

It Is Time for a New Gies Report

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After the Flexner report on medical education was issued in 1910,¹ the Carnegie Foundation decided to perform the same service for dental education: survey the field, state the essential facts as they existed, and draw conclusions that might be helpful to those concerned with the profession in the United States and Canada. The process took five years and resulted in the Gies report of 1926, *Dental Education in the United States and Canada*; it remains to this day the most comprehensive and influential review of dental education in the context of a changing profession.² Although probably less widely read than the 1995 Institute of Medicine (IOM) report, *Dental Education at the Crossroads*,³ the Gies report is still so relevant today that it must form the basis of any discussion of the continuum of dental education.

One of the most remarkable and important aspects of the Gies report (remember: Dr. Gies was a scientist but not a dentist) was his ability to step outside the often insular world of dental education and focus on the broader context in which dental education functions. In a much shorter span of time and in a condensed format, this article tries to do something similar: survey the field of dental education and highlight current and emerging critical issues, while at the same time looking outside our profession for insights that can give us new perspectives on how to address those issues. In doing so, I'm drawing on some of my own recent experiences, as we have been fortunate at our institution to hold a leadership forum that brings together leaders of industry and faculty leadership from the Harvard Business School and Harvard University, and the topics for the last two years have focused on innovation. Our exposure as dental faculty to non-health-related fields in these kinds of forums has been informative and progressive, as we have learned about educational reforms that nursing education, pharmacy education, and

journalism schools are now undergoing. This experience has given me a new perspective from which to think about dental education.

Thus, my specific aims for this article are to:

1. place dentistry and dental education in the context of a constantly changing environment, drawing on general business theories of innovation and disruption; and
2. revisit the Gies report and explore the idea that another similar report is needed.

Changed Circumstances and Disruptive Innovations

When the impossible occurred and the Boston Red Sox finally won the World Series, I searched the *New York Times* on Saturday, October 20, 2004, for some mention of the 1955 Brooklyn Dodgers, the team that satisfied my criteria at age thirteen for the greatest. I didn't find the mention I sought, but two other articles caught my eye. One was headlined "Big Arctic Perils Seen in Warming"; the other proclaimed, "Survival of the Fittest and Leanest Becomes Strategy for the Airlines."

The first article was about the slow and difficult acceptance of global warming, which a report says is contributing to profound environmental changes in the polar areas. These findings support the broad but politically controversial scientific consensus that global warming is caused mainly by rising atmospheric concentrations of heat-trapping greenhouse gases and that the Arctic is the first region to feel its effects. An 8 percent decrease in Arctic sea ice has occurred, which adds up to an area bigger than Texas and Arizona combined. The article raised a key question: how long can one remain an ostrich, ignoring changed circumstances until it is too late to forestall damage?

The second article described the process by which planes have become the subways of the sky rather than the luxury liners. Baggage handlers now watch passengers wheel their own luggage around airports and onto the plane, and clerks watch as people check themselves in at kiosks. This change can be explained through the theory of disruptive innovation,⁴ in which new carriers like Southwest Airlines and Jet Blue have achieved dominance as disruptive forces. Southwest was a hybrid disruptor because its original strategy was to compete against car and bus travel and fly in and out of nonmainstream airports. In addition, because its prices were so low, it soon took business from established airlines. Whereas Southwest initially followed a strategy of new market disruption, Jet Blue's approach is a low-end disruptive innovation. Its long-range viability depends on the major airlines' motivation to run away from the attack, just as integrated steel mills and full-service department stores did. Upstart minimills challenged the integrated steel companies like Bethlehem Steel; today Nucor reigns supreme and Bethlehem Steel is gone.

Just think of the telephone—another new market disruptive innovation. Western Union's resources, processes, and values were directed at long-distance communication via the telegraph. The growth of the local telephone market did not worry Western Union, which could have purchased intellectual property for the telephone early on. When the telephone improved to the point that longer distance communication was possible, it was too late for Western Union to respond—and it has now abandoned its role in long-distance communication.

The concept of disruptive technologies, models, or processes is an interesting one, usually applied to big industries like the disc drive business, mini steel mills, and similar enterprises. In his books *The Innovator's Dilemma*,⁴ *The Innovator's Solution*,⁵ and most recently, *Seeing What's Next*,⁶ Professor Clay Christensen explores the difference between sustaining and disruptive innovation. According to him,⁵ there are three types of innovations:

1. sustaining innovations, which bring better performance to highly demanding customers in existing markets;
2. low-end disruptive innovations, which give "overserved" customers (customers who consume a product or service but can't use all its features) "good enough" performance at lower prices; and
3. new market disruptive innovations, which provide "nonconsumers" (customers who are locked

out of the market because they don't have the requisite wealth or training) with a relatively simple convenient solution.

The principles of disruptive innovations may seem paradoxical for a service business like health care or health professions education because disruptions might be viewed as lower quality service. But quality is a relative term; it can be accurately expressed only in terms of the job people are seeking to get done. So when people care about getting something done conveniently or at low prices, they may perceive as low quality an already existing service that doesn't get the job done. Health care and education are two segments ripe for disruption, and dentistry and dental education cannot avoid the inevitable. Importantly, disruption is a relative term. An idea that is disruptive to one business may be sustaining to another.

Change and Disruption in Education and Health Care

Two chapters in Christensen's most recent book, *Seeing What's Next*, deserve the special attention of our profession, for in them, he discusses the future of education and the future of health care and asks if the theories of innovation apply.⁶ His conclusion is a resounding "yes." In higher education, he says, there are signals of change, competitive battles, and strategic choices that are evident. Signals of change include for-profit institutions like the University of Phoenix and Concord Law School, corporate training programs like General Electric's management school offering customized educational solutions, and community colleges—all creating disruptive growth with hybrid low cost/new market models. Concord Law School presents an example of an interesting but classic disruptive model.⁷ When regulations prevented students completing online law studies from taking anything but the California bar exam, Concord could have lobbied, exposing itself to great expense and the whims of industry bodies that have little incentive to change the regulations. Instead, Concord followed a classic strategy of new market disruption. The school recognized that it could tap into a market of "nonconsumers" who were seeking to achieve a goal different from "help me be a lawyer." Many people want to study law but don't necessarily want to practice law. They want to understand how the law works to further their careers, so the ability to take the bar exam doesn't matter to these consumers.

The lesson here is that industries or companies frustrated by government barriers similarly should seek to target a market segment in which barriers don't apply and take root in disruption. As the customers grow, they may force regulations to change. A similar scenario played out when bachelor of science in nursing programs' "overserved" customers were offered associate degrees in nursing programs that led to licensure in two rather than four years. Today, more than 60 percent of R.N.s are graduates of these programs.⁸

These innovations in law and nursing are improving, expanding, and reaching more and more customers and could potentially disrupt the traditional educational systems. Let me hasten to say that I am not going to advocate the creation of programs to graduate dentists who might be viewed as the optometrists rather than the ophthalmologists of patient care, but I am suggesting there are both positive and negative lessons to be learned in innovation.

Other aspects of health care are in the process of assessing changed circumstances and the impact on their professions. The American Association of Medical Colleges (AAMC) recently issued a report of the Ad Hoc Committee of Deans charged with concerns about the quality of medical education in the United States.⁹ The report is titled "Educating Doctors to Provide High-Quality Medical Care," a clear linkage between education, practice, and the health care delivery system. This committee was charged with conducting a comprehensive review of the state of medical education and recommending strategic directions for reform across the continuum of undergraduate, graduate, and continuing medical education. The AAMC report also calls for a coalition of the components of the country's medical education system—medical schools and teaching hospitals, accrediting and certifying bodies, licensing authorities, and professional societies and organizations—to commit to making progress toward achieving an ideal medical education system. In this context, it is worthwhile noting that some of our medical school deans also believe that it is time for a new Flexner report.

An example of how changed circumstances led to adaptation in a medical specialty occurred in otolaryngology. In the 1970s, the traditional treatments of tonsillectomy and adenoidectomy were questioned as routine procedures. The loss of acceptance of these long-standing treatments led otolaryngology to consider its future manpower and content needs. A strategic plan led to renewed emphasis on head

and neck cancer, with the development of fellowship programs in microsurgery and reconstruction and the fostering of scientific credibility through research. We must ask ourselves in dentistry: what if, next week, leading journals published scientifically credible work demonstrating that removal of wisdom teeth results in increased susceptibility to cardiovascular disease, or that amalgam is unequivocally shown to be linked to Alzheimer's disease? What if the soft association of periodontal disease becomes clearly linked to cardiovascular disease, and genomics can identify the people at risk? These are potential threats or opportunities that would affect our core assets and core activities for sure.

Can the theories of innovation apply to health care, and does this influence education and training? There are clearly signals of change toward more consumer-driven health care, including examples of care formerly delivered only by professionals now being put into the hands of consumers; actions to increase motivation for care like change in indemnity insurance; and developments that increase patients' ability to get good care through scientific breakthroughs or relaxed role limitations. Disruptive innovations enable treatments that are less expensive and more consistently effective, allowing more people to consume more and higher-quality health care. Three such innovations are home pregnancy tests, allowing women to find out if they are pregnant in the comfort of their own homes; blood glucose monitoring kits, making it easier for patients with diabetes to test and treat themselves; and angioplasty, permitting nonsurgeons to begin treating interventional a condition that previously had been beyond their capabilities. These disruptions have one common element: in each case, caregivers with less training became capable of providing effective care in more convenient, less expensive venues—care that historically had required expensive experts located in inconvenient, costly facilities. It is also important to note that the pregnancy test is based upon work in the 1950s and 1960s of Rosalyn Yalow, who received a Nobel Prize, and the technology that enabled the accuracy and precision of home pregnancy testing was the discovery of monoclonal antibodies in the 1980s by Jacques Saussure, also a Nobel Prize winner for his work. Scientific progress is essential to advancements in patient care.

Of course, with change and disruptive innovations in health care as elsewhere come potential challenges to "turf," and competitive battles are emerging in which procedures that look mundane to highly

trained clinicians often look exciting to less highly trained providers. This is the case with interventional cardiologists and cardiac surgeons. Will stents result in the decline of cardiac surgery, and will that surgery become minimally invasive, changing the role of the cardiac surgeon? Should disruptive entrants avoid the temptation to treat the sickest, to target highly skilled providers, or to overvalue medical expertise? Strategic decisions must be made.

The Continuum of Dental Education

In carrying the theories of innovation and disruption over to health care, most of the published material deals with medicine and disruption inherent in moving procedures and care out of hospitals and into clinics and outpatient environments. Dentistry has succeeded in following an isolationist policy to its benefit, and it is not my intent to compare medicine and dentistry. Dentistry is more like orthopedic surgery or dermatology, two medical specialties that share heritage and clearly are recognized as branches of medicine. Dentistry is also more like a cottage industry since more than 70 percent of dentistry¹⁰ is practiced in single-person offices without any connections to hospitals and by generalists rather than specialists. To some extent, dental education is also a cottage industry with disciplines and organization by specialties dominating school structures. But if we accept the notion that oral health is part of general health,¹¹ we must ask whether a profession can exist as a cottage industry in health care and whether a cottage industry can be integrated into our health care system.

Let us look to some highlights in the history of dental education and some innovations of the past to remind us of the historical context of our current situation. The Gies report's preface highlighted two issues requiring attention at that time: the recognition that dental diseases are directly related to general health; and the universal opinion that dentistry, because of its unusual technical requirements, is "a mechanical art of restoration and not a branch of medicine."²² That report in 1926 was looking at a dental profession and a system of dental education very different from what we have today. In 1870 there were ten active dental schools. Only 15 percent of practitioners were dental school graduates; 85 percent had entered the profession via apprenticeship. In 1868, Kentucky, New York, and Ohio passed

statutes putting the practice of dentistry under public defensive regulation. Graduates were automatically licensed, and any person not having a diploma or certificate of qualification was not licensed and had to take an examination. Competency was left to the dental schools to determine by graduation.

Over the next few years, the requirements for preprofessional education increased, including the introduction of a year in an academic college. In 1918, two years of college were required in twenty-six medical schools and twelve dental schools. The Gies report highlighted two experiments—one at Marquette and the other at Michigan. The Marquette experiment introduced a two-year academic requirement linked with three years of dental school by accepting students after two years of college. The report stated this was exemplary in that the performance of the Marquette students was every bit as good as the traditionally educated students. The dean of the University of Michigan dental school had launched an even more interesting innovation in 1925. A 50 percent reduction in technical time was achieved, decreasing 1600 hours of instruction to 800 hours by substituting shop practice and drawing in the engineering school and mineralogy in the liberal arts college for the standard curriculum. This included porcelain techniques not taught until some operative experience was gained. The dean stated that students were better prepared via this route.

In this educational context, the main recommendation of the Gies report was that two years of academic college be followed by three years of dental school for general practitioners only, but stated that students cannot be made a finished product in a real sense. An optional one year or more of graduate education and training was recommended as well. The report also urged that dentistry be independent in universities, that teaching and research be as effectual as the best in a good university, and that preparatory education be equivalent to that of physicians by requiring two years of college after four years of high school. The professional years of education would be lengthened so that three years would have the content of four, and the basis for close cooperation between medical and dental schools would exist through the university.

The advantages of these recommendations, which were stated in the Gies report, included:

1. Intellectual equality with students of medicine. Elimination of academic subjects learned in college would shorten the professional school experience and improve correlation of academic subjects with those of dentistry.

2. Decreased the minimum length of undergraduate dental curriculum from four years to three.
3. The graduate year would encourage advanced work, improve teaching, and promote research.
4. Enhanced coordination of dental education with higher education in general and with medical education in particular.

The disadvantages described included:

1. Decreased applicant pool because of the two-year college requirement. There was, however, much evidence for increased college enrollment at the time.
2. Decrease in curricular time would give medical sciences short shrift although expansion of these courses was hoped for.
3. Lack of coordination of proposed time of three-year program with university calendar could be overcome with summer courses.
4. Decreased annual tuition, which would increase need for state support and philanthropy.

Not much detail was provided for the optional postgraduate years, and over the next fifty to seventy years the development of graduate programs followed the organization of specialties. In the Institute of Medicine (IOM) report of 1995,³ the strength of these programs was recognized, but once again the importance of integration with medicine and the university was stressed, and the cover of the report was lavender and green, the academic colors of dentistry and medicine. The main recommendations of the IOM report for advanced specialty education included efforts to achieve or correct the following:

1. There is a need to enhance preparation for research and teaching and correct the emphasis on clinical proficiency.
2. Specialties dictate school organization structure and thus impede curriculum reform.
3. Faculty effort in graduate education detracts from predoctoral commitment.

The report also issued a clarion call for general practice residency (GPR) and advanced education in general dentistry (AEGD) programs to provide a continuum of education and training for general practitioners.

Before turning to our current situation, let's recall some historical examples of experiments in education and training and their impact. These programs—mostly designed to support the development of researchers—attracted a group of highly qualified and motivated applicants who made a difference. They created a new market disruption in a sense, but had mixed success.

First, the Yale Medical School began a program in the early 1930s in which dentists were admitted to the school for education and training in research and the basic sciences.¹² Designed to foster science and general medical knowledge in dentists and eliminate differences in real or perceived disparities in knowledge, the program enrolled twelve individuals during its existence. Three of the most prominent were Dr. Lester Burket, Dr. David Weisberger, and Dr. Seymour Kreshover. Lessons learned included several trainees “defecting” to medicine. This would be a recurring theme in such programs, including Harvard’s dual M.D./D.M.D. degree experience of the 1940s and 1950s.

Second, the University of Rochester’s unsuccessful attempt to form a school of dentistry as part of its medical school led to the creation of its Fellows Program in 1928. In subsequent years this program became a leading institution for graduate dental education in the United States. Clinical education and training and scientific programs including a Ph.D. program became examples for all of dental education. Reidar Soggneas, the first dean at the University of California, Los Angeles, was but one outstanding graduate. Today, this program represents the best of the integration of clinical and basic research.

Third, the Institute of Medicine’s Robert Wood Johnson Program in Health Care Policy is an exemplary program designed to produce leaders for health care policy and delivery. Physicians and dentists are included, and the track record of success is excellent. Dr. Chet Douglass, Dr. Jay Gershen, and Dr. Burt Edelstein are just three of the graduates. There is no competing clinical or other agenda for those entering this program, which undoubtedly contributes to its success.

Fourth, the doctor of medical sciences (D.M.Sc.) program at the Harvard School of Dental Medicine^{13,14} had an incredible record of success. This rigorous program recruited very directed young men and women; paid them a stipend, with NIH support, for most of its existence; and emphasized scholarship, basic research, and translational research. Even at our institution the basic science component has been replaced by a Ph.D. program, which makes clinical specialty training more difficult at the same time. The success of the D.M.Sc. program was clearly linked to leadership and an extraordinary environment for science and learning.

Fifth, Dr. Robert S. Harris, professor of biology at MIT, organized a conference in October 1962 to explore the possible effects of phosphate on the

growth, development, and maintenance of mineralized tissues such as teeth, as well as their susceptibility to caries. When the proceedings of this conference were published, it caught the interest of the National Institute for Dental Research (now the National Institute for Dental and Craniofacial Research), which decided to set up a unique training program at MIT to provide opportunities for dentists and scientists to expand their knowledge in the biomedical sciences and to receive sound research training in preparation for careers in dental education and dental research. The MIT Training Program in Oral Science and the Laboratories of Oral Science were established in the fall of 1963.¹⁵ The program accepted two kinds of candidates: postdoctoral associates with a dental degree who had recently graduated from dental schools, and graduate assistants who had a B.S. degree. Students with dental or chemistry/biology backgrounds would work toward a Ph.D. in nutrition with specialization in oral science. Postdoctoral students would spend one summer session at the nutrition institute in Central America. The Kellogg Foundation supported a lectureship program that exposed the trainees to the most outstanding investigators of the time and permitted them to meet and exchange ideas with those investigators. Weeklong symposia dealing with the scientific aspects of a dental specialty or a hot topic of the time were held each summer and fall. Dr. Harris and then Dr. Miller mentored more than twenty trainees in this program, including academic leaders like Drs. Michael Alfano, Dominick DePaola, Walter Loesche, and George White. Every single graduate entered an academic career or industry and was successful. What were the characteristics of this program that made it so successful? First was incredibly strong and committed leadership. The second was an extraordinary environment of science at MIT.

Sixth, in 1971 the Harvard Faculty of Medicine voted to permit an experiment: the Massachusetts General Hospital/Harvard M.D. oral and maxillofacial surgery program. Dr. Walter Guralnick, a single degree oral and maxillofacial surgeon, was the creator of the program, which was designed to provide excellent general medical education to remedy deficiencies in the standard dental school curriculum. The most important goal was to permit OMFS residents with M.D. degrees to serve on a general surgical service at an appropriate level of responsibility and authority. This would enhance the learning experience and produce graduates with the same education, training, and experience as other surgical disciplines. It

was meant to do more than eliminate turf battles. A recent review of the thirty years of the program is revealing.¹⁶ All but three of the fifty-six individuals entering the program are still in oral and maxillofacial surgery. The concept has also spread: there were three such combined programs in 1972; in 2001, there were forty-four. This clearly is the result of demand for such programs from dental school graduates. Even as the number of individuals considering academic careers has decreased, the dual degree tracks remained popular because of the expansion of scope of the specialty to include facial plastic surgery at the expense of hospital-based problems like trauma. How do we capture the best of this type of program in other specialties that are on the decline and sorely needed to educate the next generations of dental students?

These experiments were successful because of financial support, individual motivation, leadership and mentoring by directors, and institutional support. Failures occurred due to competing interests like learning clinical skills rather than enhancing them and financial factors. How should these lessons inform a new Gies report?

Recent Innovations in Dentistry and Dental Education

When we survey our particular field, we see a wide variety of innovations and disruptions going on in dental education today. Let's take a look at some of them and the questions they raise.

Consider new models of education like the Arizona School of Dentistry and Oral Health and the dental schools at the University of Nevada, Las Vegas and Nova Southeastern University. These innovations are improving, expanding, and reaching more and more customers and could potentially disrupt the traditional educational system as one tied to a research mission and university base.

Might the new dental schools with osteopathic medical school connections one day be the minimills of dental education? The education upstarts present two asymmetries: they take advantage of differences in target customers and in business models. First, the students they attract may be, arguably, less attractive to the mainstream university dental schools as measured by life situation, test scores, grades, and, most importantly, motivation. Second, these schools' business models are based upon decentralized learning

and lower cost instruction. Is this something dental education and the profession should be concerned about? We hear all the time that university connections, scholarship, and high standards are critical to advancing the profession. So do the schools at Nova, Arizona, and Nevada offer a threat to education and/or the status of the profession?

Similarly, do the implant institutes that have grown up and for-profit continuing education centers make a difference? Will our top institutions find themselves fighting over an increasingly small pool of the very best students who would still need intense, interactive training in the most complicated subspecialties, or will the number of traditional schools plummet? How should leading schools respond—by quiet observation or launching a counterattack? It may make no difference if university officials make all the decisions based on their perceptions of dental education and the profession.

Although our most distinguished schools might be safe for decades, the history of the closings of Northwestern, Loyola of Chicago, Washington University, and Georgetown needs to be recalled. Add to this the impending shortage of dentists and the growing need as oral health increasingly becomes recognized as part of general health and the growing evidence that oral health is critical to general health as advocated in the surgeon general's report of 2000.¹¹ It important for us to remember that response to disruption is very dependent upon the resources, processes, and values that collectively define an institution or a profession's strengths and weaknesses. The overview of dental education in the American Dental Association's Future of Dentistry report states, "The nation's dental schools are the practicing profession's sole link to the university and with it the esteem and professional status that dentistry enjoys and that fact above all else makes it a profession."¹⁷ Why then isn't the recommendation of the Gies and IOM reports that dental schools stay close to their universities not better heeded? The importance of aligning dental education with the core values and central mission of major universities and emerging science to address the current and anticipated comprehensive health needs of society is stressed in a recent article in the *Journal of Dental Education* by DePaola and Slavkin.¹⁸ Asymmetries are possible in education, but will they be good for the profession?

We must also ask: can we separate education and training? Are new schools where education and training rely on community clinics and electronic

curricula meeting the need for more dentists to the detriment of the profession? If, as DePaola and Slavkin¹⁸ suggest, intellectual integration across disciplines and across health professions must occur, is the shift to community-based sites just moving traditional dental education offsite? The problem we have in both generalist and advanced graduate education is ensuring that scholarship is joined with clinical education and training in the most effective and efficient manner.

How about the influence of the corporate world on graduate education? Orthodontic Education Company's influence at Colorado and Jacksonville is a threat to the status quo, but is it good or bad? Is this an example of innovation at work? Or is it an example of targeting a customer by means of offering a low-cost product? Is this tampering with admissions and a threat to academic standards and independence? This new system changes applicants' motivation for autonomy and running their own business, at least for the period of payback to the company.

What about influence from the specialty foundations? I find that very positive innovations stem from the organizations of specialty foundations today. As a founding member of the Oral and Maxillofacial Surgery Foundation, I know it well. Periodontology, prosthodontics, orthodontics, and endodontics also have foundations that support research and recently have entered into the support of junior faculty and promotion of academic careers. Importantly, fundraising has moved away from the "how will this research put more patients in my office?" question to how can we ensure the health of the specialty and care of our patients. Now if this power can be directed toward the overall good of the continuum of dental education from where the specialists come, we are on the right track. The shortage of full-time faculty, graying of the current faculty, and motivation of graduates towards general and specialty practice threaten the progress and future of the profession. If we agree that the IOM report's recommendation for advanced dental education still is the desired outcome, how do we enhance preparation for research and teaching with the appropriate emphasis on clinical proficiency; distribute content to decrease specialty impact on school organization and enhance flexibility of the content and timing of the curriculum; and expose predoctoral students to senior faculty normally committed to graduate education?

In my opinion, we need to promote academic careers by extraordinary financial support and make licensure by credential and a PGY-1 year universal.

The 2003 ADEA Survey of Dental School Seniors¹⁹ found that 37 percent seek advanced graduate education and only 1.9 percent teaching or research careers. Thus a mere forty-seven out of 4,000 graduates are interested in an academic career path. Eighty-seven percent of these graduates' long-term future plans are for private practice, and 1.6 percent are for academia. In the lack of interest in academics, dentistry has a major threat to its core asset, university status, scholarly intent, the practicing dentist, and the clinician-scholar. Scientists may come from other disciplines, but dentists must go to dental school and they must be taught by dentists. Is this an opportunity to serve an underserved market? Is the lack of interest in academia a new market opportunity?

What about the trend toward more consumer-directed health care—fueled in part by the wide availability of health information on the Internet—and the trend of procedures moving from the professional realm to the consumer and from one professional group to another? Dentistry has been at the forefront of ambulatory care and has its share of market disruptions. Home tooth-whitening kits permitting home treatment and implants making replacement of tooth loss less dependent upon conventional bridges are among them. The long-term outcomes for implant success are threatening the endodontic treatment market and may be the catalyst for changing the predoctoral curriculum. But if implantology is added to the predoctoral program, what would we eliminate, if anything? Alfano,²⁰ in discussing the need for dental education reform, lists only three things eliminated and twenty-five major additions to the educational musts for dentists since 1971. These mimic changes of shifting treatment closer to the consumer and arguably make treatment less costly not because it moves care to less costly settings, but reduces more complicated care by eliminating the need for a three-unit bridge when a single unit implant will suffice. The additions all show the influence of research on patient care and educational needs. The growth of scientific knowledge relevant to dentistry needs to be appropriately added to dental education.

Further, dentistry has yet to accept the low-end new market hybrid disruption of greater use of auxiliaries like nurse practitioners. Dental hygienists and dental assistants have important roles, but the ability to provide treatment to “overserved” customers and “nonconsumers” who cannot afford care represents an important area of need and an opportunity for expansion. Increased scope of practice for auxiliaries could also have a great impact upon the time devoted

to surgical aspects of dentistry, freeing time for diagnosis and treatment based on biological solutions. Do pediatric dental assistants placing sealants represent a potential disruption? Why *not* upgrade dental hygiene education and training? Is the new model at NYU that brings dental and nursing education closer together disruptive in a positive or negative manner?

In addition, the ability to expand the scope of general practitioners' abilities could be disruptive to specialty care and every bit as threatening to specialties as is the cardiologist/surgeon issue. Might the mandatory PGY year be viewed in this light? Why do most dental group practices or HMOs seek out graduates with PGY experience? Why do the Canadian oral and maxillofacial surgery programs still have an unwritten policy of accepting only individuals who have gone through a PGY year? Dentistry has much less concern than medicine about nonmarket forces being important to industry change because so much of our patients' payments are out of pocket. But that doesn't mean we should be less mindful of change. (Remember global warming.)

In general, medical education seeks to graduate an individual with an understanding of patient care, while dental education seeks to graduate a provider of care. This difference has a profound impact on everything we do as dental educators. A mandatory PGY year—which I advocate—would enhance the experience, repertoire, knowledge, and skills of graduates and reduce the need for licensure exams given after graduation. It would be a major advance. Enacting such a proposition would have a major effect on dental education, for it would decompress the curriculum, add flexibility, and improve patient care both in quality and access. Yet, its impact on graduate education has not even been considered. Here we see the behaviors of the global warming mentality in action. In his book *Changing Minds*,²¹ Howard Gardner explores the difficulties and resistances to new ideas and explains that changing behavior is very different from changing minds. We need some of both in dental education.

We must consider the idea of the continuum of education for successful and productive change. The 2004 ADEA Report of Best Practices²² included innovations in curriculum and innovations in dental education. Most of these best practices represent experiments of a sort, but common threads include the use of technology for educational pedagogy, emphasis on critical thinking and evidence-based practice, and integration of basic knowledge of biology,

materials, and outcome assessment of treatment into patient care. All are noble goals. None are directed at graduate education, however. The generation of ideas for improvement of graduate education is divorced from the predoctoral curriculum in most cases and left to individual programs or specialty groups. I believe the presence of specialty groups now versus the time of the Gies report in the 1920s represents a major strength of our profession and one that needs to be considered in a change agenda. Accreditation standards, however, block innovative solutions to our current problems. Much innovation effort goes into solving problems but not enough into identifying possibilities and opportunities for substantive change.

Dentistry must reflect the reality and potential of a dynamically changing health care environment. The recent survey of dental curriculum in 2002-03 by Kassebaum et al.²³ reported on progress with the eleven components of the dental education reform agenda. While some progress continues, two notable exceptions were interdisciplinary curriculum organization and use of case-based or problem-based learning—both of which are necessities, I believe, to the development of the dentist of the future. Consider also that, today, significant upgrading of the biological basis of dentistry has occurred. Despite that, only nine schools offer dedicated courses in genetics. Given the promise of science, that suggests a huge problem for our future. We must constantly ask ourselves: are we preparing our students for their patients and practices not just for next year, but for the rest of their careers? Control of time of work, being self-employed, and providing service to others were the most important reasons for pursuing dentistry as a career in the ADEA Senior Survey of 2003.¹⁹ Career variety was low, reflecting either a lack of mentoring or role modeling by senior faculty with varied careers or a very focused and directed career drive. I suspect altering exposure to only clinical dentists during the latter part of the educational experience is an opportunity for innovation. What if engineers and material scientists met with student treatment teams to brainstorm how to improve dental material and devices? What does nanotechnology offer to dentistry and the materials we use? To prepare our students for the long term, we must reduce the gap between scientific advances and incorporation of these advances into education and practice.

How does this review help us to see what's next? The signals of change in dental education abound. Community health-centered dental schools, some

with osteopathic medical school affiliation, move away from the central educational and training role of the teaching practice clinical facility where clinical faculty had direct supervision of students. This certainly will reduce the cost of dental education, but will it improve it? Will the attempt to broaden experience and increase cultural competency be as good an educational experience for dental students, or will it lead to further decline in intellectual integration? Interestingly, medical faculties faced with the need to be productive clinically have abrogated their teaching role, as medical students become marginalized in teaching hospitals. While I believe that outside experiences are critically important, will this modularization of curriculum lead to a duplication of the continuing education environment in which multiple institutions, nonprofit and for profit, are all competing for the market? Will the development of community health-centered dental education lead to an enhanced general practitioner and less need for the specialist? No AAU member university has opened a new dental school in more than thirty years, and several have closed. Dental education is creeping into the fringes of higher education and academic health centers. This is a major problem in need of a solution, but we must agree on the problem before seeking solutions.

A New Vision Is Required

Clearly, the environment in which dental education operates has changed and is continuing to change. Similarly, disruptions are occurring in the form of challenges to the traditional ways of teaching dentistry. At the same time, some changes—though marginal so far—have been made to the traditional dental curriculum. While in many ways dentistry and dental education are in a platinum period, signals of change abound, competitive battles loom, and strategic choices must be made. How can we align our values, processes, and resources so that our educational strengths meet societal needs in the next seventy-five years? The need to think through these changes, innovations, and challenges is why I believe a new Gies report is needed. Vision is a demeaned word, but without a vision we will not succeed. Without a dream, we won't plan.

I suggest that it is possible for our profession of dentistry to design its future and therefore suggest we embark on a strategy of experimentation and evaluation designed to make educational reform inclusive

and to improve care and the number of people cared for, realizing that dental schools have varied missions and it is important that not all dental schools, nor all predoctoral or postdoctoral curricula, be alike.

What would an updated Gies report address? First, we need to acknowledge changed circumstances in the world and figure out how dental education needs to adapt. What are some aspects of these changed circumstances? We must acknowledge the strength of our payment system in general in contrast to that of medicine and realize that consumer-based health care is an increasing trend. Simultaneously, we must recognize that there is disparity in care and figure out ways to address it. Patient-doctor relationships demand that dentists be able to advise their patients about many varied treatment options. There is much more that the generalist needs to know today, scientifically and clinically. The knowledge, skills, and values needed should be provided not by continuing education but by enhanced rigor and flexibility of education and training, and I think the best way to do that is to decrease the pressure to graduate a complete practitioner in four years or less. A carefully planned mandatory PGY-1 year or its equivalent will change the playing field. It can, if properly organized, enhance care of the underserved, increase the flexibility of the predoctoral curriculum, and offer exposure to other disciplines and opportunities to develop teachers and scientists. It could be a catalytic mechanism for change in dental education.²⁴ Major obstacles of funding might be addressed through loan forgiveness programs, corporate support linking the year to shared practice opportunities in schools and outside schools, and maybe even half-time programs. That's my argument—but clearly the issue of a required PGY-1 year is one that must be addressed.

Second, I think we need to reevaluate the entrance requirements for dental school. The day may have come when statistics is more important than organic chemistry. If two years of college were part of the Gies recommendation, this is not irrelevant to consider today. We also need to provide flexibility in education and training. We should consider early acceptance of dental students into specialty programs for those taking the time, like a year off to pursue acquisition of research skills. We should expand D.M.D./D.D.S./Ph.D. programs and programs to develop clinical researchers during predoctoral education. A PGY-1 year that includes education and training in the basics of clinical research would also make more practitioners part of evidence-based practice.

Third, we should seek to develop interdisciplinary graduate programs. We need to return dentistry to academic health centers and have it rejoin the mainstream. Dentistry is less understood than ever by our medical colleagues. What if, for example, oral and maxillofacial pathology—a specialty in need of reform—was incorporated into hospital-based programs like oral and maxillofacial surgery or general practice programs so that stipend support and the promise of teaching a discipline (oral pathology) might be combined with clinical practice in the appropriate school-based or associated practice? Oral pathology of the future should include salivary diagnostics and microarray genetic diagnosis linked with informatics training as well as standard pathologic diagnosis. Expanding the scope will make it a more attractive field with the potential for clinical income via diagnostics. This is innovative in terms of creating a new market.

Fourth, clinician teacher promotion tracks for both full- and part-time faculty must become part of every school's faculty development agenda. Recognizing individuals whose major scholarly contributions are in teaching, development of courses, and mentoring is crucial. It is not unreasonable to recognize long-term service as well.

Fifth, we should develop mechanisms to improve mentoring and role modeling of all students by senior faculty. I think it is especially important that we not have two classes of faculty: those for graduate programs and those for predoctoral programs. This is something that might have very positive unintended consequences, with stimulation and inspiration for students not reached otherwise.

Sixth, we must develop the financial ability to support these initiatives. Look to the American Dental Association, the specialty foundations, and the corporate sector for this support since federal or state support is doubtful at best. It would be interesting to tally up all the separate generous contributions of corporations like DENTSPLY, Henry Schein, Patterson, Oral-B, Colgate, and Procter and Gamble to support schools, meetings, etc. Resource reallocations directed to meet the requirements of our shared future vision for dentistry might lead to some interesting possibilities.

We can be the Jet Blues and Southwests of the dental world, but we cannot and must not fall into the global warming paradigm. The future of our profession is being questioned by the same types of policy leaders who created us in the past. University leaders, physicians, and scientists need to know where we are

heading and why. We need to be dreamers and draftsmen of the future. Jerry Hirshberg, lead designer at Nissan Motors, has said, “Creativity is the mastery of information and skills in the service of dreams.”²⁵ The creative process hungers for direct access to real world issues and concerns. We have faculty shortages, disparity of care, financial issues, and loss of our university base to deal with—certainly real world issues and problems that we all agree exist. Whether through a new Gies report or some other mechanism, it is our responsibility to put our minds and efforts towards an imaginative process with disciplined thinking to offer concrete solutions. We must realize that one has to dream of something different and better in order to effect change. We need a vision of dental education for this new century.

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