Critical Issues in Dental Education

Rationalizing the Dental Curriculum in Light of Current Disease Prevalence and Patient Demand for Treatment: Form vs. Content


Abstract: The premise of this paper is that the form and content of dental education do not reinforce each other. What results is suboptimal learning; dissatisfied students; difficulty generating excitement among the brightest to consider careers in dental education; erosion of dentists’ self-identity as men and women of science; and doubts over whether dental schools can continue as the primary providers of oral health education. A need for reform exists because dental curricula must be responsive to changes in current and projected disease demographics, to advances in science and technology, and to a changing societal culture affecting patient demand for treatment. Today’s dilemma is that dental schools need to continue to graduate competent practitioners to meet present clinical needs while also preparing students for a radically different kind of practice in the future. Possible approaches to resolve this dilemma include: a shift between what constitutes general practice and what constitutes specialty practice; and, the implementation of an asynchronous-distributed model of dental education. Such changes will likely be independently accompanied by changes in the role of universities in society in general that could make feasible many, now-unthinkable, alternative vehicles for providing dental education.

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She would write a poem on the blackboard in her fine Palmer method hand, and we had to copy it, in pencil. The rule was simple: NO ERASURES. If you erased once and handed it in, you got an F. Very simple.

Now you can see what she was doing with 9-year-olds. Getting them to slow down, calm down, control their stray bodily fluids, get a little discipline. Makes sense.

So we’d sit there copying, then after a few minutes, you’d hear “RATS!” and a kid would crumple his paper and start over. You had to get it 100% erasure-free or you had to come back after school to finish it.

Now this exercise taught us two very useful things: (1) good penmanship, and (2) truly extraordinary erasership. Because, face it, you can’t copy “The Village Blacksmith” perfectly every time at that age, and it was a bore. So you studied the situation, bought good fresh soft rubber erasers, learned to write lightly without pushing grooves into the paper, learned to erase carefully around the blue lines on the paper without abrading the surface of the paper—she’d hold the paper up to the light and could see where you had abraded it. So the ideal erasure just lifted the pencil mark off the paper and didn’t touch the paper at all.

Most of us got pretty good at it. She only caught me once, and gave me the only F of my grade and high school career. . . . I looked at the paper with an F on it and did not say “Gosh, I have sinned. I must go and mend my ways.” I looked at it closely and said, “Geez, she’s good! I gotta get me a better eraser—and work on dealing with those crossing strokes right at the blue line.” And I did, and she never caught me again.

Now on long reflection years after, I realized that the genius of that teaching strategy was that both parts were important and useful. It’s important to learn how to calm down and write neatly, but it’s also important to learn how to cope pragmatically with unrealistic demands on your time and talents. How good do you actually have to be? Which assignments can you shortchange? How much reading do you really NEED to do? THOSE are real-life, real-world skills, because you’re going to be juggling multiple demands forever. And, indeed, in that case, the skills of erasership that we learned were exactly congruent with the skills of penmanship—they directly helped us produce written work that was neater, cleaner, more legible, and so on.

—James O’Donnell, Avatars of the Word
H ow good do you actually have to be? Which assignments can you shortchange? How much reading do you really need to do? These questions, posed by James O’Donnell, Professor of Classical Studies and Vice-Provost for Information Systems and Computing at the University of Pennsylvania,1 are especially relevant to dental education. O’Donnell’s point in this passage describing his fourth-grade penmanship exercises is simply that the content of what we teach is one thing, but the form in which we teach it is another. A significant gap can exist between the two—between what we teach and what students learn, between what we think we are teaching and what we are actually teaching. In O’Donnell’s example, the content and form of teaching happened to reinforce each other, but they do not have to. When content and form are in conflict, the quality of learning suffers. For the sake of argument, the premise of this paper is that such a conflict exists in dental education, that the content and the form of dental education do not reinforce each other. What results is suboptimal learning; dissatisfied students; difficulty generating excitement among the brightest to consider careers in dental education; erosion of dentists’ self-identity as men and women of science; and doubts over whether dental schools can continue as the primary providers of oral health education. Another result of a mismatch between form and content is the perception that too small a portion of the curriculum has any practical real world relevance.2 This might be the natural consequence of an inordinate devotion to tradition, causing schools to teach what they want students to learn, but not necessarily what students actually need to know (a problem with content). Correspondingly, unrealistic and unreasonable demands on students’ time and talents can lead students to circumvent the system, causing them to learn more about how to go to dental school than about how to practice dentistry—learning, in the process, how to hate the dental educational experience (a problem with form). The price of our current educational strategy is high because it comes at the cost of not preparing students to succeed in an emerging world of increasing complexity, intensifying competitiveness, and continual change.

The Problem of Content

The Institute of Medicine’s 1995 study, Dental Education at the Crossroads: Challenges and Change,3 gave important impetus to concept propos-
already changing the content and scope of dental practice and will continue to do so. New diagnostic tests will enable practitioners to analyze the risk of disease and disease progression. Expanded treatment options will include biocompatible restorative and implant materials; biologically engineered substitutes for lost bone, connective tissue, and articular disks; genetically engineered growth factors; and safe, effective, and esthetic restorative materials.7

Consider the case of an innovative technique of braces-free orthodontics applicable to a select subset of orthodontic patients.9 Computer technology is used to digitize dental models and then, in simulation, teeth are incrementally “morphed” into correct alignment. Using stereolithography to generate computer-designed study models, a progressive series of removable plastic tooth positioners are fabricated for patients to wear sequentially over time. The result is orthodontic correction of malocclusion.

As a harbinger of the future, the approach is both captivating and instructive. First, because it represents true digital dentistry—a genuine software solution for an important clinical problem. In other contexts, similar technologies are already being developed to achieve tooth restoration and replacement. Second, the approach holds promise for high quality and, perhaps over time, even lower-cost mass producible dentistry. The preoperative digital records and postoperative digital records as well as every incremental step in between are preservable as computer files. These are much more than simple records of treatment in the ordinary sense of being a representation of treatment; rather, they are the treatment. Presumably algorithms could be devised that would render such a database fully scannable and fully searchable. The significance is profound because such a database would comprise an immensely powerful diagnostic and treatment planning tool. We assume that no technology can substitute for clinical experience and clinical judgment—but this might come close. Even though no two patients are exactly the same, when a database contains one million or five million fully simulated patient cases, it is highly probable that the system could match newly submitted cases to virtually identical cases that have already been successfully treated within the database. Under such circumstances, not only would the technical procedures fall well within the competence of general dentists, but so might the diagnostic and treatment planning elements.

Patient Demand for Treatment

Despite improvements in the oral health status of the population in general, the Surgeon General’s report notes profound disparities in certain population groups when classified by sex, income, age, or race/ethnicity. By 2050 about 50 percent of the U.S. population will be Asian, non-Hispanic black, Hispanic, and American Indian.7 These are groups that present a picture of disease that is generally worse than that for non-Hispanic whites. The patient population will also become not only older and more ethnically diverse, but also poorer in the economic sense.10 Such individuals are not currently benefiting from the kinds of care that are already at hand. Contributing to this disparity is the inordinate cost of certain kinds of dental treatment—treatments at which practitioners of the past have been especially adept but which are already becoming prohibitively expensive for most people. Fixed partial prosthodontics and dental implants might be examples of such treatments.

The Central Dilemma

U.S. dental schools need to graduate competent practitioners to meet present clinical needs while also preparing students now for a radically different kind of practice in the future. Thus today’s students need to achieve an acceptable level of technical proficiency to provide the kinds of dental services all of us are familiar with and for which there is still a genuine public need. At the same time, reasonable extrapolation of conclusions from credible sources3,7 project a future in which fewer of the procedures now identified with dental practice will continue to be used. This transformation could easily occur within the practice lives of current students. If such a future materializes, new approaches to oral health care could be so radically different from those now in use that present students will not even have the requisite background to begin to learn the new way of practice. The dilemma: How do current faculty members teach current students on the basis of an expected future? What if the expected future does not materialize exactly as planned? How is it possible to incorporate yet-to-be-discovered advances into the curriculum today?

What follows is not a blueprint for implementation. Offered instead are some ideas worth consid-
erating. Some are new to dental education (but not to other forms of higher education), some are already in place in some dental schools, and some have historical precedent in dentistry and might be worth recycling. Some are intentionally provocative with the aim of fostering discussion.

**Possible Solutions to the Content Problem**

Bluntly stated, dental schools will not be able to provide comprehensive education in certain areas of dentistry as historically practiced if sufficient numbers of patients no longer require such care or if such treatments are just too expensive to be practical. Nor should dental schools expect or want to do so. Inevitably, inertia exists in adapting to this reality. Senior practitioners and faculty members worry over the technical proficiency of current graduates in comparison to graduates of two or more decades ago. Their concerns, though subjective, are sincere and focus on what they consider an inadequacy of clinical experience in various dental procedures which, though declining in frequency, are still in clinical use. Many of these procedures, especially the more demanding prosthetic therapies, are so much a part of the culture of dental schools that they go right to the heart of many faculty members’ identities as dentists. If a general dentist needs to be competent in providing such services irrespective of the number of patients requiring such treatment, it follows logically that the dental curriculum will be frozen permanently in its current configuration. After all, learning to make a good denture is no different whether knowledge is used to make one denture or to make hundreds.

There is an alternative. In order to protect the dental curriculum from obsolescence and to accommodate future disease patterns and demand for treatment while also assuring continuing technical competence for those kinds of dentistry that are decreasing in frequency, two significant changes might be considered. First is a marked shift between what constitutes general practice and what constitutes specialty practice; second is an asynchronous-distributed model of dental education. The asynchronous-distributed aspects of this change are discussed subsequently under the form of dental education but will also contribute materially to improving content.

A shift between specialty and general practice offers a strategy for changing the content of the dental curriculum in a way that accommodates both the technical needs of the present and the demands of the future. If there are not enough patients available to allow dental students to achieve competence in certain procedures and if such a change is reflected in what general dentists actually do in practice, then it is time to shift those procedures out of the general dental curriculum and into the curricula of expanded specialties or into newly created specialties. This is a solution that the dental profession has historically used to adapt to changing disease demographics—decreasing numbers of patients requiring certain procedures, while maintaining the highest quality of service for those that do have such a need. If appropriate, the percentage of dental graduates who go on to postgraduate training and/or specialization could be titrated upward to 30-40 percent of the annual output of dentists (still far less than in medicine). This approach preempts the fear that too few patients will lead to inadequate training and a lower quality of care.

What are the practical implications from a curricular standpoint? Here are some guesses. If the need for certain kinds of traditional prosthodontics continues to decline because of disease demographics (despite an overall aging of the population), such procedures could shift out of general practice and into specialty practice—either the existing specialty of prosthodontics or into some new affiliated specialty. If decreased demand does not allow adequate education of the 4,000 dental students in each year’s national dental class, it would still be more than adequate for several hundred specialty students per year. A shifting of relatively complex prosthodontic procedures out of the predoctoral curriculum would open up significant curricular time and would allow for a new mix of experiences that might better reflect the realities of general practice.

Periodontics might also be markedly affected, especially if the proposed links between periodontal disease and systemic disease bear up under closer scrutiny. Improved diagnostics and the revolution made possible through molecular genetics may justify eventual shifts away from surgical procedures toward a more medically based diagnostic and therapeutic approach for periodontal disease. If the field of oral and maxillofacial surgery continues its momentum towards medicine, dentoalveolar oral surgical procedures might gravitate towards periodontics as is already occurring or toward an entirely new specialty of dental or oral surgery (sans maxillofa-
cial). Preventive and highly conservative approaches to restorative care will continue as an ever-increasing feature of general practice and, as such, should be reflected in the new dental curriculum.

If parts of the current curriculum are absorbed into the specialties, what will fill all the newly available curricular time? A reciprocal infusion could occur into general dentistry from certain of the present specialties. This may be particularly true in specialties benefiting from advances that simplify hitherto more technically complex procedures, bringing them into the domain and competence of the general practitioner. An example might be some aspects of orthodontics.

Orthodontics and correction of related developmental deformities are areas of great demand by the public—perhaps even exceeding the capacity of the existing specialty to deliver the amount of care needed. Orthodontics is of significant interest to many generalists (and to dental students), yet is a subject area that receives surprisingly little time in the traditional dental curriculum, only 3 percent of all instruction in the clinical sciences on average. Despite a lack of formal training, more than 75 percent of general practitioners have been estimated to do some orthodontics, and nearly 20 percent of general practitioners do comprehensive orthodontics. Almost one-third of orthodontic patients appear to receive treatment from general dentists. More importantly, the field has shown consistent progress in simplifying patient care procedures from a technical standpoint. Orthodontics is the beneficiary of amazing new computer-based technologies that will not only simplify treatment but will also facilitate diagnosis and treatment planning.

Can the great complexity of orthodontic diagnosis, treatment planning, and treatment be successfully incorporated into a general dental curriculum? If sufficient curricular time is made available, it could; in fact, historical precedent exists confirming this. The University of California, San Francisco conducted a program in the 1960s known as Curriculum II, in which students could declare a “major” in orthodontics, completing in just four years the requirements for the D.D.S. degree as well as orthodontic training. Nine students were admitted per year. Today, the graduates of this program continue to practice as full-time orthodontists and include some of the current orthodontic faculty members. This suggests that such an approach could be feasible provided sufficient curricular time is accorded. Expected technical advances in the computer-based diagnosis and computer-based treatment of malocclusion and other orofacial deformities make the idea of including more orthodontics in general dental training and practice even more attractive.

Continued expansion of pediatric dentistry in the general dental curriculum is also essential, both as a subject in itself and as part of a broader strategy for caring for special needs patients regardless of age. Many general dentists are unwilling to see children or set lower age limits. This may reflect a general lack of knowledge and experience with treating children per se and also in managing individuals who lack the capacity to cooperate with the dental treatment experience.

The Problem of Form

An example of the conflict that can arise between form and content is embodied in the old requirements-based system of clinical dental education. Students were held to completing a given number of dental procedures as evidence of achieving competence. Unfortunately, under such a system, the student’s interest and the patient’s interest could be pitted (grotesquely) against each other. While technical mastery was easily assessed by this method, it became increasingly evident that U.S. dental schools were inadvertently teaching something other than what was intended—namely, that patients exist primarily as vehicles for meeting practitioners’ needs. As dental educators acknowledged the corrosive effects of such a system, efforts were made to change, leading to today’s comprehensive care patient-centered philosophy. But, even in today’s curricula, what actually exists is often a blend between true comprehensive care and elements of the old requirements-based system. Correspondingly, tension persists between form and content in clinical education—between what we intend to teach and what students learn. Moreover, students themselves can be conflicted because they never imagined, when deciding to attend dental school, that their own interest might be at odds with that of their patients.

The Need for an Asynchronous-Distributed Model of Dental Education

One of the biggest tip-offs that the form of dental education needs revision is the simple observa-
tion that dental students do not, in general, like dental school. This is nothing new, but ideally higher education should be enriching, mind-broadening, even life-altering—something serious students genuinely enjoy. Dental school almost never fulfills this expectation. Students typically see the dental educational experience as narrowing, stressful, and, in some cases, debilitating. Optimal learning under such circumstances is unlikely. By the time students enter dental school, their undergraduate education has already given them a taste for what higher education can offer. They view their collegiate years favorably, seeing them as a time of intellectual and emotional development—a genuinely positive life experience. They expect more of the same from dental school, and they are almost always disappointed. Possible reasons for such disillusionment might include lack of intellectual challenge, a predilection for rote memorization, multiple choice format examinations, and disjointed group-taught courses lacking coherent themes and without regard for how material is sequenced between different lecturers. All could be interpreted as a dumbing down process that greets otherwise intellectually talented individuals as they commence a dental school career. Yet, smart students have little problem transcending these deficiencies in dental education. The question is: should they have to?

Objectively, it is hard to understand why students like college but dislike dental school. A large number of students who start college never finish; they just seem to disappear. No one particularly cares; no one even notices. There is no guarantee—not even the likelihood—that students will complete a four-year baccalaureate curriculum in four years. It may take five, six, or more years. Again, no one seems to care. College students know relatively few of their classmates because the complement of students in each class is a constantly fluctuating mix of individuals from many different levels and many different major fields of study. It is quite possible that a college student will progress through the entire baccalaureate curriculum and not be known by name by even a single professor. Contrast all this with dental school, where almost all students graduate, and, in the vast majority of cases, do so in precisely four years. Each student is known by a large number of classmates because all classes are taken together as a group, in lockstep, for the entire four-year period. With a far more favorable ratio of students to faculty, dental students are almost always known personally by many professors. College is impersonal, whereas dental school is personal. A college student’s future prospects are often very unsettled, whereas a dental student’s future of affluence and prestige is virtually assured. Yet students like college and dislike dental school. Why?

Clearly, there must be some hidden attributes of the college experience that students prize more highly than they do the personal attention intrinsic to dental school, the near guarantee of graduating within the duly stated term of the curriculum, or the prospect of a fulfilling professional career. It turns out that, as an educational experience, college delivers in those areas that students really care about, whereas dental school does not. College is user-friendly. Dental school is not. In college, for instance, students can usually enter the curriculum in any given academic term, and they can progress through the curriculum at varying rates, some taking relatively more courses and some fewer. Students at the same level with the same major are allowed to take required courses in an entirely different sequence. In other words, the college curriculum is asynchronous. Students may graduate in four years, or it may take five or more years—determined entirely by the particular course load the student undertakes. There is no particular disgrace in proceeding through the college curriculum at a different pace than someone else, and there is no disgrace in taking an extra term or two to do so.

College students may know their accumulative grade point average (GPA), but they generally do not know their class standing relative to other students. As a result, they have less of a tendency to compare themselves with others and do not generally see themselves as competitors with classmates. Owing to the profusion of students at different levels pursuing different majors, comparisons—both favorable and unfavorable—are difficult if not meaningless in a college class. Whereas college does not engender a culture of competition between students, dental school does engender such competition through its strict, lockstep, synchronous design—a kind of educational program most students have not encountered since grade school. In dental school, every project, every assignment, every quiz, every examination is open for comparison with every other member of the dental class. If students resist the temptation to make such comparisons, many dental schools do it for them by conveniently posting the range of scores and confidentially informing each student of his or her relative ranking for a given course or for the full dental school career. Purported pass-fail systems of
many dental schools embody a distinction without a difference: an honors-pass-fail system corresponding, arguably, to the traditional grades A-C-F. Moreover, such schools often continue some form of class ranking. Thus, dental students are continually forced to ask themselves whether they measure up both to the demands of the curriculum and to the performance of their classmates. The opportunity for demoralization is great, and some dental alumni harbor continuing animosity over what they consider the humiliation of dental school for years and decades. This might help explain the results of an American Dental Association (ADA) survey when 453 dentists responded to the question “If you had it to do again, would you become a dentist?” Nine percent said they were not sure; 44 percent said no.

Dental school does not promote a positive self esteem; rather, it continually demythologizes a given student’s effort to generate a personal saga about being good at something. Even if a student is not proficient at a given task, the personal myth that he or she is more proficient than most—even if false—is an important element in building proficiency over the long term by allowing the individual to believe that he or she has something worth building on.

The culture of college is one of flexibility and adaptability; the culture of dental school is one of strict rigidity. This rigidity may be interfering with the ability of dental schools to optimize the dental educational experience—a case of form conflicting with content.

An Asynchronous Model of Dental Education

Improving the form of the dental curriculum might begin by recognizing that people learn at different rates. Individuals with the potential to be outstanding dentists may happen to take relatively longer to learn certain concepts and techniques than others. A fully synchronized curriculum does not offer faster learners the opportunity to move on or slower learners the opportunity to take more time to consolidate their knowledge or technique. Dental schools use a synchronous curriculum for one overriding reason: cost. The ideal asynchronous learning experience is not possible. Having one instructor for every student in every course that allows students to enter the curriculum at any time of year and progress at their own rate would be impossibly expensive, impractical, and probably undesirable. However, making the dental curriculum relatively more asynchronous and relatively less lockstep wherever feasible could be worthwhile. Curricular rigidity is imposed by the need to take certain courses before others. However, the movement toward problem-based learning (PBL), the rapid introduction of students to simple patient care experiences during the first or second year, and the introduction in a few dental schools of exciting new DVD-based educational technologies that incorporate full curricula including syllabi, textbooks, and ancillary educational materials in a fully searchable format are examples of how the strict prerequisite order of dental school coursework is becoming blurred.

In the problem-based approach, focus is on a particular patient and a particular clinical problem. What needs to be learned from each of the relevant classic subject areas is brought together by the student using whatever human, intellectual, or technical resources are needed. A blending of all the necessary disciplines are brought to bear on a practical problem whose relevance to clinical dentistry the student both understands and accepts. It is not possible to consider at length here the various pros and cons of PBL; however, it is clear that the goal is to promote the transition to clinical care delivery by having students become adept at thinking in ways that integrate their knowledge and that allow them to apply it in a practical setting. The student assimilates basic science and preclinical science and learns when and how to apply such knowledge. The traditional alternative of having students pick up blocks of information completely out of context in year one and expecting them to apply it appropriately years later is unrealistic. The PBL approach acknowledges that the problem in clinical management is knowing which questions to ask, or more accurately, knowing which questions are being asked. The patient is implicitly asking the student a set of questions, but students do not recognize this because they have no experience with the format. This may be the single biggest disparity between the culture of being a student and the culture of being a good clinician. The difference is not so much one of skill as it is one of perspective. Cultivating the right perspective is not facilitated by always having someone else asking the questions, especially in a multiple choice format. Simply stated, being a doctor is more like being a teacher asking questions than it is like being a student knowing answers.
What will happen to our traditional lecture format? Some, like O’Donnell,1 assert that the lecture format is pretty much dead. Others19 disagree, but what is evident to anyone who spends much time in a dental school is that students pick and choose where to invest their time and talents. It is not hard to find scheduled lectures given in large auditoriums with huge blocks of students, sometimes a majority, absent. When this happens, it is not because students do not want to learn or because they do not find the subject matter relevant; it is because they have more important things to do and better ways to acquire the needed information. They need to go about the serious business of becoming dentists, and they recognize that the investment of time attending lectures does not always bring a sufficient return in achieving that goal. Students are inclined to study notes, syllabi, and parts of textbooks, glean information from the web, and develop ad hoc study groups at night, which is how real world studying (and learning) gets done these days. In a sense, dental students are reforming the curriculum themselves by skipping lectures and studying on their own with groups of like-minded students. Unfortunately, the choices students make in deciding what, when, how, and with whom to study are often erroneous. They are uncertain how best to spend their time and are not sure whom to trust to help them make that decision. It is virtually impossible for individual faculty members to have a sense of the overall workload placed on students, of how it all fits together, or of whether their assignments are even remotely achievable. Students make adjustments as best they can—deciding, in the process, to dispense with much that they see as irrelevant or optional.

Some universities have decided to work with students rather than against them, by dispensing with lectures (not completely but to a large extent) and bringing the nighttime informal study groups into primetime, during the daytime lecture hours. A tutor attends to provide guidance and direction but may not be a content expert—a “guide on the side” not a “sage on the stage.”19

Interestingly, the highly collaborative style required of the PBL format might prove troublesome in light of the predominant personality type often attributed to dentists—the introvert, the loner, the perfectionist, the person who wants to be his or her own boss, even if it means being the only income-generating worker.20,21 However, recent evidence suggests extroversion has become a more common personality type among current dental students than introversion,22 which might prove beneficial in the more social and collaborative environment associated with the PBL experience.

The preclinical curriculum might pose the greatest problem in asynchronizing the dental school experience, but may become more feasible given technological advances such as new simulation technologies. Such simulation systems track and critique student performance in a variety of restorative dental procedures. When such systems are perfected, they could help students proceed at their own pace at a time and place apart from either faculty or other students. Experimental haptics-based dental simulation systems now under development might even make it possible to perform simulated preclinical course work at home, with online interaction with the professor achieved through the web.

Finally, the curriculum does not have to become perfectly asynchronous, only relatively more so; perhaps several months of synchronous education would be interspersed between asynchronous experiences. Individualized asynchronous experiences might become possible through a more geographically distributed model of dental education, similar to the experience of medical school.

A Distributed Model of Dental Education

Dental students should have a mix of clinical experiences that reflect the requirements of general dental practice. Further, the level of clinical experience gained while in dental school should be sufficiently extensive to allow graduates to enter practice without remediation or mandatory postgraduate training in general dentistry. Ideally, dental students in their clinical years should be continuously engaged treating patients, and doing so as efficiently as possible within a teaching setting. Today, dental schools seem less able to fulfill these two objectives. The amount of time students are engaged in treating patients can be astonishingly low. This may reflect either a lack of suitable patients or the inherent inefficiencies of a teaching clinic.

Recognizing that single-location dental schools no longer provide what students need is an important first step. Rather than having patients and instructor-dentists come to students at the dental school, students need to go to where the patients and the (potential) instructors are. After attaining defined skills within the school, distributing students throughout
the community—possibly far removed geographically from the dental school—could offer a much broader and a more intense clinical experience. A distributed model might also address the inefficiency of the large ward-type dental school clinic where only students (not instructors) provide care.

Large, inhospitable ward-like dental school predoctoral clinics are hugely inefficient and often run in a state of deficit. They minimize the amount of dentistry students are able to do. The dedicated faculty who run such clinics have sometimes, unfairly, been called “checkers”—they check student work, teaching as best they can in the process. A possible improvement might be to partially reconfigure the way dental care is delivered in the educational setting by transferring patient care from the student to the faculty member for a defined percentage of time. This would create an additional category of mentored clinical training for students. Counterintuitively, it would actually increase the clinical experience of students and would allow clinics to run more efficiently and productively. The change in culture would be enormous because additional instructors would be needed who want to practice dentistry while teaching students. The proposed model—call it the mentor-protégé model—is not new; it is well established in hospital-based medical practice where students and professors are colleagues, all engaged in taking care of the same patients.

Under the mentor-protégé model, a professor-practitioner mentors a very small group of student protégés or associates. The professor is identified as the patient’s dentist, remaining so from year to year and engendering the patient’s loyalty to the faculty member-dentist and to the system. Insofar as practical, faculty and students would treat patients side-by-side. The efficiency and productivity of a private practice would not be attained nor expected, but efficiency would be much greater than it is now in most dental school clinics. Sometimes procedures would be performed by the faculty member, sometimes by the student associate, but the relationship and identity of the faculty member as the patient’s dentist (in the mind of the patient) would continue through the years. Discussion and assignments could occur using a morning rounds format or a daily case-conference between mentor and protégés.

Under such a system, even more faculty than we now have would be needed; however, faculty members’ salaries could be incentivized based partly on clinical practice income, making the prospect of full-time academics much more attractive to dentists.

The mentor would almost certainly serve as a positive role model for student protégés. Students would be freed from some of the artificial constraints resulting from a lack of faculty members and an inordinate amount of time spent waiting to have work checked. Over time, form would follow function, and the large inhospitable ward clinics of dental schools would be reconfigured to resemble small group practices with all the accoutrements of an attractive private practice setting. Most importantly, the dental educational experience could be distributed throughout the community and throughout the state inasmuch as there would be no need to confine students to dental school buildings or to maintain costly and inefficient centralized facilities. An added benefit might be the extension of oral health care to economically disadvantaged populations—a direct service to the community and an important role-modeling opportunity for students by faculty.

Implementing a mentor-protégé model would have many difficulties, but some have already been addressed at many dental schools. One of the most important would be the implementation of a comprehensive care philosophy of dental education. From the patient’s perspective, all care with the exception of true specialty care (as defined in general practice) would be given in one particular place by one particular practice group consisting of the faculty dentist and his or her student associates. The notion of distinguishing between which general dentist faculty members can supervise certain kinds of general dental care would have to be abandoned. The idea that a part-time faculty member can be a general dentist in the community but exclusively a removable partial prosthodontist when teaching would have to go. When patient needs are sufficiently sophisticated to justify referral to a specialist, the specialist faculty member would reemerge.

Another requirement would be student competency examinations both as the definitive evaluation tool of the student’s ability and, indirectly, as a means of verifying the competence and effectiveness of the mentor as a teacher of the approved course content.

Assurance of Quality

Crucial to any asynchronous and/or distributed model of dental education is the establishment of an objective, external system to ensure that students have actually learned what they need to know. For this to
happen, a much greater investment of time and effort is needed in discerning students’ knowledge and clinical ability. Today, instructors sometimes view the examination as an afterthought. Preparing the examination typically receives far less of the professor’s time than does designing course content or actually teaching.

In this regard, all of higher education may be in for a change. O'Donnell1 asserts that in the future the university will be joined—even replaced—by other providers of content. New technologies combined with market-driven incentives for the corporate sector are creating an important niche for non-traditional providers of educational material. Given the incentives and competitiveness of the marketplace, commercial interests are already developing and continually refining computer-based coursework that can be marketed on a national and international scale.23 Typically, the resources brought to bear in the development of teaching materials by the private sector far exceed the capacity of any one instructor to prepare course materials. Whatever the source, university or corporate, the effect will be the same. Diverse instructional materials will be widely marketed, sorted out through market forces, and the best will come to dominate the marketplace—as has happened with word processing and statistical software. This will be true whatever the form of the particular instructional format for personal computer-based instructional content, whether online or CD-/DVD-based. The same phenomenon already occurs for textbooks: the best in the field come to dominate. The only difference is that the new instructional technologies will penetrate far more deeply into the day-to-day reality of teaching and learning in universities than do simple textbooks. Faculty will also recognize no advantage in re-creating curricular material when higher quality, more intelligible material is already available commercially. Dental curricula between different universities are likely to gravitate toward each other, making the dental curriculum somewhat more standardized.

If this scenario proves correct, what will be the function of universities? O'Donnell1 sees the traditional university as retaining two important roles: first as an assessor of student knowledge, and second as a vehicle for socializing students into their profession. Both are essential. The great challenge of the future will be distinguishing credible sources from non-credible ones—that is, distinguishing quality. This will be the role of the university. The credibility of the university and its role as guarantor of quality will be more important than ever. Anyone familiar with the Internet knows that vast amounts of Internet content are simply non-credible. Distinguishing the good from the bad and teaching students how to discern that difference will be an important teaching function and well suited to a PBL format. Students cannot read everything, so they have to be taught discernment and they have to trust professors to help them learn it.

The notion of crediting students for studies done at institutions other than the one that actually grants the degree is quite common in higher education, but less common in dentistry. Less common, but not unheard of. For instance, many U.S. dental schools offer two-year D.D.S. programs for students who hold dental degrees from abroad. In effect, these programs are credentialing students as having fulfilled the equivalent of the first two years of the U.S. dental curriculum. The credentialing process relies on extant measures of performance. More of the same is likely in the future. If foreign graduates can be credentialed to enter the D.D.S. curriculum midstream, why not admit transfers from other U.S. dental schools—possibly even from other kinds of schools—if they achieve satisfactorily on the same performance measures, assuming the latter are sufficiently reliable? As the kinds of students admitted to various phases of the dental curriculum become more nontraditional, the relevant performance measures would need to be correspondingly more extensive.

If a way can be found to asynchronize the dental curriculum to a greater extent, and if sufficiently sensitive and accurate measures of student knowledge and clinical ability can be developed and applied, exactly when and where the student acquires the requisite knowledge becomes irrelevant. Course sections could be initiated at several different times during the year and students could enter school during any particular term. Moreover, they could proceed at different rates, possibly even on a part-time basis (allowing outside employment and perhaps a lower debt burden on graduation). They would enter the clinical phase of their training whenever they have been appropriately credentialed to do so. The credentialing would be done by the school from which the degree is sought; however, actual curricular content could be provided by many different sources, including other dental schools or by multischool consortia. It could also be provided by unconventional providers of content, such as commercial for-profit vendors, by Internet-based provid-
ers, tutors, even through autodidactic approaches. The acceptability of opening up the dental educational experience in this way is entirely contingent on developing extensive, exquisitely crafted performance measures that engender confidence in the credentialing process.

**Conclusion**

When the form and content of dental education do not reinforce each other, what results is an inadequate learning experience and dissatisfied students. Absent reform, the capacity of dental curricula to be responsive to change will be compromised. Possible solutions to the current curricular difficulties of dental schools might entail a shift between what constitutes general practice and what constitutes specialty practice, as well as the implementation of an asynchronous-distributed model of dental education. Neither are changes that will occur in isolation. They will likely be independently accompanied by changes in the role of universities in society in general that could make feasible many now-unthinkable, alternative vehicles for providing dental education.

In addition, changes in the availability of patients and patient demand for treatment, advances in dental science and technology, changes in the content and character of dental practice, and students’ efforts to reform the curriculum informally all mean one thing: dentistry is definitively beyond the nineteenth-century model that led to its acceptance as a learned profession. It is also beyond the early twentieth-century model of the hallowed Gies report. Such traditions are hard to abandon, but openness to current realities and future expectations all promise opportunities that will be as exciting as they are difficult.

**REFERENCES**

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