Use of Technology in Dental Education

Who Is Teaching What, When? An Evolving Online Tool to Manage Dental Curricula

Joanne N. Walton, D.D.S., Dip. Pros., FRCD(C)

Abstract: There are numerous issues in the documentation and ongoing development of health professions curricula. It seems that curriculum information falls quickly out of date between accreditation cycles, while students and faculty members struggle in the meantime with the “hidden curriculum” and unintended redundancies and gaps. Beyond knowing what is in the curriculum lies the frustration of timetabling learning in a transparent way while allowing for on-the-fly changes and improvements. The University of British Columbia Faculty of Dentistry set out to develop a curriculum database to answer the simple but challenging question “who is teaching what, when?” That tool, dubbed “OSCAR,” has evolved to not only document the dental curriculum, but as a shared instrument that also holds the curricula and scheduling detail of the dental hygiene degree and clinical graduate programs. In addition to providing documentation ranging from reports for accreditation to daily information critical to faculty administrators and staff, OSCAR provides faculty and students with individual timetables and pushes updates via text, email, and calendar changes. It incorporates reminders and session resources for students and can be updated by both faculty members and staff. OSCAR has evolved into an essential tool for tracking, scheduling, and improving the school’s curricula.

Dr. Walton is Professor, Department of Oral Health Sciences and former Associate Dean, Academic and Student Affairs, Faculty of Dentistry, University of British Columbia. Direct correspondence and requests for reprints to Dr. Joanne N. Walton, Faculty of Dentistry, University of British Columbia, 2199 Wesbrook Mall, Vancouver, BC V6T 1Z3, Canada; 604-822-3863; jnwalton@dentistry.ubc.ca.

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Computer-based curriculum management tools for medical education have been discussed since the 1960s, when punch-cards and mainframe computers were still de rigueur, evolving to the use of dedicated word processors in the 1980s and desktop computers in the 1990s. A 1992 review of curriculum databases in medical education concluded that there is no single best way to design a curriculum database, an observation that is still relevant.

It became clear as stand-alone curriculum databases were developed at individual medical and dental schools during the late 1980s and early 1990s that their sustainability was often subject to the availability and commitment of individual faculty “champions” who might either burn out with the magnitude of the creative endeavor or lack the requisite resources to keep information current or to make the database relevant to others beyond program administrators. The limitations of such “pet projects” became apparent, and as a result, they were often left to molder, not only wasting much of the initial investment of time and capital, but leaving residue that caused the faculty to rebuff subsequent curriculum management overtures.

The notion of a group-sponsored database that could bring together like-minded faculty members and capitalize on both shared input and resources took hold in the early 1990s. One of the first multi-school developments in curriculum databases happened in dentistry, with the American Association of Dental Schools (AADS), the precursor to the American Dental Education Association (ADEA), sponsoring a consortium under the leadership of Dr. John Eisner and the University at Buffalo that led to the creation of CATs (Curriculum Analysis Tools). While CATs held significant promise as a customizable, searchable curriculum database, it too fell victim to resource issues and could not be sustained.

It was not until much later that the Association of American Medical Colleges (AAMC) debuted CurMIT (Curriculum Management and Information Tool) for the use of North American medical schools. The program was customized to link to Liaison Committee on Medical Education (LCME) accreditation and national examination requirements, but its inabil-
ity in part to handle timetabling requirements led to the development of another medical school-focused curriculum management tool, one45,7 which added the dimension of scheduling clerkships and chronicling medical student and resident feedback.

It was into this mix of commercially available software that was either highly customized for medical education or uncertain in its future support that the University of British Columbia Faculty of Dentistry (UBC Dentistry) sought to catalogue and manage its hybrid-PBL D.M.D. curriculum. Our specially designed course structure, with only four dentistry courses each consisting of multiple modules designed to support integration and agile evolution, further mitigated against the use of an existing tool. Thus, a decision was made in 2000 to develop a computer-based instrument to answer the question “who is teaching what, when?” Seemingly simple on the surface, this question was actually complex and multilayered. By asking not just what was being taught, but when and by whom, we were moving from the simpler notion of a repository of information about the curriculum to a dynamic tool that could handle scheduling.

Thirteen years later, our curriculum database continues to grow in scope and use, based in large part on the initial decision to include timetabling. This electronic tool has been dubbed “OSCAR,” a title proposed in a name the curriculum database contest that was open to all faculty, staff, and students and chosen by a committee of similar schoolwide representation. OSCAR has evolved beyond our initial expectations, but each addition or modification continues to be part of the answer to the core question “who is teaching what, when?”

Development and Implementation
The Foundations

UBC Dentistry is fortunate to have had two deans over the past thirteen years who have been key to the initiation, development, and growth of our database project. The first had the foresight to create a stand-alone Information Technology (IT) section in the Faculty well before the notion occurred to many academic leaders and to establish a funding and leadership model that supported both educational and technological innovation. At one point part-way through database development, an IT project manager and our curriculum manager were seconded to work full-time on the project for six months, a leap of faith for any dean. Our current dean has had the wisdom to recognize the potential of our curriculum database and support its expansion to amplify and simplify the end-user experience and to include additional programs.

Our Technical Support Team (TST) offered IT leadership in the original design of the database and, just as critically, continues to provide ongoing development and maintenance to keep pace with evolving requirements. The local support of skilled programmers has been essential in translating faculty, staff, and student vision into reality. The database has also benefited from dedicated Student Services staff, led by two outstanding curriculum managers and supported by hard-working program assistants—staff members who manage the database daily and function as liaisons among faculty, students, and TST staff.

UBC Dentistry includes a dental (D.M.D.) program with approximately 220 students, as well as dental hygiene degree (B.D.Sc.) and graduate programs (M.Sc. and Ph.D., both clinical and research-based) with approximately ninety students each. The D.M.D. program, which was the pilot for which OSCAR was initially developed, utilizes a hybrid problem-based learning curriculum with comprehensive patient care beginning in Year 2. Students are organized into vertically integrated clinical teams, each with a faculty clinical advisor. Our 144-chair Oral Health Center accommodates preclinical simulation alongside patient care, with students progressing at an individual pace, continuing to develop more complex skills in simulation, while providing patient care at a level appropriate to their assessed skills and readiness.8,9 Clinic chair priority is shared among simulation and patient care sessions, with some evening and weekend sessions easing scheduling pressures. Plans are currently in development for a separate clinic to accommodate recent expansion of clinical graduate programs.

Architecture of OSCAR

OSCAR was built using Microsoft SQL and is housed on its own server. Staff members routinely entering data have a desktop entry and management application loaded on their computers, while remaining staff, faculty, and students can access information from any computer through the Faculty Intranet (password-protected) via a web server (Figure 1).
Core Functions

Grounded by the founding question of the curriculum database, “who is teaching what, when?” core functions related to course/module content and scheduling have been developed. Note that, based on the course structure of the D.M.D. program, we use the term “course/module” to refer to these curricular units. As will become apparent, this descriptor also works for more traditional course structures.

Course/module information. As part of updating documentation for upcoming accreditation, faculty members were initially asked to provide specific, detailed, and current information about their course/module, and this information was entered by staff into the nascent curriculum database (Figure 3). Since the first iteration of the database, faculty members have been asked prior to the end of each current academic year to review and update their course/module information for the upcoming year.
In their role as a course/module coordinator, faculty members can either provide the information to a program assistant, who will make the database updates, or in a more recent development, they can update the database directly using the “Module Manager” tool. Significant changes to content, timing, or learning method must be considered and approved by the Faculty’s Curriculum and Teaching Effectiveness Committee.

Currently, approximately 10 percent of faculty members input their own data using the Module Manager tool, mostly those with multiple and changing numbers of part-time faculty members teaching with them. That number is increasing as faculty members...
become more familiar with OSCAR and as staff provide ongoing, focused, five-minute tutorials at joint department meetings. The Module Manager is quite intuitive, and some faculty members simply had to be advised that the tool was there in order to use it. Training has not been mandatory; rather, program assistants (i.e., clerical staff, not IT specialists) provide periodic short tutorials at faculty meetings and also offer personalized training at the faculty member’s computer when asked. The amount of time for staff related to such training is not onerous, and it pays dividends in terms of faculty buy-in. Student and faculty feedback is sought on an ongoing basis through regularly scheduled face-to-face feedback sessions. Both groups have indicated that they prefer this informal, conversational approach to more surveys, and their candid feedback has allowed us to continue with the agile development of OSCAR.

Information reported is used not only for day-to-day running of the curriculum, but also for program review and accreditation reports. These include the following: 1) competencies addressed and assessed by each course/module; 2) course/module objectives; 3) total course/module hours, divided according to types of learning (small-group learning, lecture, lab, simulation, patient-care, etc.); 4) names of instructors, both coordinator and any additional instructors, including part-time faculty; 5) weighting and types of assessments (observation and assessment by instructor, quiz, out-of-class assignment, midterm exam, etc.); and 6) required texts and materials, including a recent development that has allowed references to be linked to related sessions from the database.

Rather than using prescribed keywords such as MeSH headings to search the database, any noun can be searched using typical search engine functions. The search can be restricted to certain sessions, course/modules, or years or be made across the entire program. While a price was paid in terms of the precision of search possible, it was and is much easier to ask faculty members to enter their course/module information using their usual terminology. OSCAR’s course/module format accommodates both the DHDP’s standard course structure and the D.M.D. program’s innovative module structure. Other aspects of data categorization and labelling were purposely kept the same to allow for ongoing analysis and potential integration across programs. As new clinical graduate programs in endodontics, orthodontics, pediatric dentistry, and prosthodontics joined the existing periodontics program, all were added to OSCAR. While all dentistry programs are sequestered within the database, each running and searchable separately, scheduling conflicts between programs can nevertheless be identified and a unified teaching schedule can be produced across programs for each faculty member. Reports from the curriculum database also allow our Curriculum and Teaching Effectiveness Committee, which oversees all educational programs within the Faculty, to analyze content and timing within and between programs, supporting real-time curriculum development.

**Scheduling.** If the course/module content part of the database helps to answer the “what” part of our core question, the scheduling component answers the “who” and “when” parts of it (Figure 4 and Figure 5). Initially, existing timetables for each program were manually entered into the database by staff and then reviewed and approved by faculty member. Since then, timetables for each year in each program have been rolled over to the next academic year by the program assistants in concert with TST staff; this process takes about two days of staff time. Tentative timetables for the upcoming year are reviewed and approved by faculty members before being published in the online database.

Rotations to off-site locations or to discipline-specific clinics or seminars, the bane of every dental school’s scheduling processes, were added to the OSCAR database as part of its ongoing development (Figure 6). Automating the scheduling of rotations remains a complex process involving about two weeks of programmer time, although it is a vast improvement over the past in both accuracy and time taken (around half a term previously when done manually). Another benefit of automating rotation scheduling was the necessary faculty rotation coordinator review and consensus-building process regarding rotation objectives and guidelines to prevent scheduling conflicts; this was easier to accomplish when faculty members could see the payoff of improved timeliness and clarity as a result of increased automation.

From these timetables and the list of faculty teaching in each course/module, OSCAR then pro-
duces an individual schedule for each faculty member (full-time and part-time) and student. Faculty members can be assigned to student groups for small-group or clinical teaching; using the same process, students can also be assigned to learning groups. The program can flag scheduling conflicts at the time information is entered and allows for faculty members to be added or removed from individual sessions as each term progresses. This latter feature allows the database to be the source of sessional information upon which part-time faculty members are paid.

Once timetables and schedules have been published online, they can be searched, making it easier to locate faculty members or students when needed. Individual schedules can also be downloaded to several popular eCalendars (e.g., MS Outlook or Google Calendar) on personal computers and smartphones (currently including Android, Windows, and Blackberry devices as well as iPhones). This innovation has been a significant value-added feature of the database, providing an incentive for faculty members to keep their course/module information up-to-date. The old adage “garbage in, garbage out” applies here: if the information in the database is out-of-date, the schedules that faculty members download will be similarly inaccurate, and even if they are unperturbed by such inaccuracies, they will quickly hear from students, who do care!

Another key end-user benefit that has been added in recent years is the management of inevitable schedule changes. Live changes can be made by course/module coordinators or by program assistants directly in the database, and they are then pushed to personal eCalendars. Notifications of schedule changes are also sent automatically by email, while last-minute changes (e.g., cancellation, room change) can be sent by program assistants via text to faculty and student smartphones. Sessions that have been changed (cancelled or rescheduled) are highlighted with strikethrough text in the database, so that consideration can be given to keeping either the original or changed schedule for the following year.

OSCAR has in the last two years been updated with a link to axiUm to allow scheduling of operatories in our 144-chair Oral Health Center. Thus, another overwhelming manual exercise has been automated, with the associate dean of clinical affairs in consultation with the integrated clinical care module coordinator and the staff curriculum manager providing chair booking “ground rules” to TST programmers, so that clinic chairs can be assigned based on scheduled learning requirements. Chair assignments are sent from OSCAR to axiUm at the start of each term, with nightly updates based on ongoing changes. Students, who used to have to book their own chairs, are now able to see in axiUm where they are booked and who will be their instructors, and they can add their patients’ names to scheduled clinical sessions. Students can also see any unscheduled chairs in axiUm, allowing them to utilize scheduled Independent Study sessions to book a chair for patient care, subject to instructor availability, if they feel that is the best use of their time.
Ideally, OSCAR would be updated to an open-source, fully web-based application that could be readily shared and continually developed with input and customization by other dental schools. Integration with Learning Management Systems (LMS) such as Blackboard (commercial) or Moodle (open-source) could marry the curriculum database and timetabling/scheduling functions of OSCAR with the self-study, assessment, and discussion functions of existing LMS.

Future Directions

With any software, there are challenges in maintaining currency. OSCAR has been built on a platform with protected code and licensed access to a number of commercial programs (Basic, Java, etc.). Fortunately, Microsoft SQL remains robust and current, but OSCAR’s proprietary nature as it stands makes it challenging to distribute the program widely.

Figure 5. Example of timetable for Year 2 D.M.D. class for a selected week: any session can be selected for more detail

Note: Some detail has been omitted from screenshot to protect individual student, staff, or faculty identities.
Faculty members inevitably resist change, sometimes preferring to maintain course detail, schedules, or calendars either on their desktop computers or on paper, the arrival of ever-more computer-comfortable faculty members and the demands of tech-savvy students maintain the momentum that supports this electronic exchange of information and allows all involved to know who is teaching what, when.

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Many people have been involved in the development and evolution of UBC Dentistry’s curriculum database, from faculty members who have provided critical data and “test-driven” early versions, to staff who’ve organized and updated information, to students who’ve provided helpful feedback on what’s working and how to make it better. The following individuals in particular have made significant contributions to supporting, designing, developing, implementing, and maintaining OSCAR: Ed Yen, LMS tools, a challenge we are currently studying at UBC Dentistry.

The longevity and continuing development of UBC’s curriculum database can be attributed primarily to two factors. First, essential support and infrastructure have been consistent in the form of faculty leaders who supported software development, implementation, and maintenance in word and in deed, along with committed staff and in-house IT support. Second, an exchange of benefits occurs when administrators ask faculty members for information, in the form of current data inputs for program operation and ongoing curricular analysis and development, and are able to provide a benefit in return in the form of individualized electronic teaching schedules that are updated in real-time. This process creates an incentive for faculty members to provide required information, both in order to receive a correct schedule and as a result of student expectations for current, individualized information. While some faculty members inevitably resist change, sometimes
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