriculum reform (e.g., curriculum integration, competencies assessment etc.). It could be argued, moreover, that attending to curriculum evaluation is central to the priorities of curriculum reform in terms of informed decision-making, on-going reflection and analysis of curriculum effectiveness. Further, very little attention has been afforded to date on curriculum context evaluations. This contrasts with other programs where evaluation is conducted with a rigorous and scholarly approach, whether on a whole unit or on a part of the whole, for example, a single course or instructional strategies and methodologies (Abraham, Vinod, Kamath, Asha, & Ramnarayan, 2008; Dalton, et al., 2007; Hubball & Burt, 2007; Katajavuori, et al., 2009; Ryan, Hanrahan, Krass, Sainsbury, & Smith, 2009).

Dentistry's CTEC bears the responsibility for overseeing curricular evaluation. A subcommittee focusing on the DMD curriculum, made up of faculty members and student representatives, advises CTEC on DMD curricular issues. Two of many terms of reference are to "review program goals/philosophy, curricular objectives, curricular guidelines, student competencies/outcome statements and course contents with regard for accreditation, licensure, resources and the time available for each program, and recommend changes when needed" and "evaluate, where possible, the effectiveness of the curricula" (Dentistry Curriculum and Teaching Effectiveness Committee, 2009, p. 1). Although CTEC is involved with issues of planning, assessment, and programming, evaluation of curriculum from a long and broad perspective is given much less emphasis. That is, curriculum practice tends to advance in a linear pattern, as opposed to an iterative process where evaluation, integrating current scholarly literature and research methodologies, plays a key role in judging curricular effectiveness and transforming curriculum.

With respect to process evaluation of Pediatric Dentistry, course and module coordinators review what is working and what needs improvement. Syllabi are reviewed to ensure that global and specific objectives are stated explicitly and that learning experiences are connected to learning objectives. Ongoing informal feedback from key stakeholders—clinical instructors, health authority dental staff, students, and patients'

families—provides qualitative data on how teaching and learning is progressing. Discussion takes place with the year-specific coordinators to schedule and integrate learning from multiple disciplines.

Regarding impact evaluation of Pediatric Dentistry, responses through standard university course evaluation forms are sought at the end of every course to address issues, such as to what extent does the program meet, surpass, or fall short of the identified learning outcomes, and why and how. Linking evaluation data across all years of Pediatric Dentistry can provide insight to the strengths and weaknesses of learning experiences. For instance, while second-year students identified strengths to be “different interactive learning methods employed”, “taught from a more clinical aspect which is a refreshing change”, and “encourages self-learning” (“Survey Report”, p. 2), methods of assessments of clinical learning by senior students need reviewing because there are wide instructor variances in student assessments in Pediatric Dentistry.

Student outcomes are not followed or evaluated after graduation; however, there is usually one student per year who is interested and accepted to a program of specialty training in Pediatric Dentistry. This implies that the student who has elected to specialize has valued the learning and the learning has contributed to the student’s development in the longer term. Furthermore, another measure of success has been the development of a new specialty training program in Pediatric Dentistry at UBC. Three dental graduate students were admitted to the first cohort of the combined Master of Science (M.Sc.)/Diploma in Pediatric Dentistry Program in 2010 and one of the three is a dental alumnus from UBC Dentistry.

### **Key Barriers and Emergent Strategies**

Curriculum reform is a complex and labour-intensive process requiring significant time, energy, expertise and support (e.g., committed and influential leadership to foster a curriculum learning community, faculty development, and adequate resources). Developing and sustaining a curriculum with learning-centred strategies, therefore, is not without significant challenges to implementation (Hubball & Pearson, 2010). Increasingly evident within the UBC Dentistry faculty is a commitment to balance content knowledge with broader skills, such as critical thinking, problem solving, and communication, required in practice. External program accreditation has been a motivating factor for curriculum reform of the predoctoral dental degree program. Given expansion of the Faculty of Medicine, dental faculty members have responded to past recommendations by the accreditation team and taken on leadership roles for their own curriculum development and integration. Some barriers related to an entrenched “culture” of dental education have been removed, such as overcoming a lack of buy-in and initial resistance to problem-based learning. Not surprisingly though, engaging and maintaining motivation of faculty, who have time constraints, heavy workloads related to teaching, administration, and research, and varying knowledge regarding the literature related to higher education, make it difficult to sustain curricular reform.

The variability of faculty curricular and pedagogical expertise to design learning-centred courses with higher order learning outcomes and to renew curriculum pose an ongoing challenge. There is limited acknowledgement in career progress and academic tenure decisions for individual faculty members and modules or courses that



demonstrate curriculum excellence. The scholarly process of planning and implementing a course with interconnected and relevant learning objectives, activities and assessment receives limited attention by faculty and university, nor are successes shared with peers. This oversight can lead to a sense of disconnectedness to or even marginalization within the community of UBC Dentistry (Wenger, 1998). It can reinforce the traditional culture of practices of dental education, including teaching in isolation and silo learning, both counter-productive for ongoing curriculum renewal.

UBC Dentistry is serious about supporting faculty development as leaders in curriculum practice, as evidenced over the last ten years by the annual nomination and selection of seventeen dental faculty members for participation in the Scholarship of Teaching and Learning (SoTL) Leadership Program at UBC. This structured program of study focuses on a learning-centred approach to teaching as part of a critically reflective practice. Over half of the participants have chosen their area of research in and developed leadership portfolios focused on the Scholarship of Curriculum Practice (SoCP) (Hubball & Pearson, 2009). Action research, familiarity and access to SoTL and SoCP literature, and critical reflection around curriculum practice has increased engagement of dialogue of SoTL program graduates with their colleagues in their respective areas of practice. Potential leadership is growing to address the broader curricular and pedagogical issues within dental education.

However, although individuals may be interested in or already are pursuing research focused on dental education, attempts to develop a community of practice within UBC Dentistry around educational research have not been sustainable. Recognition and reward, such as tenure, for professional dental educator faculty interested in pursuits of this nature is an element yet to be addressed at UBC Dentistry. Specifically, there is little research to evaluate curriculum practice at UBC Dentistry. Contributing factors are stressful academic workloads, a lack of knowledge, expertise, and support—administrative, resource, and financial. Furthermore, research, publications, presentations, and peer review in SoTL and SoCP are not historically valued within Dentistry. Lack of awareness of the SoCP, a relatively new field of study, along with inadequate recognition and support for educational research presents many challenges.

The new appointment of an educational researcher at UBC Dentistry is both promising and progressive toward greater scholarship of curriculum and pedagogical practices, including program evaluation projects, and has the potential to be a valuable resource to support faculty investigations related to SoTL and SoCP. The educational researcher has initiated dental educational research seminars for interested faculty, many of whom are graduates of the SoTL Leadership Program. While there are many possible areas for study, some questions to be addressed might include the following: How effective are currently-defined dental competencies in determining practice-readiness of graduated dentists? What are the advantages and disadvantages of problem-based learning where the tutor is the facilitator versus students as self-facilitators assisted by roaming tutors? What are best practices of clinical assessment? How can instructional skills of sessional faculty be developed? What critical medical knowledge must the dental practitioner must have to practice dentistry? What are the long-term outcomes of UBC dental graduates?

## Conclusion

Consistent with a range of health disciplines, UBC Dentistry has an ongoing process of curriculum renewal as evidenced by progress toward integration of the biomedical and clinical sciences, a problem-based learning curriculum, and community-based dental experiences. Understanding the curricular reform requires acknowledgement of the challenges as well as the advancement of faculty development as a means of attaining sustainable curriculum reform. In addition to a lack of financial and administrative support, challenges stem partially from a lack of SoTL and SoCP expertise and integration of the current scholarly literature and research methodologies to evaluate curriculum contexts, processes, impacts, and outcomes. On-going research and evaluation of curriculum implementation (from a broad and long perspective) is vital to measure progress and effectiveness on a wide range of relevant indicators. Further, research and dissemination of curriculum practices is in its infancy across North American dental schools.

On the other hand, there are strategies moving forward the renewal of curriculum at UBC Dentistry. These include greater recognition of the benefits of scholarly approaches to curriculum practice. While understanding of competency-based dental education is evolving across dental schools, within UBC Dentistry, there is already commitment to graduate dentists who are ready to begin practice with a multi-disciplinary focus and higher order learning skills. This is observed in the integration and application of the biomedical sciences, clinical practice, and professional behaviour in real-world settings. More attention is being given to improved student learning outcomes across departments and disciplines and to authentic assessment strategies and methods. Emergent expert leadership of faculty, as exemplified by those who have participated in SoTL Leaderships Programs, creates opportunities for dialogue and dissemination of evidence-based scholarly curriculum practices. With conscious intention and realized leadership and support, faculty scholarship on the undergraduate dental degree program at UBC Dentistry can develop as an outcome of an iterative and cyclical process to examine the planning, assessment, programming, as well as evaluation strategies for curriculum reform.

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