Journal of the American College of Dentists

Dental Education

Journal of the American College of Dentists

A Publication Presenting Ideas, Advancements, and Opinions in Dentistry

Mission

THE *JOURNAL OF THE AMERICAN COLLEGE OF DENTISTS* shall identify and place before the Fellows, the profession, and other parties of interest those issues that affect dentistry and oral health. All readers should be challenged by the *Journal* to remain informed, inquire actively, and participate in the formulation of public policy and personal leadership to advance the purposes and objectives of the College. The *Journal* is not a political vehicle and does not intentionally promote specific views at the expense of others. The views and opinions expressed herein do not necessarily represent those of the American College of Dentists or its Fellows.

Objectives of the American College of Dentists

THE AMERICAN COLLEGE OF DENTISTS, in order to promote the highest ideals in health care, advance the standards and efficiency of dentistry, develop good human relations and understanding, and extend the benefits of dental health to the greatest number, declares and adopts the following principles and ideals as ways and means for the attainment of these goals.

A. To urge the extension and improvement of measures for the control and prevention of oral disorders;

B. To encourage qualified persons to consider a career in dentistry so that dental health services will be available to all and to urge broad preparation for such a career at all educational levels;

C. To encourage graduate studies and continuing educational efforts by dentists and auxiliaries;

D. To encourage, stimulate and promote research;

E. To improve the public understanding and appreciation of oral health service and its importance to the optimum health of the patient;

F. To encourage the free exchange of ideas and experiences in the interest of better service to the patient;

G. To cooperate with other groups for the advancement of interprofessional relationships in the interest of the public;

H. To make visible to professional persons the extent of their responsibilities to the community as well as to the field of health service and to urge the acceptance of them;

I. To encourage individuals to further these objectives, and to recognize meritorious achievements and the potentials for contributions to dental science, art, education, literature, human relations or other areas which contribute to human welfare—by conferring Fellowship in the College on those persons properly selected for such honor.

Dental Education

Issues in Dental Ethics

Departments

FROM THE EDITOR

Bullet Journalism

B ullet journalism is the greatest thing since the invention of the concrete bicycle.

In their tune "The Only Living Boy in New York," Simon and Garfunkel offer this commentary, "I can gather all the news I need on the weather report." From this we can conclude that those are some dynamite weather reports or Simon and Garfunkel don't have much of an appetite for news. In a world that actually makes heroes of people who proclaim to be "too busy" and where expressing expectations of others is poor taste there is much to be said for a light touch in the literature.

Who has time to actually read dental publications anyway? Aren't the titles, abstracts, and pictures sufficient?

There is no precise definition of bullet journalism (Duh!). Its essence seems to be in the general direction of

- Short, very short!
- Attention grabbing, headline-like
- Graphic, or better yet, multimedia
- Impressionistic rather than rational
- Hypertextual (the reader supplies the context)
- Rhetorical, if you know what I mean
- Grounded in innuendo
- Professionally positive, implying universal success ... or at least a chance to win something
- Casual Friday all week

The Internet is a good example–if you can wade through the ads and find your place on the scream (oops, I meant to say screen). Actually, the now bankrupt Japanese game company Atari started it all. The word "Atari" means "hit," as in the sense of "to score." The idea in life is to get a lot of hits. Ad companies used to talk about exposures to a message; now they literally count the number of hits on a web page. The number of times something is said matters more than how well it is supported. (No one has figured out how to measure what folks are learning from these hits.) And, very important in this stressful, high stakes world, it is our right to have a reset button so we can start over if we don't like our scores. After all, it's no fun to play if we can't win or if we are faced with difficult trade-offs.

Ideally, we could reduce dental journals to bullets. Isn't the acme of respect for the reader to give him or her only what is needed and nothing more? Isn't the epitome of disrespect thinking that all dentists want the same information and presuming that writers know what that is? Several dentists have suggested

to me that we create a journal that will peer review the peer reviewed literature and publish one- or two-sentence summaries of the "point" of the literature for busy readers.

Some people seem to think that dentists can't think. At any rate, it might be risky to present alterative points of view since that surrenders to the reader con-

S ome people seem to think that dentists can't think.

trol of what the reader learns. I strongly believe that the profession is better served when what dentists learn is controlled by them than by the folks presenting the information? Abstracts that clearly state the problem, the conclusion, and the evidence are useful adjuncts to journal articles. They guide readers, and readers know when they as individuals have gotten their time's worth from the piece. Readers are the ultimate effective editors; they simply don't read what is of no value to them. A diet of nothing but hors d'oeuvres is unhealthy, but that should be the reader's choice.

Adams has a cartoon to the point. The boss snipes that Delbert's report is weak on content and interest. But he boasts that he has fixed all that. He added a few exclamation points.

Bullet journalism is PC–"professionally complementary." Have you every read anything in a "throwaway" that was critical of "DOCTOR!" Don't all the pieces end

questions and innuendo can be used freely. After all, they separate those who are in the know from those who are clueless, don't they? And that is why

reading deficiencies. A friend discovered that entrance was based on a standardized test given every few weeks through the counseling center. A few days later, my friend and I presented ourselves at the counseling center and earned among the lowest scores ever recorded. We were admitted to the training program and showed up early the first day, sitting in the front row, ready to become Olympic-class speed readers. The program began with a timed baseline exercise. The only material we were given during this twenty minutes was the sixteen-line poem by Robert Frost "Stopping By Woods on a Winter's Evening,"

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by showing how Doctor is just a few simple steps away from S-U-C-C-E-S-S. Never mind the fact that most of the bullet journalism is written by those who are consultants or CE presenters who are experts in guiding those "final few simple steps."

Bullet journalism doesn't have to tell the whole story ...

A wonder of bullet journalism is that context doesn't matter. What freedom for both author and readers. The bullets can be arranged in various orders. The story line is not critical to the logical development of the material. This protects us from the dangers of logical inconsistency. Since we are playing to values, rhetorical
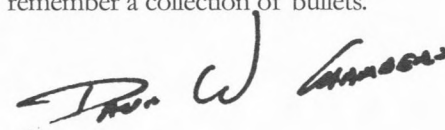
context plays such a critical role in bullet journalism.

Stories have no place in bullet journalism. So let me tell you a story. In my

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first semester in college, I heard about a multi-week training program for students who needed help with reading. I went to sign up. I was denied admission by a stuffy bureaucratic graduate assistant because I had no diagnosed

the one that ends "But I have promises to keep / and miles to go before I sleep." In that twenty minutes of reflection on reading I learned that what really matters is what the reader takes away. I also learned that most people remember a story full of detail a lot better than they remember a collection of bullets.

David W. Chambers, EdM, MBA, PhD, FACD
Editor

Overview of Issues Facing Dental Education

Richard W. Valachovic, DMD, MPH, FACD

Abstract

The Executive Director of the American Association of Dental Education discusses some of the major issues now facing dental education. These include: increasingly complex missions, faculty recruitment and retention, financing, student debt, postdoctoral education, lifelong learning, diversity, clinical education, research, trans-generaltional learning styles, globalization, and licensure.

Practicing dentists' incomes are rising. A well researched need for dental care has turned into a dramatic demand for dental care in the United States. The budgets of the NIH and its National Institute for Dental and Craniofacial Research have nearly doubled in the last ten years. Major advances in technology and research have significantly increased the treatment options that dentists are able to provide to their patients. Dental schools now have large numbers of highly qualified students applying for the roughly 4,000 coveted seats in the first-year class each year. A new focus in many dental schools on enhancing the quality of the student experience has engendered strong feelings of allegiance of alumni toward their alma maters. All of these wonderful milestones suggest that this might well be the first "platinum age of dentistry" in history.

Yet, for all of our successes, there are many challenges that face the dental education community and our profession as a whole as we enter the first decade of the twenty-first century. The purpose of this article is to present an overview of the issues currently facing dental education and strategies that the American Dental Education Association (ADEA) and others are developing to address them. Many of these issues are considerably different from the ones that were thought to be of the highest priority only fifteen to twenty years ago. But many of these issues will have very long term effects if they are not addressed by all of the constituencies in the dental profession in a collaborative and positive way.

The Complex Mission of a Dental School

There has been a very subtle but increasingly dramatic change in the societal expectations of universities and their schools and colleges in the past twenty years. Universities now exist in an environment of substantial accountability for their academic performance in three key areas: teaching, research, and service. This accountability extends to the dental school as well. Whereas in previous times, an institution of higher education might have been able to focus on one of these three areas and be widely recognized for it, every institution now must excel at all three. For the dental school, this means that it is no longer enough to be well regarded as an excellent "clinical" school, or an excellent "re-

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search" school, or to be excellent as a "community service" school. The expectation is that every dental school will be excellent at everything. This burden complicates the development of a strategic plan as the dental school dean needs to provide for excellence in all areas, and to provide the human and financial resources to support them. The American Association of Dental Schools, as ADEA was known before 2000, held a major conference on these issues in October 1998 entitled, "Leadership for the

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Future: The Dental School in the University," which addressed these issues and developed strategies to cope with them.

Faculty for the Future

Ask the dental school deans in the United States to identify the top three concerns that need answers right away, and there is one word that would be in

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the vast majority of responses: FACULTY. Concerns about faculty recruitment, retention, and development are clearly on the minds of anyone involved in dental education. There are many reasons for these concerns, but high among them are the lure of private practice, the demands and expectations of the parent universities for promotion and tenure, and the perceived income differentials between private practice and academic life. The number of vacant budgeted positions in U. S. dental schools now approaches four hundred (Haden, Beemsterboer, Weaver, Valachovic, 2000). Dental schools are increasingly relying on part-time faculty. The future of our profession depends on a vibrant, highly qualified, and committed faculty to continue to provide for the education of new students and the lifelong learning of those in their professional careers. ADEA is working together with a broad constituency of groups to respond to this evolving concern. In particular, ADEA and the American Dental Association (ADA) have collaborated through established joint opportunities such as the Council on Dental Education and Licensure, as well as through a unique Dental Education Summit that was held during 2001.

Financing Dental Education and Graduating Student Debt

The 1999 ADEA Survey of Dental School Seniors shows that the average graduating debt approaches $100,000

(American Dental Education Association, 2000). While this level of debt may not be a major concern when viewed against a lifetime of substantial earnings, it is a very real problem for young dentists upon graduation from dental school. We know that it affects the decisions that graduating dentists make, and influences their choices of career, where

to establish their practices to maximize their returns, and potentially some patient care decisions. The real cost of dental education is high, and the tuition that students pay is only a fraction of the amount required to cover the expenses incurred by schools to educate students. It will not be a simple task to reduce graduating debt for everyone, but there are ways to provide incentives to encourage graduating students to pursue career options that might have seemed impossible given their debt burden. For example, ADEA has been working effectively to develop loan forgiveness programs at the federal and state levels

for dentists who choose careers in teaching and research, or who are willing to provide dental care in underserved areas.

Postdoctoral Education and Lifelong Learning

Fewer than half of graduating seniors pursues postdoctoral education (American Dental Education Association, 2000). The portfolio of knowledge and skills in the basic, clinical, and behav-

ioral sciences required of the graduating dentist has exploded over the past decade and yet the traditional four years of education has not changed to respond to this remarkable increase in expectations for current professional competency. It is clear that the continuum of predoctoral, postdoctoral, and lifelong learning will need to be enhanced over the next decade. This also has significant effects on the current state of continuing dental education in this country. Distance learning, or distributed education as many are now calling it, will play a much more substantial role in the delivery of continuing education in the future. This will require much more collaboration between the practicing communities and the education community in identifying and meeting the needs of dentists as lifelong learners in the decades to come.

Diversity in the Profession

The 2000 United States Census brought home to most Americans the dramatic changes in the diversity of the population that have occurred since 1990 as well as the changes that should be expected in the coming decades. Less than 10% of dental school students are from underrepresented minority groups (African-American, Hispanic/Latino, and Na-

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tive American/ Alaskan Native), significantly less than the overall percentage of each group in the U.S. population (Valachovic, Weaver, Sinkford, Haden, 2001). A long-standing goal of the dental education community has been the development of a workforce that more closely represents the overall population.

Providing for the Best Clinical Education

For much of last one hundred years, the clinical education of dental students has occurred within the "footprint" of the dental school. All dental schools continue to have clinical training facilities within them, but up to 70% of schools now have some form of offsite clinical training facility (American Dental Association, 1999). This provides a mechanism for the students to gain experiences with a more diverse array of patients, in a variety of different settings, and under the supervision of a broader group of faculty. This is a substantial change from the experiences of many dentists who graduated before the 1980s when most clinical training occurred within the dental school clinics. At times, offsite facilities have created tensions between the academic and practicing communities. Working closely together to understand each other's needs and concerns, however, has produced a dialogue that all hope will improve the situation.

The Consequences of Current and Anticipated Research

One of the most compelling issues facing dental education is anticipating the effects of the outcomes of all of the new research that has evolved in the past decade and the promises of the results of current research. How will the new treatments that are expected to result from the release of the Human Genome Project affect the practice of dentistry and the education of new dentists? If the current research on the correlation between oral health and systemic health shows that there is a causal relationship between oral health status and such conditions as cardiovascular disease and stroke, diabetes mellitus, and low birthweight infants, then there will be a whole new imperative on eliminating the oral cavity as a source of disease. How will this change the dental curriculum? How will it change the way in which al-

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lied dental professionals participate in the treatment of patients? What new research opportunities will it open for dental school faculty and scientists? As we start to prepare for an unknown future, the entire dental profession needs to monitor the developments in these areas as they have the likelihood of changing the way dentistry is practiced and students are taught in very profound ways.

Cognition and Learning

Students being accepted into dental school this year for the graduating class of 2006 were born around 1980, and if they are professionally active until they are sixty-five years of age, will still be practicing until almost 2050. The average age of current dental school faculty is around fifty years of age (Haden, Beemsterboer, Weaver, Valachovic, 2000), meaning that they were born around 1950 and graduated from dental school in the mid 1970s. It is too simple to say that one group comes from the "baby boomer" generation and the other from the "millennium" generation. There are profound differences in the way that individuals were educated between the two generations and the way in which teaching and learning was conducted. Adapting to new dimensions of cognition and learning in a more global and diverse society with the considerable role of technology will continue to be a significant challenge for dental educators of the future.

Globalization and its Effects on Dental Education and Research

ADEA, in collaboration with the Association for Dental Educators in Europe (ADEE) and the International Federation of Dental Education Associations (IFDEA), held a major conference in Prague, Czech Republic, during April 2001 entitled "Global Congress in Dental Education." This meeting brought together two hundred and forty dental educators from forty-seven countries and one hundred and sixty dental schools across all of the continents. The participants discussed a wide variety of topics and shared common experiences across the various domains of dental education. It is obvious that our world is more interactive and the concept of "globalization" continues to evolve (even taking consequences of the events of September 11, 2001 into account), and there is considerable opportunity for

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U.S. dental schools to become more involved in working with schools in other countries. For example, many schools have curricular materials on the Internet that may be exportable to other countries. The United States has one of the best accreditation systems in the world, and methods of assessment of standards across large groups of schools, such as within the European Union, are in demand.

Licensure

There is a developing tension within the dental profession concerning ways to assess the competence of graduating students to practice independently within the community. Traditional methods of

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testing students for licensure have involved human subjects. The American Dental Association, the American Dental Education Association, and the American Student Dental Association all have current policies calling for the elimination of humans as part of licensure testing by 2005. Those within the dental examining community are concerned about this change and determining methods other than licensure examinations involving human subjects to evaluate the skills and competence of dentists applying for licensure. This tension clearly necessitates

the cooperation of all of the constituencies involved, but places a unique burden on the dental education community to help develop standardized and reliable testing methods not involving humans which assure the competence of the applicant and protect the health of the public.

Summary

This overview of the issues facing dental education is not meant to be exhaustive nor to provide answers to all of the compelling questions facing the dental education community. Other articles in this issue of the *Journal* will also address many of the issues identified here. It is important to recognize that dental education is in a very dynamic time of change, brought on by forces both

within and outside of its control. The leadership within our profession is there to respond to the challenges of this time of change, and I am confident that it will provide for the continuation of a solid tradition of educating the best dentists in the world who provide a standard of care second to none.

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Dental Education:
One Dean's Perspective

Michael C. Alfano, DMD, PhD, FACD

Abstract

A dean looks at dental education and the practicing profession from the perspective of three years in dental school administration and sixteen in industry. A significant challenge is to balance costs and standards in the face of well-meaning calls for benefits from those who are not charged with meeting costs. One issue of central importance for education is keeping the curriculum properly positioned in a dynamically evolving profession. The knowledge and skills needed to manage the practice pharmacopeia are used as an example of this problem. It is proposed that schools adopt a future orientation. Dental education must be valued within the higher educational community just as dentistry is valued for its contributions to society at large. Any drift toward proprietary interests must be resisted. This can best be accomplished through a partnership between education and organized dentistry where the lobbying power of the ADA is used to gain the resources education needs and where education, including research and patient care aspects of its mission, are enlisted in support of the practicing community.

I have been dean of the largest dental school in the United States for three years. That should be a long enough period to learn most of the key issues facing the dental education enterprise in the country; but not so long to have lost a fresh perspective. In addition, although I started my career in dental education in the early '70s, I have been in the corporate sector and out of dental education for about a generation. I trust this ab-

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sence provides additional perspective. What follows is not a researched, referenced treatise on the state of dental education in America. Space would not allow it, and I lack the breadth of experience to do it. Instead, I present a series of snapshots of dental education that might pique your interest and foster new dialogue.

Some Challenges Inherent in Dental Education

The dental school of the twenty-first century is quite different from the one that most Fellows of the American College of Dentists attended. These differences are enormous, they are almost all positive, and virtually every improvement has come at great expense that continues to drive up the cost of dental education. The modern dental school is a panoply of simulation systems; student advisement; quality assurance; remediation; faculty shortages; computer net-

works; and a litany of EPA, OSHA, CODA, NIH, FDA, HCFA, GME, HEAL, and state board regulations. Moreover, the scope of the curriculum has expanded dramatically, while the available time has remained fixed. For example, when I graduated from dental school in 1971 there were about 700 distinct chemical drug entities; there are now about 7,000. Yet the curriculum time for pharmacology in most dental schools has remained static. It is not surprising that dentists are not inclined to write prescriptions.

Dental School Administration: Perception vs. Reality. It is fashionable for dentists not engaged in university management to perceive educators as distant, ivory tower elitists who waste resources. I know this to be true, because I heard it when I worked in a dif-
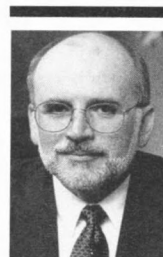
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The Right to Write Prescriptions—Use It or Lose It

Shortly after the nicotine replacement patches -- medications which double the successful quit rate of smokers -- were launched by the pharmaceutical industry, my former employer thought it would be great if dentists had the opportunity to prescribe them for their patients. The latest data from periodontal research had confirmed that smoking is second only to bacteria in its negative impact on periodontal health. And, after all, dentists are licensed to prescribe drugs to meet the oral health needs of their patients. Both of these facts proved to be irrelevant because a couple of State Boards of Dentistry and at least one state dental society questioned the competence of dentists to write these prescriptions because of the potential side effects of the medication. Yet two years later, these same medications were switched to "over the counter" status allowing laypersons to use them without consultation.

Undaunted, my former employer went on to develop a prescription medication for aphthous ulcers. This was the only medication proven to accelerate the healing of these ulcers, and the company was confident that the profession would embrace it. Yet after spending millions of dollars to market this product to the dental profession, and after spending no money to market the product to physicians, two years later physicians were writing three times as many prescriptions for the drug as dentists were.

ferent capacity. It is true that deans can sometimes be deserving of this type of criticism when they occasionally engage in the obfuscating dialogue dubbed "deanspeak." An example might be something like, "Utilizing evidence-based dentistry will facilitate construction of a phased-sequenced, digital curriculum which builds on our distance learning bandwidth in order to more fully secure the competencies we require and the outcomes envisioned in our strategic planning initiatives." Indeed, the perfectly good term "evidence-based" has become an educator's insider badge of conformance. It is used as an adjective so frequently these days that its significance is trivialized. It is occasionally used by people who do not understand the concept, or on the all too numerous occasions when, in fact, there is no evidence. On occasion, it is used with potential devastating effect when the design

of a systematic literature review is flawed.

That said, my colleagues in the administration of dental education are bright, dedicated, and driven to achieve excellence—not only at their institutions, but also for the profession as a whole. But managing a dental educational institution is an extremely challenging task. For example, in industry I delivered twenty-three consecutive budgets and managed two large cutbacks. But managing the budget in dental education is a more daunting task. Why? Industry does not operate with employees who have lifelong jobs (tenure). Industry does not need to sustain chronic money loosing divisions (clinic operations). Industry works primarily to meet the needs of one constituent group, the shareholders (in contrast to the multiple constituencies of dental education such as students, patients, faculty, alumni, legislators, and central administration). Industry is not obli-

gated to reach out to touch the poor (community service and access). And industry does not need to create information for the simple good of society (research). For that matter, the same things said of industry also can be said of private dental practice.

Accordingly, one can argue convincingly that the dental educational process, as opposed to business or dental practice, is inherently encumbered in a manner that decreases efficiency. The type of innovations that are transformational almost always come from organizations that are driven by entrepreneurship. In contrast, educational institutions are almost always led by consensus that sometimes is antithetical to innovation. Thus, transformation of the dental education process requires a very sensitive leadership that inspires the many to reach consensus on the ideas of a few. However, even when this delicate balance is achieved, there are systems and external requirements that conspire against success, as discussed in the next section.

External Standards Both Help and Hurt. The encumbrances inherent in the educational enterprise discussed above contribute to the difficult time that exists in dental education in the United States. However, there also are many external forces that must be addressed if we are to achieve significant improvement.

One problem limiting the opportunity for success in educational reform is something that might be called the "tyranny of the committee." Input from appropriately charged, diverse committees that can effectively judge the potential impact of new plans or evaluate the performance of a faculty colleague is invaluable. Well-meaning outside groups can hamstring schools while they are trying to set standards. The committees to which the adjective "tyrannical" might apply are those that have some type of regulatory function, be they at the ADA, the FDA, or elsewhere.

After about thirty-five years of committee service of one type or another, I note that these groups can be an effective way to gather ideas, identify problems for independent synthesis, and de-

velop consensus. In this regard, they are as valuable to industry as they are to academic or professional societies. Unfortunately, committees usually are not successful at establishing a good cost-benefit ratio because committees rarely have either fiscal responsibility or accountability. The nature of the interpersonal dynamics in a committee is usually one of "Let me

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show these folks how demanding I am by proposing standards that are so high that no one can meet them." In this regard, committees with a regulatory bent, almost always increase the cost of doing business. Here is how.

Several years ago, the FDA and comparable organizations in Japan and Europe established a committee to normalize drug regulations worldwide to reduce the enormous cost of drug development. The idea was to require standardized animal models, fixed standards for product stability, and so forth. This was a good idea to be sure. But once the committee members got together, they adopted the highest standard for each parameter for each of the hundreds of standards for each country. Why? They did it because no one on a committee wanted to argue that a 10% variation of a drug ingredient required in one country is a better formulation than a tougher 5% variation that might be required in another country. The 10% standard might be perfectly acceptable for safety and efficacy and might be implemented at a fraction of the cost of the 5% standard. But since the 5% "high ground" standard is proposed, everyone on the committee feels obliged to adopt it. The result of this process was higher, not lower costs.

In dental education this phenomenon might be played out in a committee developing guidelines for postgraduate specialty education. One person on the committee might come from a wealthy school that provides a full-time dental assistant for each specialty student. He or she would argue that this is the best way to train specialists, and would probably be correct. It would be argued that the new standards should demand such support of our graduate students, and no one on the committee would likely resist, because the committee is not charged with ensuring the best cost-benefit ratio. The result of this process would be higher costs. An example of this phenomenon occurred when the specialty of prosthodontics went to a three-year training program from the previous two-year format. Better education? Of course. But the number of applicants to these programs dropped nationwide because students perceived a reduction in the cost-benefit ratio.

Thus, the tyranny of the committee is not an intentional result of power crazed committee members, but rather an inherent flaw in the interpersonal dynamics of the committee process. Properly charging committees and ensuring that committee authority is mostly advisory can minimize this effect.

What It Means to Stay Current

The two vignettes in the sidebar highlight the scope of this problem. These stories are illustrative of the problem faced by dental educators in attempting to keep the curriculum relevant to a dynamically changing profession. The most disconcerting aspect of these vignettes, is that the future discoveries in the areas of disease prevention, diagnosis, and treatment are almost certain to come from the sciences of genomics, proteomics, microbial genetics, and pharmacogenomics. To seize these advances, clinicians will certainly need to write prescriptions and inject biologicals into their patients. The prospects for dentists to perform these services under the present training system are worrisome. Therefore, it is possible that physicians will apply some of these advances in oral disease management. To the extent that such physician involvement helps patients, society is served; but the dental profession may be marginalized in the process. Therefore, we must do a better job in using our prescription writing skills to maximize our effectiveness as a profession.

National Boards and Curriculum Growth. National board exams, coupled with a solid accreditation process, serve as an important tool to ensure that dental students, educated at disparate institutions around the country, and frequently far from their home states, have a reasonably standard set of baseline knowledge. In addition, the National Dental Board Examinations are fair and administered very well. I do believe that an inadvertent byproduct of the National Dental Board Examinations is that they stifle curricular innovation.

In light of the example prescription waiting skills, one could make a solid case that hours allocated to pharmacology, particularly applied pharmacology, should be dramatically increased in the dental curriculum. That would raise the issue of what to take out of the curriculum to make room. One could argue that biochemistry should sacrifice some of its hours to the more "relevant" science of pharmacology. Of course, the biochemistry faculty, who would argue that biochemistry provides much of the basis for pharmacology, would admonish me. However, while it is important that dentists understand the impact of anaerobic metabolism compared to aerobic metabolism on something like muscle fatigue, I respectfully submit that it is not relevant to calculate the ATPs generated by each turn of the Kreb's Cycle. I believe that there are numerous other examples of topics we teach that are not absolutely relevant to the development of quality dental practitioners.

The old defenses of "We always did it; we are staffed to do it; there will be Board questions on it; and, to do any less would be to dumb down the curriculum" must be questioned. Honoring unexamined tradition perpetuates the status quo. The Joint Commission on National Dental Board Examinations invites seated dental faculty to write the questions. Not surprisingly, they tend to write questions on what they *are* teaching, not necessarily what they *should be* teaching.

Focusing on the Future. An alternate approach would be for the national board to help guide the development of dental education. The emphasis could be shifted to knowledge and skill that will likely be relevant to new practitioners with projected careers of forty years. This may mean that not only are sciences like biochemistry reduced in curriculum time in order to add more pharmacology, but also certain clinical sciences, such as full denture technique, could be reduced to allow for newer techniques like implant dentistry to be taught. There will be a need for full dentures in the foreseeable future. However, as the baby boomers—the last generation without the full benefit of fluoride—die, full den-

*T*he dental profession is at the early threshold of returning to its roots of lower public esteem.

ture construction will likely become so rare that the dentures required by the public can be handled by specialists.

This approach would liberate dental schools to innovate the curriculum because they would know which directions the National Dental Board Examinations are taking. Moreover, it is likely that, once dental schools can construct a more relevant basic science curriculum, dental students will cherish the experience rather than view the sciences as a low relevance hurdle that they must jump. While we dental deans like to boast about not teaching to the Boards, the availability of so many national board review courses, study guides, study periods, and so forth

would suggest that the Boards certainly do impact curriculum development.

A Disturbing Trend

This section will probably get me into trouble and may be misinterpreted. However, I find the trend I am about to describe so troubling for the profession of dentistry that I would not be honest to this topic were I not to describe it here.

*F*ull denture construction will likely become so rare that the dentures required by the public can be handled by specialists.

In a nutshell, I am very concerned that the country has closed dental schools at prestigious private universities like Northwestern, Georgetown, and Emory. This concern is not about the supply of dentists for the country, but rather about the small value these private institutions placed on dental education. For the most part, public universities are driven to sustain dental schools by state legislatures because society needs dentists. However, great private universities have

elected to build dental schools because they have believed that they contribute to the intellectual milieu of the university. When private universities decide they no longer need dental schools this is not as much a statement about economic problems as about academic values. Indeed, private dental schools have closed for supposed economic reasons with $400,000 deficits that are little more than rounding errors in universities with billion dollar budgets.

Thus, the dental profession is at the early threshold of returning to its roots of lower public esteem. One recent survey seems to indicate that public respect for the profession is already dropping.

Therefore we must work hard to ensure that we do not return to that era when proprietary schools, not universities, drove dental education. Yet, as I write this, I understand that another proprietary school is interested in opening a dental school.

Why is this trend mentioned in a section dealing with external threats to the educational process? Because if dental educators do not maintain a high level

of scholarship which is cherished at the university level, there will surely be more academic closures masquerading as economic ones. The bottom line is that the deans of the nation's dental schools must be vigilant to ensure a robust research enterprise. However, such endeavors are expensive and can contribute significantly to the overall cost of dental education. Another, less costly, way to embrace the parent university would be the widespread participation by the dental faculty and students in the scholarship of the university. The contemporary debate on terrorism so dominant on university campuses today constitutes an excellent opportunity for dental schools to enter the campus dialogue.

Some Good News

In spite of all of these problems and the daunting challenge of leading a dental school in the twenty-first century, there is little chance of being a successful dean if optimism does not prevail. Indeed, the rather odd situation in which dental practice has never been more vibrant, at the same time that dental education is struggling, must be addressed. Here are some positive signs.

A Growing Partnership. Organized dentistry (read the ADA) and dental educators (read the ADEA) participate in programs together in a courteous manner that would lead an observer to believe that they work well together. How-

ever, this is not always the case, and once the members of these organization are ensconced in their own milieu, there is an increased tendency to criticize the actions of the other group. I have been in each camp, I have heard the critics, and I re-

other. There will be some arguments fought and some compromises will have to be made—just as in the best marriages—but the results should be spectacular. The ADA can unleash its lobbying might in support of education

decades. This powerful initiative started at dental schools, in hospitals, in regional consortia, and via the public health sector, and is now moving national with the help of the ADA. What teamwork!

Space does not permit an analysis of the many other initiatives that deserve extensive discussion. They include the potential for regional alliances of dental schools to reduce costs, rethinking the role of state and regional boards, fostering new treatment and payment paradigms for dentistry, and mobilizing the dental workforce in a unique way as a national resource to combat terrorism. These initiatives can be win-win-win-win for society, for the profession, for education, and for research if we step up to the challenge and drop some of our individual biases.

*T*here is little chance of being a successful dean if optimism does not prevail.

gret to note that there is truth in this harsh characterization. Fortunately, I get a real sense that this is changing, and we are at the gateway to unleashing enormous power on behalf of both practitioners and educators. Here is how it could work.

First, educators and practitioners need each other more than they ever imagined. Of course, it should be intuitive that this is true, but this has not been the case. So let's define what a new partnership should look like. The ADA is an awesome political force in America, and its PACs are listed as among the most effective in the land. This has served the dental practitioner very well indeed. It also has been supportive of dental research, but it has not focused much attention on education until recently. By contrast, the ADA has been less successful in public relations, and often can only react to the latest problem (e.g., amalgam safety, dirty water, anesthesia deaths, etc.). The ADA also has had membership problems in recent years and is concerned about access to care.

Dental education, in contrast, has modest lobbying clout, but can be a very effective, credible generator of positive public opinion for the profession, can help shepherd new membership in organized dentistry, and can help with the access to care problem. Thus, the makings of a much richer partnership are in place.

This mutually beneficial alliance will not come easily, because in the past the groups have not really engaged each

to garner more government support. Tuitions can go down, and quality can go up. In turn, the educators can relentlessly foster the benefits of ADA membership to their students, while generating news coverage and delivering improved access in areas of key geographic need. Thus, the public is served, the profession is benefited, and education prospers.

It is already beginning. Broad Recommendation #6 in the new, *Future of Dentistry Report* calls for a formal organization consisting of the ADA, the ADEA, the AADR, and the NIDCR. This should be a "top-to-top" partnership that can get the job done. Moreover, Education Recommendation #4

Conclusion

Dental education is in trouble. It is hurting at the very time that the dental profession is most prosperous. Society seems to be reevaluating the esteem it places on the profession.

Nevertheless, opportunity abounds. We should begin by moving immediately to adopt Broad Recommendation #6 from the ADA *Future of Dentistry Re-*

*E*ducators and practitioners need each other more than they ever imagined.

of this report calls for dental practitioners to open their checkbooks and contribute to their alma maters. In addition, three recent editions of the *ADA News* ran features on the problems in the nation's dental schools.

Other initiatives. Another example of how this alliance can work is the current national initiative on oral cancer. Bravo to the ADA for taking on an important public health issue that also creates great positive spin for the profession. This program has the potential to improve oral cancer survival rates that have remained virtually unchanged for

port. After about a year of high level, no holds barred dialogue, we can move to a series of broad-based summit meetings and focused workshops planned by all involved constituencies. The previous methods of meeting in silos where parochial groups revel in their own agendas have not served us well. Let's stop whispering about the folks in the other silos. Let's get out and plant the fields together with crops of public support, membership, improved access, teamwork, and innovation. Our cooperative farm will prosper, and the harvest will be bountiful.

Part-time Dental Teaching: A Personal Retrospective

Dennis N. Morea, DDS, FACD

Abstract

A prosthodontist in private practice who teaches part-time describes the benefits he has received from combining these aspects of his career. The rewards of teaching early in professional life include professional identification, the opportunity to share views with senior colleagues, and learning from the patterns of mistakes make by students. Later, the rewards included experience synthesizing and organizing one's knowledge and the inspiration to pursue advanced training. Still later, the challenge of working with graduate students who are constantly striving to advance the field prove rewarding. Throughout, the common theme of personal and professional inspiration is a characteristic of dental education.

I am a prosthodontist, practicing in New York City. My private practice is limited to fixed, removable, and implant prosthodontics. I also teach at Columbia University's School of Dental and Oral Surgery.

My roles as private practitioner and part-time educator are separate yet equal. The two entities are woven synergistically. While my clinical experience has enhanced my teaching ability, my academic experiences have improved my clinical skills.

When asked to reflect on my experience in dental education, I thought I'd share my view in two ways: first from my perspective as a dental student and second as dental educator.

My Education As Dental Student

Each of us has had a different perspective of our own dental education.

The education I received not only taught me how to do clinical dentistry, but it also became the blueprint from which I would construct my professional life.

For me, dental school in the late 1960s included a world in turmoil regarding the war in Southeast Asia and the political unrest it caused on university campuses throughout the United States. Columbia University in New York City, where I was a student, was certainly not insulated from these problems. In fact, it was one of the hottest spots of student upheaval across America. Many young people at the time had no faith in the national government, no trust in anyone over thirty, and little, or no respect for faculty and other authority figures.

Oddly, that was not necessarily the case at the dental school, located a mere fifty city blocks north of Columbia's main campus. Possibly because of its small class sizes, the very high faculty-to-student ratio, and a superb and dedicated faculty, the dental school became a safe haven to pursue a professional education.

The faculty consisted of polished, highly ethical practitioners who espoused professionalism. They seemed to have been hand picked, and I was in awe of them. Even though each had a distinct teaching style and practice preference, they all shared a common thread in the fabric of their characters: they all loved dentistry and teaching provided a channel for this passion. And so, we, as students, considered ourselves extremely fortunate to be among these seasoned mentors who generously shared their expertise and wisdom. Little did I know at the time that the education I received not only taught me how to do clinical dentistry, but it also became a blueprint from
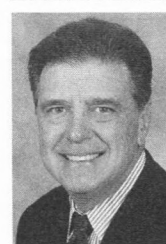
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which I would construct my professional life. The impact of the faculty's professionalism set a standard that I wished to follow in my own career.

Given my positive academic experience, I was honored when asked to join

mentors. I can easily attribute a sizable portion of my dental know-how to those first five years of teaching. Getting to know many of my mentors in this way created another advantage; they now became my professional colleagues

students as well. Watching the students work gave me an appreciation for some of the pitfalls that can occur when doing clinical dentistry. Viewing some recurring problems with the same technique would help me as a teacher when approaching the next student attempting the same procedure. In addition, it would also help me avoid the same problems in my own clinical practice.

Middle Years. The next five-year period consisted of new learning opportunities. I was asked to become the director of the pre-clinical course in fixed prosthodontics offered to second-year dental students. Among my many responsibilities was to review the literature, prepare and give seventy-five hours of lectures per year, write course out-

I can easily attribute a sizable portion of my dental know-how to those first five years of teaching.

Columbia's faculty after completing my general practice residency. I was further honored when an esteemed member of that faculty invited me to join his dental practice. My career had begun. I was on my way. The decision to accept these two positions some thirty years ago put my life on the course that has brought me to where I am today. I remember my only hope at the time was to grow professionally and to someday emulate the very faculty members who had left such a strong impression on me.

My Career As a Dental Educator

I view my teaching experience as one that can be broken into three distinct stages each of which presented its own unique challenges and opportunities.

Early Years. My first contact with teaching was as a Clinical Instructor two days a week in the senior prosthodontics clinic. Feeling totally out of place due to my lack of experience, my only consolation was that I was teaching in the very same institution with the very same instructors who had guided me so effortlessly when I was a student.

My former professors helped me in many ways. I was showered with an abundance of professional hospitality. They helped me direct the students who were under my supervision. They advised me on treatment planning decisions. When I brought in study casts of my own private patients, they counseled me on the preferred treatment. They made suggestions in handling difficult management cases. In retrospect, it was a private tutorial as I, the young instructor, was judiciously escorted by my own

and personal friends, who also began to refer patients for treatment to my young growing practice.

I must say that during this early period as a dental educator I not only learned from my mentors, but from my

How I Benefit from Combining Practice and Teaching

I realize that the impetus for me to begin teaching was the respect and admiration I had for my clinical instructors. But, interestingly, my decision to continue teaching for so many years was more based on the advantages, challenges, and opportunities that academics has offered. Some of these benefits can be summarized as follows:

- Association with an accredited teaching institution provides a certain degree of prestige in the eyes of other professionals and patients

- Teaching forces the practitioner to stay current with the dental literature and evidence-based dental procedures

- Academics challenges the individual to expand his or her capabilities by creating new opportunities for learning

- Teaching allows for the interaction of the varied specialties of dentistry in a clinical setting with the inherent exchange of viewpoints that always results

- Academics forms professional bonds and friendships among faculty members that reach far beyond the walls of the institution

- Interaction with other dedicated professionals broadens one's private practice referral base

- Teaching can be considered as a "pay-back to the profession" for the quality of life that dentistry has provided

- Teaching provides its personal rewards especially as former students become successful dedicated ethical practitioners

lines, create a syllabus, grade examinations, and submit final grades. Like most individuals in dental education, I had no training in the necessary pedagogical skills. Left to my own devices, I consider this aspect of my teaching career as the most formidable in that I was forced to expand upon my own capabilities. I had to learn to organize my allotted lecture time and to use each session effi-

not to mention time away from my family, the decision rested comfortably with me. I did, however, squeeze time in to continue teaching at Columbia, an activity that had become an integral part of my professional life.

Later Years. I completed that program sixteen years ago. Since then, I continue to enjoy practicing dentistry while I volunteer my time a day a week

tors and students are now very close personal friends in addition to being professional colleagues. I have many social, non-professional interactions with these individuals most likely due to the common bond of academics that has brought us to similar points in our careers.

Why I Teach

Historically, dental education began with the apprentice model, whereby the experienced clinician guided his young apprentice until the apprentice was amply qualified to work on his own. The scientific advancements of the twentieth century, including the advent of computer technology and new state of the art dental materials, have brought dentistry to its present level. While dental education has been permanently altered by the use of computer assisted learning systems, a notable part of that original apprentice model still exists on the clinical floors of all dental schools to this day. The impact the clinical faculty has on its students remains immeasurable. Just as our instructors influenced us, we hope to leave something behind with our students.

> *The catalyst and inspiration for me to further my own dental education were the very same young people I had taught years before.*

ciently. I also had to learn to deliver concise lectures bearing in mind that my students' dental knowledge was limited. In other words, I not only had to learn to be prepared, but to be sensitive to my student's learning needs as well.

It was also during this period that a number of my previous students, having completed postdoctoral prosthodontics programs at other institutions, returned to Columbia as instructors themselves. As we began to teach side-by-side, and within a short time, it became very obvious to me that these former students had acquired an extensive knowledge base in a mere few years. For instance, their understanding and recall of the dental literature and research was admirable. They had also been exposed to various viewpoints regarding treatment options that were just as defensible as the views taught at Columbia.

Consequently, the catalyst and inspiration for me to further my own dental education were the very same young people I had taught years before. So, after ten years in private practice and teaching, I decided to make a professional commitment. I enrolled in a four-year, part-time postdoctoral prosthodontics program at the Montefiore Hospital Medical Center. Although I knew it would require long hours of study, a compromised office schedule,

to Columbia's postdoctoral prosthodontics program. I consider this part of my teaching career to be the most challenging because of the caliber of students enrolled in this particular type of program. This teaching stage has given me the opportunity to get to know a number of fine young prosthodontists, many of whom have traveled from distant parts of the world to pursue an advanced dental education. Thirsty for additional knowledge, postgraduate students constantly challenge the clinical staff to stay

on the cutting edge of the dental literature and research. These dedicated students have made a specialty choice and wish to derive the most from their three-year commitment to advanced dental education. To that end, and in a small way, I feel privileged to play a role in their professional lives.

One striking aspect of my thirty-year teaching career is that many of my men-

> *One striking aspect of my thirty-year teaching career is that many of my mentors and students are now very close personal friends in addition to being professional colleagues.*

In my thirty-plus years of teaching I have come to realize that regardless of how much time I give, I always receive much more in return. For that reason I strongly urge my students and colleagues to consider teaching as part of their own professional lives. Academics not only broadens one professionally, it also serves to maintain the continuum that has brought dentistry to where it is today.

A Fresh Look at How Dental Schools Prepare Dentists for Today's Practice

Derek Kirkham, DDS

Abstract

The current Vice President for Students of the American Dental Education Association and a recent graduate who also completed an Advanced Education in General Dentistry residency looks at dental education in light of the current demands on beginning dental practitioners. He describes the didactic curriculum that incorporates much new material on the changing foundations of health and dental materials and the comprehensive care, competency-based clinical model typical of most schools. He also discusses how debt, community service, practice opportunities, and initial licensure affect recent graduates' perceptions of the profession. He concludes that continuous learning is the obligation of all dentists, regardless of when they may have graduated.

Dental school was one of the hardest but most rewarding experiences I have gone through. As a recent graduate, I look back with many fond memories, but I also remember the frustrations that I experienced. Coming into the profession as a total outsider, not having any family or close friends in dentistry, I am grateful each day that I found this profession. The great opportunities and challenges that face the profession vary from outstanding private practice environments to a shortage of faculty members to teach the next generation. Dental school is just a first step toward facing these opportunities and challenges. I hope to give you an insight into what dental school is like today and some feeling for what I experienced.

Getting into a dental school today is a challenging process that starts with good grades at an undergraduate university and high DAT scores. Schools are also looking for well-rounded students who have been active in the community, participated in extracurricular activities, and won honors. Very few students get into school without a bachelors degree. The number of students applying seems to change like the tide. This last year the number of applicants continued a downward trend following a recent high in the late '90s. There are many factors that play into the decision to attend or not to attend a professional school. An additional four years of training, huge debt load, golden opportunities in other fields, the economy, and lack of knowledge about the profession all effect this decision and thus the number of students applying.

I remember a dentist visiting my second grade class and teaching us about oral health. I also remember his statement that you do not want to be a dentist because there are too many of them. Times have changed, that same generation of dental graduates is now having a hard time finding the right persons to buy their practices.

Debt from Education and Beginning a Practice

Dental students today face a much different world than their predecessors did a decade ago or more. Older faculty members often tell students about how they worked their way through dental school and graduated with no debt. Today, students are paying tuitions that vary from $9,000 to more than $50,000 a year. This does not include instruments, books, and living expenses. Lucky for me, I attended a school where the tuition was on the lower end of the scale because I finished school married with four children. Most of my debt came from paying living expenses. It is not certain I could have worked while going to school. Throughout most of the program, the curriculum included more than twenty semester credit hours and lab work. I did not work a job, but I had an arrangement to work for my rent by remodeling a house. Even with the help on my rent and a military scholarship, I graduated $89,000 in debt with $45,000 of it being unsubsidized loans that are
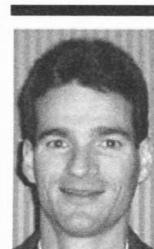
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continuing to kill me with compounding interest to this day. I have friends who graduated from private institutions with almost $200,000 in debt.

Realizing the amount of debt incurred in dental school is frightening, and that debt can affect the decisions gradu-

> *I graduated $89,000 in debt with $45,000 of it being unsubsidized loans that are continuing to kill me with compounding interest to this day.*

ates make. When considering the first years of practice, the first question that comes to mind is ability to pay loans and still live above the poverty level. Buying a practice only adds to the debt load and stress to make money. Loan payments on a $100,000 debt can be a large chunk out of your take home pay when starting out. Trying to pay off the debt in less than thirty years while buying a house and a practice adds up to a lot of budgeting and living cheap. I took a military scholarship to help defray some of the large amounts borrowed. But a military scholarship is only a loan of time for money and still can prove difficult to pay back.

The New Didactic and Clinical Curriculum

Today's dental school curriculum has changed some from years past. Gold foils are no longer taught, and in their place we take classes such as immunology, implants, microanatomy, esthetic dentistry, microbiology, periodontal microbiology, two pathology courses, and begin the never-ending study of changing dental materials. Each day of the first year is full of medically oriented classes introducing us to the exploding world of medical knowledge.

Some older dentists have told me that our hand skills suffer due to some of the traditional technique classes being reduced in hours. But I am glad I had the kind of training I received when I look at some of the health histories patients present with today. There is still

plenty of hands work in dental school. Traditional preclinical classes teach how to do all of the patient treatment and laboratory work for each dental procedure. As students achieve a level of competency they are introduced to clinical patient care during their second or third years. The competencies students must demonstrate to graduate from dental school today are comprehensive of the knowledge, skills, and values needed to begin today's dental practice. These competencies go far beyond what is required to pass an initial licensure examination.

National Boards Part I, is the first major academic hurdle in either the first or second year of dental school. The first set of national boards test all of the basic science material taught the first two years of school and dental anatomy. While students are trying to learn how to set denture teeth, cast gold, and do operative dentistry they are also studying for basic science classes and boards. There are some students each year who do not pass the boards and must retake them until they pass.

National Boards Part II come in year four. This comprehensive test covers all of clinical dentistry and features a case-based format. This serves to test treatment decision-making skills. Passing both national boards is a prerequisite for all initial licensure examinations in the United States and is a requirement for graduation from most dental schools as well.

Patient care in dental schools now follows a competency-based, comprehensive care model of treatment. The days of earning your way out of school by completing a number of requirements are gone. Each student screens, diagnoses, and treats a family of patients just as dentists do in practice. If a patient needs specialty treatment the student takes the patient to a specialty clinic and performs the treatment there. I had patients that I brought from the initial screening appointment all the way through final treatment. Many of these patients became personally interested in my education and helped me build confidence in my treatment and patient relationship skills. As I prepared for graduation I reevaluated each patient individually and transferred him or her to a third or fourth year student so there would be a consistent continuation of care. This is much like what a practitioner does when selling a practice.

Student competency is determined by ability rather than number of procedures completed. Sufficient experience is guaranteed through prerequisites that must be met prior to competency testing. Competency tests are performed after sufficient experience is gained in order to test students' abilities to perform to the standards expected of dentists in practice without any assistance. Students

> *Trying to pay off the debt in less than thirty years while buying a house and a practice adds up to a lot of budgeting and living cheap.*

are also accountable for understanding the rationale for the procedures they perform. For example a competency test in oral surgery on a simple extraction will not only test how the student performed the procedure but also the student's ability to diagnose, knowledge of anatomy, local anesthetic, interpretation of medical history, and other relevant considerations. Each student is also evaluated on patient management skills while doing the procedure.

There are several competencies in each of the specialty areas of dentistry and on all of the general dentistry skills. This may differ slightly from school to school, there is, however, a common

Serving the Community and Learning to Manage a Practice

I had the great opportunity of attending a school with a requirement of

tions of being an associate, however, can discourage one from wanting to learn while working for someone else. Having to sign a non-competition contract makes one very leery of just how far away they will have to move if things do not work out. I had many classmates who had family practices to walk into, but the rest of us have to deal with practice brokers who are trying to sell a practice to make a commission. I have several classmates who started scratch practices because it was a better deal than purchasing a practice in their given locations. Networking between schools and the private practice community could help students to have a better awareness of what their options are upon graduation.

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*G*old foils are no longer taught, and in their place we take classes such as immunology, implants, microanatomy, esthetic dentistry, microbiology, periodontal microbiology, two pathology courses, and begin the never-ending study of changing dental materials.

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core of competencies essential to general dental practice identified in the accreditation process. Competencies range from Class I amalgams to surgical extractions. If a student is not found to be clinically competent in a specific area, he or she must continue clinical practice and be re-evaluated. Faculty members from each respective specialty administer the competency tests. That way every department of the school has a chance to evaluate each student's abilities. Each school's system is different, but students do not move forward or graduate until they are competent. Many of my classmates were weeks or even months late demonstrating their competency and did not graduate until they were finished.

The amount of lab work that students do for their patients varies greatly from school to school. Some students cast all their own gold and set their own denture teeth, while others have all their work done by a lab as if they were in private practice. I went to a school that was trying to decrease the amount of lab work students had to do for their patients. However, I still found myself casting my own gold and setting teeth due to the slow pace of the lab. When I graduated, I felt like my hand skills were good and what I needed was time to develop as a practicing dentist. Dental school does a good job teaching the basics of general dentistry.

practicing dentistry in a public health care setting for one hundred and eighty days. This was a way the school helped pay back the state for funding the school. Last year, students contributed more than two million dollars of free dental work in these clinics. Students were required to have demonstrated competency in all areas before beginning this program. As students, we benefited greatly by being able to practice under indirect supervision where we could make some treatment decisions. A part-time faculty member worked in each clinic and was available to help and answer questions. In some ways it was like a short postgraduate residency. I became much more confident in my diagnostic and treatment skills as I had the opportunity of treating five to ten patients a day rather than the more typical two patients a day in dental school.

Initial Licensure Examination

The last great challenge before practice is to pass one of many boards. There are currently four regional boards and several states that continue to run their own tests to make sure that schools have properly trained students.

I had a conversation one day with a member of my state's dental board. He told me that this state would never accept any other regional or state boards because those tests are inferior. I have noticed in my short journey in the world of dentistry that his attitude is common. (It may even reflect the way examiners from other states feel about the tests in my state.) Dentists are concerned to protect their turf from incompetent dentists trained at inferior institutions. I am being a little sarcastic, but licensure boards rep-

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*T*he complications of being an associate, however, can discourage one from wanting to learn while working for someone else.

Today's dental students receive training in practice management but have the opportunity to apply only a few of these skills while in school. Many students are interested in learning from more experienced practitioners the "ins and outs" of running a private practice. The complica-

resent this distrust in a very big way. The ADA spends a great deal of time each year through the Council on Dental Accreditation accrediting dental schools and residency programs. This process is designed by dentists to assure that students receive proper training and attain the

needed skills to practice dentistry. The American Dental Education Association spends time and money each year help-

> *If schools are under-preparing us then where are the data that show today's graduates are any different from the graduates of years past?*

ing schools develop curriculum that will educate the practitioners of tomorrow. If a student graduates from an ADA accredited dental school, why do they have prove that they have learned the basics of dentistry to a local board? I feel it is because board members do not trust their examiner colleagues in other states, the dental schools, or the ADA that accredited them.

When I took my regional board, I sat next to a board certified periodontist who would be one of my faculty members at the AEGD that I was attending that fall. Here was a specialist who can do sinus lifts, place implants, and grow bone taking a test to show he had the skills to treat his patients by doing a Class II amalgam and a root canal treatment on a plastic tooth. What a joke. We are told that boards are to protect the public. Did the periodontist need to be screened for public safety just because he moved from a different area of the United States?

If schools are under-preparing us then where are the data that show today's graduates are any different from the graduates of years past? And shouldn't the examiners be talking with the schools to correct the perceived problems there rather than penalizing recent graduates who have no legal standing? It is often a surprise which students end up failing boards. The gentleman ranked second in my class did not pass the periodontal portion due to grainy calculus residue after his scaling and pol-

ish. That's right, he did not pass the polish and had to retake the periodontal portion of the board a month later in another city. After flying his patient and himself to Kansas City, the water main in the school broke and the board was canceled. His only option was to wait several months to take it again in Minneapolis, Minnesota. To retake the periodontal portion of the board cost him thousands of dollars and the potential income from months of practice. He had passed all of his periodontal competencies in dental school with high marks and was given the Annual Academy of Periodontology Award by the periodontal faculty at graduation.

Continuous Learning

Don't take me the wrong way; I do not feel that all new graduates can practice at the same level of perfection that an experienced practitioner can on the day they graduate. They do not have to do this. What is required is that they have the skills, knowledge, and attitudes needed to continue to develop as dentists while treating patients in a safe fashion. I went to an AEGD residency because I wanted to improve on the basic skills I learned in dental school.

I think all graduates should do at least one year of postgraduate training to enhance their skills and knowledge. I know this is a sensitive subject, but dentistry has grown in scope and knowledge since just a few decades ago. Medical school is only the beginning of medical training, but dentistry has clung to the four-year model of teaching. State boards then feel they have to check up on the schools to see if they crammed all of the expanding world dentistry into the same four years of dental school. If a mandatory one-year postgraduate residency were required for licensure, perhaps this could replace the requirement for each state to test incoming dentists.

Now that dental school is over and I have completed a residency, I still find that I need to continue to learn new skills on a daily basis. Part of being a professional is the commitment to lifelong learning and the gaining of additional skills. Dental graduates from ten and twenty years ago have had to do the same. Gold foils are gone, and some are still trying to adjust to that. In a few more years amalgam will be out dated and I wonder if we will be able to cope. What will dental schools teach and

> *Part of being a professional is the commitment to lifelong learning and the gaining of additional skills. Dental graduates from ten and twenty years ago have had to do the same.*

boards test when G.V. Black is out dated?

Tomorrow will bring many new and exciting options to dental treatment and we will have to adjust the way we think. Although procedures and materials will change, dental school gave me the basics competency to begin practice and the desire to continue learning throughout my career.

Dental Education

Keeping the Curriculum Current with Research and Problem-Based Learning

Charles F. Shuler, DMD, PhD

Abstract

Active learning is more effective than passive learning and the critical activities are discovery, mastery, and application. Only 10% of a typical dentist's career is spent in dental school, so the educational experience must provide the tools used for life-long learning. Problem-Based Learning is a model used in several dental schools that is grounded in these assumptions. PBL makes use of small groups, patient cases serving as the vehicle for learning, with student directed outcomes.

The National Academy of Sciences published a major study in 1999 called *How People Learn* that reviewed the results of studies on learning process (Bransford, Brown, & Cocking, 1999). They found that engagement in the process of learning by the student/learner played a critical role in achievement. Individuals engaged in their learning were highly self-motivated to master the material and the time committed to learning was viewed as positive. One component that contributed greatly to increased engagement was the use of inquiry-based methods of teaching. Inquiry allows the student/learner to self-generate questions and direct his or her learning to answering these questions. This self-direction gives the student/learner ownership of the learning process and changes the environment from

"forced to learn" to "want to learn." Developing questions and seeking answers is a natural way to learn, one used in nearly every situation except formal educational venues. The questioner becomes the most important individual and the one who controls the learning process. Student-directed inquiry was not found to be a common component of dental curriculum in the Institute of Medicine report, *Dental Education at the Crossroads: Challenges and Change* (Field, 1995). Future dental curricula should include both the most topical content and a style of pedagogy meant to optimize the educational experience.

In the spirit of inquiry as a motivator for learning, this article is driven by a series of questions related to dental education. These questions are meant to stimulate inquiry into your own personal educational and dental practice history. The responses of each reader will likely differ greatly due to the wide range of individual experience, however each perception represents an important contribution to the topic, "Keeping the Curriculum Current." In the framework of this issue, it is not possible to enter into a real-time dialog for each question. Rather, the questions are posed to frame

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a discussion on the overall topic and stimulate future areas of inquiry that might influence curriculum modification and faculty renewal. The discussion following each question is meant to provide a contribution to the framework for considering the future of dental education.

What are the steps in learning?

Is the learning process in dentistry different than in other fields?

Did the learning process that prepared you for your career resemble that used for a hobby, craft, or sport?

"Discovery," "Mastery," "Application"—three words that summarize the stages of learning in any situation. This

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cycle is true both for school/university-based learning as well as informal learning that each individual pursues to better accomplish an activity outside his or her career. Initially a student/learner discovers the need for new content to advance understanding. In traditional lecture-based education this discovery is driven by a course syllabus and faculty lectures; the faculty, acting in the best interest of the students "discovers" what they need to learn. This process of discovery is in distinct contrast to the approach that would be followed when for example someone discovers a problem that arises in a hobby such as gardening. In both cases, once the learning objective is discovered, each individual learner proceeds to master the material through study and investigation. In a school situation the mastery is directed to satisfy the perceived requirements of a faculty member, while in a day-to-day life situation mastery is aimed at the self-directed needs of a hobbyist. Achievement in a traditional learning environment is documented by specific assessments that are dictated by the faculty, while the effects on the hypothetical gardening scenario more often are measured by self- and peer-assessment by those who experience the garden.

The learning cycle is completed when the new knowledge is applied to better understand a situation that has not previously been experienced. Importantly, the relevance of a specific topic becomes most clear in the application step, whether that be in the dental clinic or the garden. Learning is an active event and application a powerful activity to reinforce concepts and principles. Traditionally dental education has emphasized a strong faculty-directed program that gives the learner little latitude for initiating the discovery process. Application has been focused primarily on technical

learning objectives. Opportunities for inquiry-driven discovery of learning needs have been few and avenues to apply most of the basic science content to clinical situations have been extremely

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The learning cycle is completed when the new knowledge is applied to better understand a situation that has not previously been experienced.

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limited. Students begin to discount those learning outcomes that do not have apparent relevant application and for which faculty assessment is directed primarily to measures of rote memorization.

When the faculty "discover" the learning needs for the students there is limited engagement and little motivation for the student learner to discover the current state of knowledge. Rather the students become conditioned to learn within the bounds set by the faculty members and requirements needed to perform acceptably on specific assessment events. The mechanisms of student assessment become a powerful motivator, not as an aid to master learning but for the ego-gratification received from faculty-assigned grades. Without the motivation generated from student-directed inquiry there is little reward for pushing the bounds of knowledge beyond those established by the instructor. This approach can condition the learner to accept the course content as state-of-the-art and discourage inquiry about alternative approaches. The discovery of new knowledge and application for best practices in oral health care can be impeded by four years of curricular conditioning.

What is the objective of the dental curriculum?

Should dental curricula be static or dynamic?

How should dental curricula prepare students for changes in oral healthcare delivery?

A four-year dental curriculum prepares a graduate for approximately forty years of practice. Less than 10% of a dentist's professional life is spent in dental school. A four-year dental education can only provide an introduction to the profession and thus serves a critical role as a foundation for future professional development. Dental education should provide "tools" for the future that are not limited solely to instruments and techniques but include the ability to find, evaluate, and apply new information. Student preparation must include approaches that assist in the development of abilities for critical thinking, problem-solving, and life-long learning. These types of skills are more likely to be generated if the dental curriculum encourages student inquiry and provides answers that are based upon the current state of knowledge.

Using the best available evidence to determine strategies for oral health care

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is a standard of professional conduct. Educational programs should model this standard by including the latest evidence in the content of the curriculum and using pedagogical approaches that are supported by evidence generated in educational research. While technical skills are absolutely required to graduate from dental school and provide care to patients, caution should be exercised with respect to the long-term utility of every

clinical technique included in the dental curriculum. We should envision the nature of dental practice for our current students, both at the time of graduation and at the end of their professional careers. Recent graduates will certainly experience dramatic changes in the dental practice environment during the next forty years. These changes can not be exactly anticipated, but this anticipation should be included in the dental curricula, such that the skill sets possessed at the time of graduation from dental school will not be a static resource for use throughout a dentist's entire career. The dynamics of change in health care should be a consideration as dental curricula are developed and constantly modified to reflect the latest advances. The ability to evaluate new therapies and adapt to new methods of patient care will require dentists ever more capable of evaluating the scientific evidence and determining the best options for their patients. The attitude of life-long learning necessary to remain current in professional knowledge should be acquired as part of professional education.

What was the curricular content in dental education in 1961?

How does that compare to the practice of oral healthcare in 2001?

What will be the nature of dentistry in 2041?

The past forty years have seen remarkable changes in the delivery of oral health care. An incredible body of scholarship has been produced during that time that includes reports on instrumentation, techniques, materials, etiologies of diseases, diagnostic aids, drugs, and therapeutics. Many examples can be cited to reflect the dramatic differences between the dental practice environment in 1961—when silicates were a common tooth colored restorative material, the high speed handpiece a recent innovation, and HIV unknown—and in 2001—when medications can be prescribed to eliminate specific periodontal pathogens, dental implants are a routine procedure, and gene therapy a therapeu-

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tic option. One would hope that in 2001 the scope of dental practice for a 1961 dental school graduate does not mirror their dental school curriculum.

Many of these advances in oral health care delivery progressed initially to the dental private practice environments but were slow to be included in dental curricula. In many instances the content of dental curricula trailed both the profession and the evidence produced in the literature. The result was graduates whose level of understanding trailed, rather than led the state of knowledge in their own profession. The use of scientific evidence to update and modernize dental school courses and programs has often been slower than the change in approaches to oral health care delivery. The use of scientific evidence to establish best practices in health care is a well-established principle that will continue to direct the delivery of care in the future.

In 2001 the entire sequence of the human genome was reported and that remarkable resource is now available for a new series of discoveries using the genetic code to enhance oral health (Inter-

national Human Genome Sequencing Consortium, 2001; Venter et al, 2001). The genome will provide new information on oral disease susceptibility leading to new interventions to prevent disease and promote health. Genetically based tests will become available in the next ten years that can be used at the chair side to provide patients with specific disease diagnoses and disease risk assessment. New interventions will be developed to take advantage of these diagnostic aids and reduce the morbidity of oral disease. Despite the remarkable scientific achievements in molecular biology and the tremendous potential for the future, the inclusion of genetics and molecular biology in dental education remains quite limited. To provide a good foundation for future professional growth, dental curricula need to include content that prepares the graduate to evaluate new scientific advances. The rate of change in the healthcare environment will continue to increase in the future. These new advances will definitely impact delivery of oral health care. New graduates need to be prepared to evaluate the literature and make informed decisions on how to implement the latest findings into their practices for the benefit of their patients. The past and the future all play impor-

*G*enetically based tests will become available in the next ten years that can be used at the chair side to provide patients with specific disease diagnoses and disease risk assessment.

tant roles when designing dental curricula that optimally prepare the new dental graduates for their professional careers.

Do dental curricula prepare students to deal with the changes expected in the future?

How can the learning environment stress the relevance of these skills?

Can the pedagogy encourage students to seek the best evidence and latest scientific advances?

How do dental students learn to use and evaluate the most recent scientific literature?

Is there a pedagogy that can increase student engagement and motivation to learn?

Problem-Based Learning (PBL) represents an alternative pedagogy that differs from traditionally structured curricula with respect to the discovery and application phases of learning (Fincham & Shuler, 2001; Fincham et al, 1997; Shuler & Fincham, 1998). Three elements are critical for PBL: (a) small group learning environment, (b) problems are the vehicle for learning, and (c) student-directed learning outcomes. In PBL the students "discover" their learning objectives by studying a patient related case developed by the faculty to achieve a set of curricular learning objectives. Therefore at the initial discovery phase, student-driven inquiry is already driving the learning process by identifying the outcomes embedded in the case scenarios. Each case includes a wide range of information about the patient, such as the signs and symptoms, and the student groups engage in a period of critical thinking to establish a set of hypotheses/ideas to explain the observa-

and motivated to master the content in order to better understand the patient's condition. Student-based inquiry drives the curricular learning outcomes that are embedded in the series of problems that constitute the curriculum. Thus, students direct the active process of learning while faculty dictate the scope of the learning objectives through the creation of the problem cases and control their sequence in the curriculum.

The learning objectives are mastered by students seeking the current state of knowledge through the use of the most recent textbooks, scientific literature, web-based resources, and human experts. The content is by necessity at the very cutting edge of knowledge and the current state of evidence is accepted as the place to begin to understand the subjects. The peer pressure in the student group ensures that the information is of high quality and from recent, reliable sources. Once the learning objectives have been achieved they are immediately applied to the case through re-evaluation of the hypotheses. Application immediately follows mastery to emphasize the role of this information in patient care situations. For example, connections between altered physiology and patient presentation become evident linking basic science content to clinical practice. The entire small group works collaboratively to assess the new material and determine the relevance to understanding the case and establishing the next series

The PBL pedagogy naturally integrates discovery, mastery, and application through the focus on analyzing the condition of a patient. The use of patient presentations as a focus for learning mimics the eventual practice environment and builds student confidence in problem analysis through a critical-thinking process. Problem-Based Learning provides a pedagogy that works not only for basic science content areas but also for the clinical sciences. The series of learning events, discovery, mastery and application are identical for clinical skills. The application of technical skills required for dentists can occur through the treatment of simulated patients in a preclinical laboratory providing a natural foundation for eventual treatment of patients in a dental clinic. No difference in pedagogy is needed based on the learning objectives. Student inquiry becomes the basis for all learning outcomes resulting in greater student engagement and motivation.

What does it take to change dental curriculum and prepare for the future?

Clear identification of the objectives of a dental education is a necessary prerequisite for initiating curricular change. Resistance to change is a natural event and there is considerable inertia to changing dental curricula, as evidenced by the slow introduction of the most advanced scientific findings. Curricula based on a collection of the personal opinions and preferences of individual faculty may not achieve the objectives as effectively as an educational structure with a holistic view of the process. Careful evaluation of the strengths and weaknesses of a program of dental education should include consideration not only of the four years a dental student is in residence but the next forty years of their practice lifetime. Building a strong foundation for a professional career requires a long-term view of the profile of knowledge necessary to provide oral health care at the highest possible standards. A commitment to life-long learn-

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*P*roblem-Based Learning provides a pedagogy that works not only for basic science content areas but also for the clinical sciences.

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tions. Based on these student-generated ideas, the student groups identify sets of learning objectives that are necessary to evaluate their list of hypotheses and determine their appropriateness and accuracy. These learning objectives constitute the material that each student will master.

Through the PBL process, students are immediately engaged in that material

of investigations. The application phase leads to identification of deficits in knowledge that compromise understanding and these student-identified areas initiate the discovery stage anew. The cycles of learning are on-going throughout the four years of dental school and develop a behavioral pattern consistent with a life-long learning outcome.

ing is essential to remaining current in the delivery of oral health care.

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Education Problems and Web-Based Teaching: How It Impacts Dental Educators?

Glenn T. Clark, DDS, MS

Abstract

This article looks at six problems that vex educators and how web-based teaching might help solve them. These problems include: (1) limited access to educational content, (2) need for asynchronous access to educational content, (3) depth and diversity of educational content, (4) training in complex problem solving, (5) promotion of lifelong learning behaviors and (6) achieving excellence in education. The advantages and disadvantage of web-based educational content for each problem are discussed. The article suggests that when a poorly organized course with inaccurate and irrelevant content is placed online, it solves no problems. However some of the above issues can be partially or fully solved by hosting well-constructed teaching modules on the web. This article also reviews the literature investigating the efficacy of off-site education as compared to that provided on-site. The conclusion of this review is that teleconference-based and web-based delivery of educational content can be as effective as traditional classroom-based teaching assuming the technologic problems sometimes associated with delivering teaching content to off-site locations do not interfere in the learning process. A suggested hierarchy for rating and comparing e-learning concepts and methods is presented for consideration.

Some educational innovations occur because they allow information to be imparted "faster, cheaper, and better," if you will allow me to borrow the motto of NASA director, Dan Goldin. For example, when slide transparencies became readily available they quickly became standard methodology and were universally used in lecture halls by the majority of dental educators as an essential part of the in-class presentation. This technology provided images that were faster and better when compared to overhead transparencies, handouts with images on them, or drawings on the chalkboard. While not cheaper than these other modalities, the cost was obviously not an impediment to the widespread rapid adaptation of this method in education. Another educational modality, videotaped lectures, have been promoted as a replacement for the traditional lecture format since they allowed asynchronous learning (i.e., learning separated in time from the presentation of information), self-paced learning, and distance learning. However, videotape-based lectures have not been widely adapted. This limited acceptance has been due to the fact that the technology and the expertise needed to create, edit, and reproduce these tapes was not readily available to faculty nor easily learned. In essence, it was not "faster, cheaper, and better."

Compared to creating and providing a traditional in-class lecture, creating a computer-based, web-accessible learning module is neither faster nor cheaper. With regard to being "better," the evidence on web-based teaching is yet to be established one way or another, and this paper will address what has been published in this regard in a later section. Perhaps the "faster, cheaper, and better" mantra may have outlived its usefulness as an educational imperative. Before casting it aside, however, one needs to look closely at these three characteristics in light of new developments. It is critically important that new methodologies be examined closely and not rejected due to lack of familiarity with the method or inadequate investigation or consideration. Therefore before defining and discussing the value of web-enhanced dental education, it would first be appropriate to establish the six constructs in dental education.
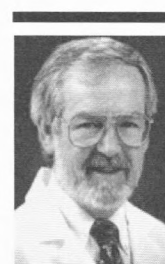
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Problem #1: Limited Access to Educational Content. Within the predoctoral curriculum of a contemporary U. S. dental school, there are many rotations of students to off-site locations. Week-long and month-long blocks and externships to specialty clinic rota-

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One frequently proposed solution to the problem of limited access to educational content is to digitize, archive, and make the content available on the web.

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tions and mobile-dental or community-based clinics take the DDS student away from the school. These blocks and rotations are all done in an effort to expose them to new and more diverse experiences. These off-site experiences present scheduling problems for many students who have conflicts between the rotations and on-site lectures.

Another problem seen by private dental practitioners who reside in rural environments is limited educational access to newly developed information and methods. In some areas in our more remote states such as Alaska and Montana, dentists may be a long distance from educational centers, and the issue of limited access is a substantial problem. There is also limited access to expertise that is associated with special settings such as the training and consultation needs of military dentists in wide-reaching locations. While the military has developed distance education solutions for their situation, the current solution for the schedule-challenged DDS student is to hope that class notes or the handouts (if provided) cover the essentials of the missed classroom presentation. Alternatively, the dental student may just hope that what was said, but not recorded on these handouts, was not critical. The current educational solution for dentists in rural areas is to regularly attend large dental conventions and meetings where they can access the latest in educational presentations.

One frequently proposed solution to the problem of limited access to educational content is to digitize, archive, and make the content available on the web. On the plus side, web-based teaching would help dentists in geographically distant locales find better and less expensive continuing education offerings. It would also allow off-site students to access the missed lecture content. On the negative side, while didactic educational materials (lectures, slides, and recorded discussions) lend themselves to digitizing, archiving, and web delivery, this does not solve the problem of laboratory based "hands-on" courses. Moreover the limited magnitude of this problem (i.e., compared with the entire population of dentists, rural practitioners make up a very small percentage of the total group) will not drive continuing dental education purveyors and dental school administrators to spend more than a small portion of their limited resources to develop web-based delivery of educational content.

Problem #2: Asynchronous Access to Educational Content. Providing asynchronous educational content is not typically an option within the traditional lock-step predoctoral and graduate dental curriculum. Yet, shouldn't it be? Students who cannot access educational material because they are engaged in other assigned educational experiences should not miss any opportunity to expand their knowledge base. This issue is also a problem in other settings. For example practicing dentists hear about a new method or technique that they wish to acquire but when they call the local expert in this content at the nearest educational institution, they find out the course is not going to be offered for another twelve months. Another common ex-

ample occurs when a dentist hires an inexperienced new front-office or chairside staff member. Obviously, the dentist would like to have the new employee attend a basic course in infection control and hazardous waste management or a dental office billing and management skills course. Clearly waiting until the next course is being offered at the dental convention isn't an option since the skill and knowledge are needed now. The current solution is that the existing staff can serve as the educators for the new staff. While this works well in some larger offices, at times this approach can lead to "the blind leading the blind." In smaller offices it may be that knowledge gained through on-the-job learning will result in perpetuated errors.

Although most dental schools have not met the challenge of regularly providing alternative methods for acquiring educational content outside of a continuous lock-step curriculum, this is not the case elsewhere. The need for asynchronous "on-demand" educational content has driven several dental continuing education purveyors and some local and state dental societies to provide online and home or office based self-study educational programs. Unfortunately, most current course offerings are provided as mailed video or audio presentations or via a text-based self-learning syllabus. The typical end-of-course student performance evaluation (if there is any) is via an open-book test of the user's knowledge that is subsequently mailed- or phoned–in.

The very action of providing asynchronous "on-demand" courses requires that they be standalone courses with only minimal student-faculty interaction, if any at all. This is an impediment to student learning and is contrary to good educational theory. The magnitude of this problem of asynchronous learning is larger than the schedule-challenged dental student or geographically-challenged dentist, but the wide spread delivery of sophisticated, interactive, high quality courses online has not yet happened.

Problem #3: Depth and Diversity of Educational Content. In this modern and increasingly complex world,

there is an ever-growing need for educational content to have substantial depth and diversity. In the perfect world, the true master educator knows everything and everyone in the field and keeps abreast of all newly emerging knowl-

ha" experiences occur when students bring their explorations back to their professor or study group for discussion. As is true of most things, there are negative aspects to this modality. The exploring student often becomes distracted

disease, temporomandibular joint dysfunction, severe bruxism with secondary headaches, and burning mouth syndrome to name but a few. Some of the uncertainty in dealing with these more complex problems is related to the lack of highly effective, easily applied treatment procedures. The greater issue is that dental students have little exposure to patients with these diseases and disorders, yet the lack of these cases in the dental student patient population is not representative of their prevalence in the general population. This rarity is more due to the fact that such patients do not seek care at a dental student clinic. On the other hand, every general dentist will be confronted with a myriad of complex problems during practice that have never been seen before. It is reasonable to say that our current methods of teaching, which provide limited complex problem solving opportunities make it highly unlikely that dentists will be prepared to correctly diagnosis and treat complex patients.

The need for asynchronous "on-demand" educational content has driven several dental continuing education purveyors and some local and state dental societies to provide online and home or office based self-study educational programs.

edge in his or her field and other related fields. This master educator then provides the students with the boiled down synthesis of this knowledge and hopes that this imparted information has a long half-life. The bad news is that few educators are able to achieve such dynamic mastery of their field; the synthesis of knowledge provided in lectures is often years outdated and the half-life of knowledge is becoming shorter and shorter. The scope or magnitude of this problem is universal in that it impacts each and every educational encounter. Moreover, the ability to provide dynamic up-to-date, evidence-based dental courses is limited by two facts. First, most educators are quite comfortable with the process of providing highly-structured, lecture-based, limited-interaction courses. Second, the limited time available and student-to-faculty ratios in most dental schools, continuing education, or dental society provided courses are such that small group discussions of emerging concepts is a luxury often not afforded.

One solution to the problem is to encourage students to explore the two best information databanks available on the Internet (e.g., Medline and the World Wide Web) to discover controversies, emerging new concepts and, when available, proven evidence. One positive feature of the process of self-discovery is that the pathways taken almost always increase the depth and diversity of the educational content for the student. "Ah-

while traveling down a pathway that, although interesting, may lead to ancillary issues of less importance to the central investigation. Nevertheless, most educators eperienced with such methods woul say, "if time allows, let them explore since they will usually get to where they need to go."

Problem #4: Training in Complex-Problem Solving. Across the four-year time period needed to achieve a dental degree, students are exposed to many courses where they are taught a multitude of facts, figures, and techniques. Teaching these students how, and more importantly when to correctly apply this information when dealing with patients is a constant problem for dental

educators. In some areas of clinical dentistry, the student is provided with a reasonably diverse exposure to a variety of problem areas and problem solving thus becomes less problematic. For example, it is reasonable to expect a new dental graduate to be able to deal successfully with occlusal caries, a missing premolar tooth, a dental abscess, or a broken incisor. However the expectations fall rapidly when you start naming less common dental problems such as erosive lichen planus, rapidly progressive periodontal

The issue of limited exposure to complex problems is not confined to dental students since in some circumstances it may not diminish with addition clinical years of practice experience. Clark and Browne (1994) reported data gathered from attendees at a chronic orofacial pain conference. The attendees were primarily orthodontists and general

The bad news is that few educators are able to achieve such dynamic mastery of their field.

dentists and they were asked to review a patient case history and examination finding before selecting, from a list of sixteen options, the diagnostic terms that best described the patient. As a group, the attendees selected fourteen of the sixteen (88%) of all possible diagnostic choices, and no single item was endorsed with a greater than 41% frequency. These data clearly indicate a serious lack of agreement among the attendees regarding their criteria for selecting a temporomandibular dysfunction

and chronic orofacial pain diagnosis. The same spread of choices, with poor overall agreement among the attendees was seen for their treatment selections as well. The genesis of this problem may be the fact that the traditional textbook and lecture format provides general factual knowledge but rarely exposes students to specific problem cases where decision-making skills are required. At the completion of the lecture course,

ter; (2) these students required an elapsed time of 30.0 minutes per case; and (3) the cohort of students showed an improved internal consistency in the achieved scores as they practiced more cases.

Problem #5: Development of Lifelong Learners. As knowledge increases, the need to stay abreast of it becomes more and more urgent. We all know of individuals who have not at-

non-existent. Dental treatment using lasers, air-abrasion, and bonding were not performed. Osseous integrated dental implants were not commonplace. The public concept of dentistry was as a solution for two-diseases: caries and periodontal conditions. Today's reality is that the modern dentist must differentiate and manage more than two hundred oral diseases. All of these facts encourage both educators and individual students to engage in the development of a lifelong learner mindset. The future demands it and striving for and maintaining success in one's career dictates it be so.

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student knowledge is traditionally tested with multiple-choice questions that evaluate the student's mastery of factual information and understanding of terminology. This type of educational methodology often successfully achieves its goal and is a time-proven approach to teaching factual knowledge.

One promising solution for teaching students how to diagnose and problem solve complex patients, is to use interactive, case-based computer simulation programs (Berger & Boxwala, 1995; Cundick, Turner, Lincoln, et al, 1989; Hubal, Kizakevich, Guinn, Merino, & West, 2000 Mulligan & Woods, 1993; O'Neill, 1990; Scheuneman, Van Fan, Clyman, et al, 1998; Stevens, Kwak, & McCoy, 1989). Computer hosted, case-based instruction has several advantages over the traditional textbook and faculty lecture-based learning methods. Such software forces the individual student to play the role of decision-maker and allows him or her to apply factual knowledge to an individual patient. Clark, Koyano, and Nivichanov (1993) described the value of such a case-driven computer-based teaching system. The study reported on the general performance a third-year cohort of dental students. The findings were as follows: (1) a majority (80%) of the students in the class used the system to practice a total of 508 cases during one 10-week quar-

tended a continuing education course in years and still practice using the methods they were taught in dental school. This issue would not be of concern if knowledge were constant, but twenty-five years ago, Fortune 500 companies and the military were virtually the only computer users. Bioterrorism was a concept that only existed in "spy" novels. HIV/AIDS did not exist and gloves were not used in dentistry except in surgical settings. Antibiotic-resistant infections were

One solution to the dilemma of promoting a lifelong learning orientation is to introduce students to the technology and methodology that will make learning more convenient in the future. It is not only necessary to introduce the methods, but also to ask students to model the learning behaviors you what them to demonstrate later in their careers. One method of doing this is to develop and place "advanced courses and content" online and let those students and recent graduate have ready access to it. On the plus side, this modeling may encourage students to access new knowledge in the future, but that is not

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Table 1: Student Involvement and Talent Development

Measures of Student Involvement
- Increased library use
- Increased hours of study on a specific topic
- Increased discussion with faculty and other students

Curriculum Actions That Promote Student Involvement
- More writing tasks (rather than multiple-choice tests)
- Guided independent study opportunities
- Interdisciplinary courses
- Fewer courses with broader topics and more time allocated per course
- Narrative evaluations of student performance
- Increased community involvement opportunities

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always the case. The magnitude of this problem is larger than any of the prior problems since there is a clear and progressive graying of the population. The major effect of increasing longevity combined with the rapid pace of biomedical and technologic change in the world means that many new diseases and treatments will surface and therefore lifelong learning will be a necessity, not a luxury.

Problem #6: Achieving Excellence in Education. Finally the problem of how to achieve excellence in education is one that every educator and every educational institution strives to solve. Excellence in education has been defined by Alexander Astin as the ability to achieve maximum talent development in a student (Astin, 1990; 1991). Astin has studied the talent development process in-depth in higher education, but not in dentistry per se. The results of this research can be stated as follows: "The highest degree of talent development is correlated strongly with a highest degree of student involvement." The outcome measures associated with increased student involvement are listed in Table 1. These measures mean that students are doing more than just attending class and studying to pass a test they may promptly forget. For example, the use of the library resources (other than a study hall), the number of increased hours of study on a specific topic, and increased discussion outside of class with faculty and other students via discussion sessions or student study clubs are all outcome measures that represent student involvement. The specific curriculum actions that seem to promote these behaviors are also listed in Table 1. These actions promote in-depth thinking rather than simple short-term memorization and include more writing tasks more guided independent study opportunities, community involvement projects, and interdisciplinary courses where different points of view on a topic are brought to bear. All of these actions promote student involvement beyond simple memorization and regurgitation in the classroom.

What We Know About Web-Enhanced Teaching

Of course a badly organized course with inaccurate and irrelevant content placed online is still bad, inaccurate, and irrelevant. Assuming the content is interesting, accurate, and relevant, the six educational problems described above can be partially or fully solved by hosting teaching modules on the Internet using the web. For example, limited access issues (Problem #1), at least for the content that can be taught with images and words, can be fully solved with web-based content. Teaching hands-on course material will still require a physical presence, although someday and for some procedures, remote simulators may make this problem more amenable to web-based teaching. The issue of how to provide asynchronous educational modules (Problem #2) to the schedule-challenged dental student or the practicing dentist or staff can be solved by putting courses online so they are available on-demand. Unfortunately, standalone, "on-demand" educational materials will not involve much real-time or instructor-to-student interaction. The issue of expanded depth and diversity of educational content (Problem #3) is one that lends itself to using the Internet to explore the massive digital databases that are available. Encouraging students to surf the web or Medline does not automatically make a course better, and this type of teaching will require training of faculty on how to most efficiently incorporate these material into their courses for greatest effect. The challenge of getting individual students experience diagnosing and treatment planning cases that are complex, relatively rare, or just not in their patient pool (Problem #4) is another problem that can be solved by developing and providing computer-hosted, case-based presentations on the web. Providing this content and tracking, recording, and evaluating student choices involves the most expensive and complex use of web-based technology. Until such software becomes more readily

Today's reality is that the modern dentist must differentiate and manage more than two hundred oral diseases.

available, most schools will not be able to develop, host, and monitor such sophisticated educational courseware. Finally, developing lifelong learners (Problem #5) and achieving excellence in education (Problem #6) are two of the more complex educational problems in need of solution. Simply mounting courses on the web will not solve either problem unless the design and implementation of the educational program is well thought out and adheres to the best educational principles.

The fact that most major universities have wired their student dormitory rooms for broadband access to the Internet is not because they want students to have faster, cheaper, and better access to their favorite digital music recordings. The second generation Internet has been launched and is operating at several universities. Many medical schools and now several dental schools mandate the students have a laptop computer and have set up online, in-house communication services throughout the school and clinic area. Some universities are mandating that every course has its own website and with every passing day, commercial web-site courseware is becoming more and more user friendly and available (Chodorow 1996; Davis, Wythe, Rozum, & Gorel, 1998; Sellen & Telford, 1998). No one argues that setting up a course web site and placing interactive content on the web from a course is a time-consuming process. However, the use of a web-site syllabus that has links to other databases brings increasing breadth and depth of content to the student. Such links allow students to access massive amounts of ancillary

information and allows them to work at their convenience and focus on topics of greatest interest to them (within limits). From a practical perspective, distributing information online can reduce problems and cost of duplication and distribution of course material. In general the time for web-based teaching is increasingly now (Davis, Winstanley, Duffin, & Griffiths, 1997). I would argue that the technology has advanced far enough that faculty time to produce computerized

graduates more likely to use the web for distance learning to keep abreast of new developments in the medical field. An example of why the such experiences need to be provided to the "captive audience" students is provided by a paper by Piga and colleagues (1995). They describe the use of distance learning methods with a nationwide databank of digitized video-based lectures as a method of providing continuing education for medical doctors in Italy. These authors

web-based videoconferencing on nurses' clinical skills in a rural Japanese hospital and reported that the number of nurses who endorsed the view that distance learning had value as a way to improve the care of patients was only 27% after the second session. The fact that 73% did not endorse distance leaning as a valuable adjunct to patient care may have been due to the content of the program provided. Nevertheless, these authors suggested that there was substantial usefulness of distance learning for upgrading the skill of clinical nurses in a rural Japanese hospital. Another study by the same group (Saeki et al, 2000) examined the value of a web-based videoconference course provided to health center staff in a rural Japan area. It included four ninety-minute sessions and two follow-up sessions to fourteen public health nurses, nutritionists, and dental assistants. They demonstrated that the attendees had greater knowledge of community health-care planning and evaluation and they had greater interest in telehealth educational methods after the course. The course had an additional benefit in increasing the collaboration between community health workers and university staff. Kim and Vetter (1999) describe a web-based real-time two-way interactive video and Internet course between a university in the U. S. and a college of nursing in Japan. The classroom environment used a combination of synchronous (two-way interactive video connections over an Integrated Services Digital Network) and asynchronous technologies (electronic mail, Internet-based discussion forums, and World Wide Web pages). Students' course evaluations highlighted areas of success and pointed out some of the challenges that remain for effective implementation of international education courses. Geraghty and Young (1999) discussed the pros and cons of using satellite based real-time video conferencing for continuing education program in oncology. As do other authors, they cite the need for rapid dissemination of medical information and lifelong learning in the arena of oncology. They describe a large video- and Internet-based (plus phone, FAX for

*M*any medical schools and now several dental schools mandate the students have laptop computer and have set up online, in-house communication services throughout the school and clinic area.

course content is equal to or less than traditional methods. Access of students to faculty can be equal to or better that traditional methods. The use of chat rooms, LISTSERVs, and e-mail interactions make it easier to ask individual questions and get answers. Finally, the development and packaging of unique expertise educational content for sale or trade with other universities or to nontraditional educational markets will be increasingly feasible. These facts argue strongly that web-based education is increasing and will be in our educational future. The only questions are to what degree and how soon.

Will Web-Based Learning Actually Produce Lifelong Learners? Since the World Wide Web is only in its first decade and only in the past five or six years has web-based teaching content become available, no one can know the answer to this question. However, there are several papers in the literature that describe the integration of videoteleconference-based and web-based teaching content into the daily fabric of medical and dental school curriculum (Khonsari & Fabri; 1997; Sear & Douglass, 1998). These papers suggest, but generally do not provide data, that these methods will make medical school

describe that although this unique distance learning opportunity gave physicians the opportunity to update their knowledge at home at their convenience, they made very little use of the video database. The main reasons for failure to connect with the educational database were the lack of time and unfamiliarity with the instrument. Although the results of the study were discouraging, the authors suggested that with resolution of technical problems linked with the system and an increasing familiarity of physicians with these educational tools, the Italian videotex system would work as an efficient medium for provision of continuing education.

What Are the Pros and Cons of Using Web-Based Teaching? The most commonly offered criticism for using the web-based teaching (e.g., electronic mail, LISTSERVs, newsgroups, and web pages) in lieu of traditional classroom teaching methods is that real-time interactivity among students and between the students and the instructor was diminished. There have been several reports that describe the pros and cons of using web-based teleconferencing methods to provide real-time, interactive class meetings. For example, Sawada and colleagues (2000) examined the effect of

those not Internet capable) educational programs, which were distributed to more than 220 sites across Europe. Unfortunately this report does not evaluate the efficacy of these methods versus traditional oncology conventions. Finally, Ware, Olesinski, Cole, & Pray (1998) describe the barriers and success of implementing an interactive video-based instruction program addressing issue in rural health case in the State of Kentucky. They concluded that extensive training of new instructors was essential to make the system work efficiently.

What Evidence Exists Regarding Efficacy of Web-based Teaching?
The data on this can be divided into two phases: reports on video-teleconferencing-based remote education and reports on Internet-based delivery of educational content. Those studies that compared video-teleconference-based remote education to live lectures and showed that at best these methods were comparable. For example, Freeman, Fell, and Muellenberg (1996) compared two types of delivery methods for clinical laboratory science teaching on forty senior baccalaureate degree students. The contrasted methods were interactive video-teleconferencing and on-site classroom teaching. These authors gathered data using eight post-tests scheduled at periodic intervals and via a national certification examination. The two-way analysis of covariance showed no significant difference between the students' examination scores based on delivery method except in the chemistry topic area. They concluded that their data generally support the use of interactive video-teleconference-based teaching as an effective alternative delivery method for students who cannot attend class on campus. They also concluded that it was not better than live, on-site provision of the same content. Hoskins, Neville, Smith, and Clark (1997) evaluated whether general practitioners who completed a distance-learning program on the topic would alter their protocol for management of patients with acute asthma attacks. They used data from two national surveys on the management of acute asthma attacks in the United Kingdom as their pre- and post-assessment conditions. The cohort that completed the distance learning module included 91 general medical practitioners and data was reported on the management of 782 patients with asthma attacks in 1991-92 and 669 in 1992-93. They found that the patient management protocol changed in line with recommended guidelines as a result of the online course. Unfortunately, they did not adequately control for the confounding effect of self-selection to participate in this program. Lewis, Bredfeldt, Strode, and D'Arezzo (1998) reported on the changes in residents' attitudes and achievement after distance learning via two-way interactive video compared to on-site educated residents. They had residents from five remote programs attend four educational conferences. Two resident programs received the same conferences but they were live and provided on-site. The authors assessed these two groups and found no difference in achievement, however, attitudes toward learning by interactive video declined after this experience. They suggest that this negative attitude was because the preparation of the faculty in this methodology was inadequate.

The Internet-based distance education program data present a similar but slightly more favorable picture when compared to on-site live lecture content delivery. For example, English, Harrison, and Hart (1998) reported on the effect of a distance-learning program in physical therapy and compared these students to on-site learning students. They reported that there was no statistically significant difference in the outcome measures between the two groups. Woo and Kimmick (2000) compared Internet-delivered lectures versus in-person lecture instructional methods and found that there were no significant differences in test scores and overall student satisfaction scores for the two methods. However, the Internet students reported significantly higher "stimulation of learning" compared with the traditional lecture students. Goldberg and McKhann (2000) found that student test scores were clearly improved in a virtual learning environment compared to traditional on-site lecture-based education only student scores. They reported that the average scores on weekly examinations were 5% higher after normalization for the virtual learning students. They suggested virtual learning made it possible for the faculty to spend less class time relaying facts and more time engaging students in discussion of scientific theory. In summary, the current data suggests that web-based delivery of content is at least as good, if not more effective than tradi-

Table 2: Presentation Methodologies for Distance Learning

- Real-time video conferencing
- Real-time audio conferencing
- Previously recorded, streaming media (audio, video, CDs or DVDs)
- Online media, static media (images with text, images with brief associated audio or text)
- Downloadable (off-line) streaming media (audio, video, text-audio)
- Downloadable (off-line) static media (images with text, images with brief audio, text only)
- Mailed media (videotapes, audiotapes, text-image workbook)

Table 3: Presentation Methodologies for Examination

- Secure paper-based tests with proctors (multiple-choice, T-F, fill-in, short answers, essay)

- Secure online testing with proctors (multiple-choice, T-F, fill-in, short answers, essay)

- Insecure paper-based or online testing (multiple-choice, T-F, fill-in, short answers, essay)

- Online keystroke monitoring of student behavior and choices

tional classroom-based education methodology. Obviously these preliminary studies do not establish this conclusion in a definitive manner and more work is needed.

What Distance Educational Methods Are Available?

The methods of providing distance educational content are many, and it is beyond the scope of this article to define and contrast these methods. However, I will present what I consider to be rules that should govern the selection of online presentation and testing methodology.

The first rule is that, *The target audience and budget-time constraints will dictate the presentation and evaluation methodology to be employed*. The various presentation methodologies that are available for use are listed in Table 2.

The second rule is that, *When there is a need to carefully distinguish and rank student performance proctored, secure testing is required*. The various testing methodologies are listed in Table 3. I will not compare or contrast these methods in this article, except to state the obvious. Namely, that proctored, secure, paper-based and online testing of students is the most stringent way of evaluating performance. The second most stringent way of evaluating student ability involves tracking of each online keystroke. Knowing these data allows student log-on behavior and web-viewing pathways to be recorded and evaluated. Finally, the least stringent method of student evalua-

tion is the insecure (open-book) paper-based and online testing method.

A Proposed Hierarchy for Electronic Learning Methodologies

Since the focus of this article is on web-based teaching, I will not focus on or review the non-web-based methods for teaching students that are at off-site locations. These methods include mailed video and audiotape-based programs and mailed self-paced text and image-based student workbook programs. Also included in this list would be the broadcasting of two-way live interactive teleconference based programs and non-interactive television and radio educational modules. Instead I will focus on the concepts that underlie e-learning using the Internet. To illustrate these concepts I have provided a diagram in Figure 1 upon which I will build this discussion.

Traditional Teaching Methods. These methods form the base of the pyramid since the basic principles that make a live real-time presentation interesting, accurate, and relevant also apply to a web-based presentation. The curriculum innovations that promote student involvement and make talent development possible do not change just be-

cause the content is delivered over the web.

Web-Based Teaching. The circle located in the center of the pyramid represents web-based teaching as it symbolically represents the common tread binding together all the other components of the pyramid.

Linear versus Nonlinear Presentations. On the left side of the pyramid are the two components of linear and nonlinear teaching. Lectures are traditionalyl described as linear presentations. They have a start and finish point and the pathway between these two points is followed without deviation. Online presentation that take a set of slides and notes and put them online for viewing or downloading without providing any diverting links to other content would be an online linear presentation. This method is less complex and generally an easier method to implement when doing web-based presentation so it is lower in the pyramid. In contrast, nonlinear teaching can occur in the lecture hall but if the instructor allows it, student-generated questions can dictate the content and meanderings of the presentation. Online presentation which are nonlinear provide links between content pages and the student are both directed and encouraged to follow the path that most suits their interest during the session. Nonlinear presentations is located higher in the pyramid as it is far more complex an educational concept.

Non-Tracking versus Tracking of Online Activity. On the right side of the pyramid are the two components of non-tracking and fully tracked presenta-

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*O*ne issue of concern to educators is that there is a risk of creating a two-tier system of education.

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tions. Of course, lectures are always non-tracked presentations since it is impossible to know if the student is following along or even paying attention during the presentation. Web-based presentations that are downloaded for offline viewing or printing are non-tracked

content. Even online presentations that are not downloadable but have no recording of what pages were actually viewed or how long the student spent viewing each page constitute non-trackable presentations. It is clear that online non-recorded or off-line viewing of learning module downloads allows no tracking of student choices. In other words, you can not be sure the student even looked at the content. In contrast, tracking of all selections made by the student and the time spent on each page in the web site can be performed with the right software innovations. A less involved tracking would be to incorporating periodic non-recorded quizzes into the content pages where passing the quiz releases access to the next page.

Concept and Content Development Complexity. As you move from linear content to nonlinear content the time required for development of the underlying educational concepts and the content increases in complexity. For example if you want to provide the student with problems to solve and allow them to explore the options and at the same time provide immediate interactive feedback as they make these choices, this requires a far more complex educational plan than simply taking a set of slides and notes and putting them online for viewing or downloading.

Cost and Technology Complexity. As you move from non-tracking to tracking of online content the costs (mostly time) of providing this content and analyzing the student performance will rise substantially. Moreover the complexity of the technology to actually provide online tracking increases substantially since this requires a relatively powerful database be running in the background.
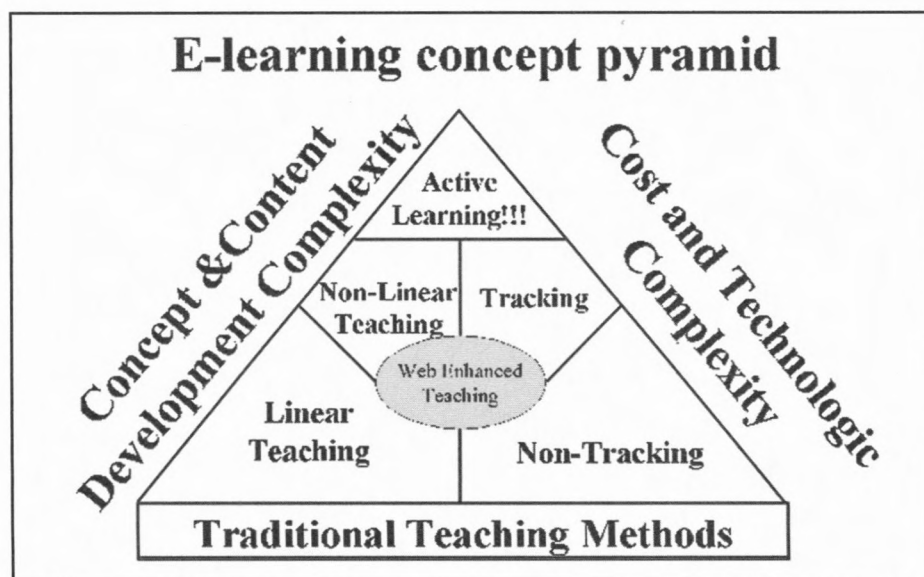
Achieving Active Learning. Located at the highest point in the pyramid is the block labeled active learning. This concept is synonymous with increased student involvement in their education, and the concepts of nonlinear student determined learning modules and close tracking of student choices performance would be methods that promote and allow assessment of how much active learning is occurring.

Summary and Conclusions

With the advent and increasing use of the Internet, one issue of concern to educators is that there is a risk of creating a two-tier system of education. The bottom tier will be the non-Internet access students. These bottom tier students will not necessarily be students located outside the U. S. since half of the estimated 377 million people currently using

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The way dental educators provide information to their students will change in the near future.

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the Internet are outside the USA. Those in the bottom tier will be those who do not have access to or whose instructors have chosen not to incorporate web-based methodologies into their educational efforts. A bipartisan, U. S. congressional committee report on this topic concluded that the promise of the Internet lay in its unique ability to center learning on the student instead of the classroom, to focus on the strengths and needs of individual learners, and to make lifelong learning a reality. This report states that the Internet cannot solve every problem in education and there is a substantial need for continuous and relevant training and support for educators and administrators at all levels regarding how to develop and deliver web-based content. If the support for this training and infrastructure is not forthcoming soon, the current generation of educators will not solve the problems I have presented and their students will miss the opportunity to incorporate this powerful technology into their lives and the barrier to lifelong learning via the Internet will not be lowered.

What I have presented in this article should suggest that the way dental educators provide information to their students will change in the near future. I suggest that dental educators will need to incorporate web-based teaching content into their teaching efforts when even and where ever it seems feasible. Finally, I would predict that while web-based teaching may not prove to be cheaper, it can be substantially faster and better. The qualifiers on this last statement are that web-based teaching will be "faster" for the student to acquire knowledge but not

E-learning concept pyramid

Concept &Content Development Complexity

Cost and Technologic Complexity

Active Learning!!!

Non-Linear Teaching | Tracking

Web Enhanced Teaching

Linear Teaching | Non-Tracking

Traditional Teaching Methods

for the faculty to create it and "better" in that there will be increased depth and diversity of content being provided.

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Future of Dentistry—Education Chapter

The Future of Dentistry Report was accepted by the ADA House of Delegates at the annual meeting in October 2001 in Kansas City. This report addresses issues of significance to the future of the profession, offering both in-depth factual background and recommendations.

The thirty recommendations having to do with education are reprinted below with permission. Readers are strongly encouraged to obtain a copy of the full report from the ADA, to read it thoroughly, and to become involved in the future of dentistry.

David W. Chambers, EdM, MBA, PhD, FACD
Editor

RECOMMENDATIONS FOR DENTAL EDUCATION

Education is expected to undergo dramatic changes in the next 15 years. The cost of dental education, probably the highest of all the major academic offerings, threatens to price dentistry out of the education marketplace.

Greater integration of the dental school into the surrounding academic community will help to sustain support but will not prevent cash-starved health science centers from looking at their dental schools as a potential financial resource for its medical programs.

All of this is taking place at a time when expansion of oral and craniofacial science, changes in disease patterns, advances in dental materials, coupled with technologic advances are competing with the traditional elements of dental education for curriculum time. Compounding these issues is the recent reduction in dental school applicants, the lack of progress in increasing the diversity of dental school students and faculties, and an inadequate pool of qualified faculty members.

Reduced government support and increased regulatory requirements have contributed to the escalating educational cost. This eliminates large segments of the college population from considering dental school as a career. This is even more evident among certain minority groups who are enrolling in other career programs with shorter training periods and higher rates of return. A continuation of this trend promises to negatively impact attempts to increase the diversity of the dental workforce. Upon graduation, large educational debt may be a factor in career choice, forcing many of these young practitioners to place undue emphasis on monetary priorities during the formative phase of their careers. For some, this means forgoing a career in dental education.

FINANCIAL SUPPORT FOR HIGH QUALITY DENTAL EDUCATION

The provision of quality dental service for all Americans must be considered a national goal. Critical to obtaining that goal is the education of a high-quality, diverse cadre of dental practitioners.

Education Recommendation-1: The provision of sustained federal/state funding to support dental student training, either in the form of scholarships or direct unrestricted block grants, should be a high priority issue.

Education Recommendation-2: Creative financing and partnership with various communities of interest should be developed to increase the diversity of the dental workforce.

Education Recommendation-3: Programs should be developed to educate dental students and young graduates in debt and financial management.

Government leaders have suggested that reductions in federal and state support of educational institutions, such as dental schools, should be made up by the private sector including corporations, faith-based organizations, foundations and individuals. In this regard, dentists have proven to be charitable individuals by virtue of providing large amounts of free care to the poor. However, they generally have not focused their charitable giving on their dental educational institutions. Since corporations and foundations frequently assess alumni support as a measure of the worthiness of the institution, an increase in support by dentists for their alma mater would likely be highly leveraged. Such support would make the dental educational system less dependent on tuition and clinic income, and would likely lead to the graduation of dentists in less debt, as well as the development of a dental educational system which is in greater resonance with the issues that confront clinicians in private practice.

Education Recommendation-4: Dentists should be encouraged to provide significantly increased financial support for their educational institutions. They should also suggest to grateful patients as well as to other philanthropic individuals among their friends, that they consider a gift to the local dental school.

COST REDUCTION

Non-tuition revenue sources for the education industry have been pushed to limits. Thus, additional costs must be absorbed by tuition increases that add to high student debt. State contributions to health education centers are often controlled by medical administrations that, with their own budget pressures, are becoming increasingly reluctant to share their declining funds. To address the potential of reduced or insufficient funding, dental schools should seek ways to provide education at reduced cost without compromising quality.

Education Recommendation-5: Dental schools should explore regionalization in dental education in which dental schools collaborate to reduce costs and enhance quality in dental education. Dental schools should examine the cost effectiveness of sharing teaching faculty through electronic distance learning.

Innovative techniques, such as placing curriculum on a DVD, clinical simulation, and virtual reality warrant further evaluation as means of reducing instructional costs.

Education Recommendation-6: Dental educators should seek to use new technology and scientific advances which have the potential to reduce the cost of instruction.

OFF-SITE CLINICS

Maintaining a fixed clinical site, owned and operated by the dental school, is exceedingly costly. The medical model of sending students to hospitals and clinics for third and fourth year training experiences has resulted in significant cost reductions relative to corresponding dental school-based training. Off-site training opportunities for dental students that are educationally sound and provide access to care for the underserved should be encouraged.

Attempts to increase the dental school's clinical income through establishment or expansion of clinic activities outside of the school's primary location could put the school in direct competition with its practicing community. When dental schools have established clinics staffed by clinical faculty in affluent neighborhoods, the local professional response has not been supportive.

Education Recommendation-7: Any plans for a dental school to expand its clinical activities outside the school's primary location should be discussed with local practitioners, alumni and local components of organized dentistry.

Education Recommendation-8: Research should be conducted on the cost effectiveness of off-site training opportunities.

CULTURAL COMPETENCY

The dental profession should reflect the diversity of the population and have the cultural understanding and skills needed to provide services to a growing and diverse patient population. Dental schools have a responsibility to recruit and retain under-represented minority students and faculty and for training students to be culturally competent in dealing with various populations.

Education Recommendation-9: Dental schools should develop programs in which students, residents and faculty provide care for members of the underserved populations in community clinics and practices.

Education Recommendation-10: Dental education curriculum should include training in cultural competency, as well as the necessary knowledge and skills to deal with diverse populations.

CURRICULUM DEVELOPMENT

The explosive growth in dental knowledge will challenge dental educators to provide programs that enable the new graduate to deliver quality dental care to the public within the traditional curriculum length. The dental education curriculum should become more relevant to the practice of modern dentistry. Areas which should receive greater emphasis include: special needs populations; applied pharmacology, including pain management; business management; esthetic dental techniques; implant prosthodontic therapy; and increased knowledge of systemic disease. This would better prepare dentists to treat patients with complex medical problems. The skills necessary to evaluate the safety, efficacy, and cost effectiveness of new treatments also should become an integral part of the curriculum.

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Education Recommendation-19: The dental profession should develop educational tracks with special degrees or certification for students interested in research, education, or public health futures. Specialized curricula should be developed to train these individuals for work in those areas.

Education Recommendation-20: The dental profession should seek actions to extend debt forgiveness programs to dental graduates who are willing to make a commitment to academic dentistry.

Insufficient numbers of specialty-trained faculty could lead to a shortage of specialists in the distant future. Affordable, high quality, postdoctoral training opportunities for the development of dental specialists are essential to the viability of the profession. All components of the dental care system are dependent on the training of sufficient number of specialized clinicians, practitioner consultants, dental researchers and educators.

Education Recommendation-21: Federal programs that underwrite research and specialty training need to be enhanced with sufficient funds allocated to dental applicants.

Education Recommendation-22: Specialty organizations should be encouraged to continue efforts dedicated to funding teaching scholarships and fellowships.

Education Recommendation-23: Dental educators should be encouraged to test alternative, less faculty-dependent models for educating dental students.

CENTERS FOR RESEARCH EXCELLENCE

Dental schools must be supportive of the development of new knowledge and its incorporation into practice. The success of the future of dentistry depends upon the dental schools' expansion of scholarly activities. The conduct of and resources for these activities will increasingly rely on multi-disciplinary and multi-institutional collaborations. Competition for scarce research dollars, which can enhance faculty productivity and offset portions of educational salary commitments, is expected to increase. It is unlikely that all dental schools will be able to successfully compete for the funds necessary to develop and maintain a sophisticated research program. The mission of these research mega-centers would focus on developing the research capabilities of faculty members of a research consortium. Both on-site and off-site research involvement would be offered.

Education Recommendation-24: The dental profession should support the establishment of centers for research excellence that provide research training and opportunities for organized research for dental faculty within a defined geographic area.

MAINTENANCE AND ENHANCEMENT OF EDUCATIONAL FACILITIES

Many of dental education's physical facilities require major renovation. Many students are not using state-of-the-art equipment. With schools unable to set aside funds for deferred maintenance, the financial resources needed to purchase new technologies to enhance student learning are unavailable.

Education Recommendation-25: The dental profession should develop lobbying efforts directed towards the development of new assistance programs for the improvement of the physical facilities of dental schools.

ALLIED DENTAL PERSONNEL TRAINING

Training opportunities for some members of the dental team are not sufficient. There are shortages of all dental allied personnel. If the dental team is to function in the most efficient manner, a sufficient number of competent team members should be available. In addition, dental practitioners need to provide a stimulating work environment with sufficient reward systems to acknowledge performance excellence by dental team members. Continuing education opportunities, supported financially by dental practices, may provide the incentives for existing team members to stay in practice.

Education Recommendation-26: Well-funded, innovative recruitment programs to identify and enroll quality candidates for dental hygiene, dental assisting, and laboratory technology education should be developed.

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Requirement-Driven Dental Education and the Patient's Right to Informed Consent

Scott Van Dam, DDS and Jos V. M. Welie, PhD

Abstract

In dental education, students spend much of their time treating patients' oral health care needs. Many dental schools still require students to complete a specified number of treatments of various kinds before they can graduate. It often happens that students need to do a particular treatment in order to complete school requirements, when this treatment is not what the patient truly needs, or is not the only treatment indicated for the patient's condition. Consequently, students will be tempted to talk the patient into accepting the procedure. Likewise, educational requirements may tempt the student to postpone certain treatments or forgo non-credit-bearing interventions altogether. We argue that this conflict of interest is inevitable (even though the educational system adopted by the school may mitigate the problem) and analogous to that found in therapeutical experimentation. Hence, we advocate the same ethical solution as has long been adopted for conflicts arising in biomedical experimentation: informed consent.
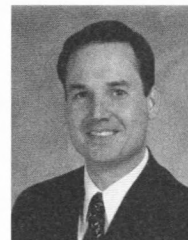
Dr. Van Dam is a resident in the Department of Oral and Maxillofacial Surgery at the Mayo Clinic in Rochester, Minnesota.
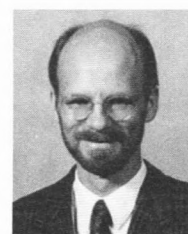
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Some years ago, while still in dental school, one of us was browsing around the bed and mattress section of a large furniture store and overheard parts of a conversation between a saleswoman and someone she appeared to be training. The trainee was being told which mattresses to show the customer first and what information to share with the customer about them in order to maximize sales of the more profitable mattresses. Initially, it was a bit surprising that the saleswoman would be so frank about her sales tactics, with customers within obvious earshot. Or was it naive to imagine that any salesperson, anywhere, would conduct sales business much differently? It is, after all, a salesperson's job to help customers spend their money liberally, and it is up to the customer to shop around, ask the right questions, and figure out what good value really is.

In the domain of health care, the customs are different, or at least they should be. Early on in their education, dental students are taught the importance of adhering to a professional rather than a commercial model when practicing dentistry. Here, the word "profession" is to be taken quite literally: A professional is someone who professes, that is, who publicly promises (to act beneficently). Even if most dental students do not swear an oath at graduation (as do most medical students), they are still professionals because they belong to the profession of dentistry. Indeed, it is the profession as a whole, and not just individual dentists, that professes to act on behalf of the public. The public, in turn, trusts individual dentists because of this comprehensive commitment by the profession of dentistry as a whole. These are the terms of the "social contract" between dentistry and society.

It is important to emphasize that the hallmark of a profession is the benefit of patients and not simply the maximization of the interests of all parties involved. Consider a patient with a congenitally missing maxillary lateral incisor and an otherwise nicely aligned and well maintained dentition. A three-unit bridge or a single tooth implant could both be satisfactory ways of replacing this missing tooth. The bridge, a routine and profitable treatment in any dental office, could be prepared and fabricated quickly at a slightly lower cost to the patient than the implant. Conversely, the surgical placement of the implant would have to be referred to a specialist. Several months later the dentist would begin restoring the implant with a single crown.

If the goal were to maximize the interests of both the dentist and the patient, the bridge would be the obvious choice: the patient receives a satisfactory restoration quickly and at a slightly lower cost, and the dentist doesn't give up a considerable portion of the profits to a specialist. However there are good reasons for considering the implant as well.

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The bridge involves crowning and thereby compromising the adjacent teeth to a certain extent. The main clinical advantage of an implant is maintaining integrity of the adjacent teeth. This may or may not be a significant issue for the patient weighing these two very different yet acceptable treatment options. But regardless of how the patient decides, the information or options given to the patient must not reflect any interests besides those of the patient.

The Code of Ethics of the American Dental Association emphasizes that "professionals have a duty to act for the benefit of others...the dentist's primary obligation is service to the patient and the public-at-large." The code furthermore states that obligations related to managed care, or other "practice arrangements"... "do not excuse dentists from their ethical duty to put the patient's welfare first." (Section 3). Although no reference is made to competing interests of the dentist, the final eight words make clear that the interests of patients ordinarily override those of all others, including the dentist.

One of the ways in which the profession of dentistry operationalizes its commitment to the public's trust is by insisting on medical indications for treatment. Dentists will only recommend treatments that are actually indicated because of the patient's medical condition. In other words, patients can be assured that if a dentist recommends a particular intervention, it is not because the dentist is trying to maximize his or her income, as any good salesperson would. The patient does not have to adopt a "buyer beware" posture as the clients in a furniture store should. Patients don't expect to have to shop around, ask all the right questions, and assume the responsibility for coming up with an appropriate treatment plan. Instead, patients trust their dentist to communicate honestly and thoroughly with them about *their* oral health status and needs and finally to recommend treatment always with *their* best interest in mind. If the bridge is recommended, it is a treatment that the patient truly needs and one that is the best remedy for that need. If, as is often the case, more than one treatment would adequately address the patient's dental health needs, the patient should be objectively informed of other considerations such as differences in durability, cost, or esthetics of different restorative materials.

If at any moment in time a dentist shifts his or her practice from medically indicated interventions to purely elective interventions, the dentist ought to inform the patient of the fact that the treatment recommendation is not based on objective indications. Whether a patient needs a crown can and should be established according to scientific pa-

rameters that are independent of both the individual patient's subjective wishes

point students must switch from mannequins and models to real-life patients.

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as well as the particular dentist's preferences. If a patient doesn't want a crown, the dentist can still argue that the crown is truly indicated on the basis of an objective assessment of the patient's condition. But there are no such objective parameters to determine whether a patient requires whiter teeth, for example. A "need" for tooth whitening generally cannot be diagnosed independently of the patient's subjective wishes. It would not make much sense to tell a patient that she truly needs whiter teeth, while that patient adamantly insists she is perfectly happy with her tooth color (Welie, 1999).

Dental Students

This "contract with society" pertains to all dentists who profess to practice according to the objective principles of medical indications. It also applies to dental students who practice under the auspices of licensed dentists in dental school clinics. The patients who frequent these clinics cannot object to their being treated by students, although the fact that they are treated by students should be made very clear to them. But patients can insist that their treatment recommendations are determined by objective principles only, and not by the private interests of the dental students treating them.

Dental students will not gain financially from recommending treatments that the patients do not really need. But that does not mean that students are always motivated by altruism only. In order to refine their clinical skills, at some

This means that students treat patients not, or at least not only, because the *patients* need those treatments but because the *students themselves* need those treatments.

Many dental school curricula insist that each dental student, prior to graduation, complete a certain number of procedures. In any given quarter or semester each student must successfully complete a certain number of Class II amalgams, posterior composites, anterior composites, gold restorations, amalgam polishes, crowns, dentures, root canals, quadrants of periodontal scaling and root planing, exams, treatment plans, prophylaxes, and so on. It is then up to the student to find the patients who need these treatments and get them done in the time period specified by the school.

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This is accomplished with relative ease by some students and with considerable difficulty by others in those schools that use requirements. The risk of having to repeat a year or graduate late and not be eligible to take licensure exams at the regularly scheduled time is a source of great anxiety for many students. In a 1997 study, Peretz and colleagues asked Israeli dental students about potential stressors in their learning environment. The primary stress factor

for the students in all three classes surveyed (fourth through sixth year) was the quantitative requirement system. Similar findings are reported by several other researchers in the U.S. and elsewhere (Dodge, Dale, & Hendricson, 1993; Grandy, Westerman, Combs, & Turner, 1989; Hicks, Dalem & Hendricson, 1985; Sgan-Cohen, 1989; Yap, Bhole, & Teo,1996).

Being efficient and motivated is the best way to avoid getting into problems with requirements. However, for many students, efficiency and motivation do not suffice to meet all the requirements. A requirement-conscious approach to patient selection, treatment planning, and patient management becomes necessary, and is an acknowledged problem among dental students and faculty (Dodge, Dale, & Hendicson, 1993; Vining, 1984). Generally, students have no control over which patients enter the clinic for treatment; but they may have a choice whether or not to accept a patient once the initial screening exam has been completed and the patient's needs have been determined. This approach involves thinking twice before accepting patients with complex treatment needs that will be difficult and time-consuming or patients with needs that do not coincide with educational requirements of the student. Students know that they cannot afford to simply keep busy treat-

ing whatever comes their way. Even basic required restorative procedures must be kept in balance with each other.

A good example is the management of small to moderate Class II lesions. It should be noted that small (incipient) Class II lesions are a valued commodity in many dental schools, especially when competency exams and initial licensure examinations come around. The most ideal lesions are best saved for competency exams or boards, while less-than-

ideal lesions are spread out proportionally to cover requirements for Class II golds, silvers and composites. If requirements call for at least eighteen Class II silvers, five Class II golds, and two Class II composites during a year, a student who ends up restoring a total of thirty Class II lesions will obviously need to make sure that eighteen of these are restored in silver, five in gold, and two in composite. Most students find that this takes at least some "steering" on their parts when it comes to treatment planning with the patient (see sidebar).

The student's needs to complete certain types of requirements influences not only the planning of patient care but also the scheduling and sequencing of care. Treatment plans may be completed in the sequence and even to the extent that benefit the student. Often there is an unavoidable sequence of steps to accomplish a treatment plan, based on the urgency of the patient's problems as well as school policies. However, there is a fair amount of flexibility in the system as well. Students can game the system and try to postpone treatment or delegate specific treatments to other students. The patient then ends up in a kind of holding pattern along with other patients waiting in the wings for work to get done. Patients with complex treatment needs are more likely to find themselves in such a limbo pool or being passed around between students who "cherry pick" from the patients' treatment plans to meet their educational requirements.

In our experience, students and faculty members do try to foster expeditious treatment of patients. However, both students and faculty in some schools have come to accept requirements as an unavoidable fact of the dental education culture and have learned to turn a blind eye to ethical problems created by this artificial treatment model. It is not uncommon, nor necessarily even frowned upon, to schedule a patient for a competency exam to fill a small, non-progressing carious lesions, while the treatment of the patient's other, more advanced carious lesion is delayed. Too

Case Scenario in the Ethics of Case Selection

George O'Brian, a fifty-five-year-old man, visits the dental clinic because of a "hole in his tooth." George is a school bus mechanic who intends to pay in cash. Mary Simonsen, a third-year dental student, examines George. The "hole" turns out to be a large, cavitated Class III (#10). The patient also has three large Class V abfractions, a relatively ideal Class II lesion (#20 with occlusal sticks, fractured MMR, incipient mesial caries), extensive incisal abrasion, group function, and fremitis from bruxism. The Class I mobility for #10 and the cervical abfraction obviously are due to the bruxism. Mary performs a cleaning and writes an operative treatment plan. She schedules three operative appointments, explains the bruxism problem to the patient, and adds an occlusal night guard to the treatment plan although she does not really anticipate that the patient will view a night guard as a high priority (and hopes the patient will not since fabricating a night guard yields no educational credits for Mary herself).

Mary has finished all Class III composites for the year, eleven of fifteen required Class II silver amalgams, three of five Class II golds, but neither of the two required Class II direct composites. Moreover, Class II composites must be done on premolars, while golds and silvers can be performed on molars or premolars.

When the patient returns for the first operative appointment, Mary presents George with the treatment plan for him to sign. At this time the patient asks her what filling will be done first. Mary has already listed tooth #20 on the composite grade sheet for today's procedure. Surprised, the patient asks why not fill "the one with the cavity." She explains that tooth #20 has a cavity as well and it wouldn't matter much which one we did first. But the patient insists that the #10 (Class III) can be painful at times and wants it filled first. Mary is worried that the patient may not return for the second and third appointment once the "hole" has been filled.

often this patient ends up back in the limbo pool while other student priorities are attended to, particularly when the school year is about to end and students are scrambling to meet requirements. As senior students approach the time of graduation and board exams, some will use their own money to pay for work to be done. Most perturbing is the finding that a small minority of students intentionally create lesions for board examinations (Feil, Meeske, & Fortman, 1999)

Role Models and Rationalizations

This brings us back to the example of the two furniture salespeople. When the new batch of preclinical students enters the clinic, they promptly receive some informal "training" from the seniors. Instead of telling each other which mattresses to sell first and how to go about it, students learn from each other what types of patients to look for, which requirements to make their highest priority, how to avoid getting bogged

down in non-essential treatments, and even how to get patients to choose certain restorations.

For example, there are different sales pitches for different materials. "Gold inlays and onlays are the 'Cadillac' of all fillings"; "the school charges much less than private dentists on the outside do, because the school wants us to get a lot of experience"; "I can achieve the best restoration contours with gold"; "I love to work with gold and this would be the perfect situation." Composites "are the way dentistry is going"; "they actually bond to the tooth"; and of course they are "esthetically much more pleasing." Silver is "cheap"; is "time-tested"; and "permits the least amount of recurrent decay."

Obviously, these strategies to align patients' clinical needs with students' educational needs are not written down or even handed down as such. Instead, they are role-modeled by senior students and adopted by every new generation of

golds can be hard to come by, either because patients choose silver which is cheaper, or don't want to travel to the dental school for two appointments, students are quick to suggest gold, even to their Medicaid patients. If a Medicaid patient chooses this option but cannot pay, students will sometimes pay for all or part of the gold filling themselves. This effectively illustrates that some students may end up under considerable pressures to complete specific requirements.

Before we analyze the ethical quandaries that arise out of these conflicts of interests, it should be emphasized that most students do not seek these conflicts; they are simply placed in situations where they must deal with these issues in order to graduate. Indeed, most students are painfully aware of the fact that their own educational interests conflict with the needs of patients. This is why they seek to rationalize their decisions in an unconscious attempt to appease their troubled conscience. The problem we

these patient wouldn't be able to get treatment elsewhere because they are too poor to pay the steep fees typically charged in private dental practices. Dental school clinics provide a valuable service to such indigent and marginalized patient populations. Although this is true for many dental school clinics and although those schools can justly be proud of their charitable involvement in care for the underserved, that fact, in and of itself, does not answer the question raised. That a patient may not get any treatment whatsoever if the patient is not treated by a dental student does not justify the student's using that patient as an object of educational requirements. Although the patient's interests are evidently served by receiving dental care in the school's clinics, the fact remains that the dental student, in providing dental treatment to the patient, is not focusing on the patient's interests only. As pointed out earlier, the hallmark of a profession is not a utilitarian maximization of the interests of all parties involved. The interests of the patient should supersede the interests of the dental professional, including the dental-professional-in-the-making.

*T*he strategies can become so inconspicuous that they loose their cynical edge and begin to sound quite reasonable.

students in much the same way as the unspoken rules of etiquette are passed from generation to generation. In fact, the strategies can become so inconspicuous that they loose their cynical edge and begin to sound quite reasonable: "What could be wrong about recommending gold to the patient instead of amalgam? After all, it is the 'Cadillac of treatments' and who wouldn't want the best possible treatment?"

Students not only are pressured to give priority to their own educational needs by dental schools that have requirement systems. Reimbursement issues can further complicate the problem. For example, Medicaid does not pay for gold inlays or onlays, let alone most crowns and bridge work. And yet a significant number of dental school patients are on Medicaid. Since Class II

are facing is not one of uncaring individuals; it is a systemic problem invoked by the structure of some dental school curricula, specifically those with significant numerical requirement systems.

Toward a Solution

Many dental students are under pressure to get requirements fulfilled and as a result base their treatment recommendations in part on their own educational needs rather than the medical needs, financial restraints, and other personal interests and preferences of their patients. If we grant there is a potential conflict of interest, the question arises whether the conflict is serious. Does this behavior constitute a violation of the very "profession" of the profession of dentistry?

One of the commonly offered answers to this question is that many of

If we concede that this conflict of interests poses a serious ethical quandary, how can it best be addressed? It does not suffice to merely acknowledge the conflict, leaving it up to students to handle the conflict the best way they ethically can. Granted, graduated dentists will face all kinds of pressures and conflicts of interests as well. Their bank loans may be weighting them down and tempt them into recommending the more expensive treatments to their patients. However, it makes neither ethical nor educational sense to intentionally abandon students to these conflicts of interests simply because they will face similar conflicts once they have graduated. Indeed, by abandoning students to these conflicts we run the risk that they will become ethically more callous rather than robust.

From a students' perspectives, the problem is significantly reduced if the faculty, rather than the students them-

selves, carry the responsibility for these decisions. This can be achieved if dental students, much like medical students, rotate through different clinics, treating whatever patients have been scheduled during that time period. Faculty mentors, assisted by computerized student

may not be used to serve the interests of the dentist or dental student only; instead they must be respected as bearers of interests and dignity in their own right.

It is true that our situation—treating patients' oral health care needs in order to serve students' educational interests

cause they themselves chose to be involved in the research.

The principle here is better known as "consent." Consent by the research subject is ethically necessary in any and all experimentation with human beings, whether therapeutical or non-therapeutical. In order for the consent to be valid, the choice must be a genuine choice. Genuine choice minimally requires that one knows what one is choosing for or against. Hence, the consent that is to be obtained from these research subjects must be an "informed consent." It is the responsibility of the researcher to make sure that each and every subject is informed and understands what he or she is choosing for or against.

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records, guard over the students' progress in all relevant areas. One of the alleged down-sides of such an educational system is the decrease in the number and variety of clinical experiences per student during the course of their education, but several previous studies reported no such decrease (Evangelidis-Sakellson, 1999; Herring & Stephens 1982; Holmes et al. 1999; Johnson 1999)

However, such a shift does not dissolve the conflict; it only relocates it. The patients are still treated with the students' educational interests in mind, be it the mind of the student or that of the supervising faculty member. Different educational systems may exacerbate or mitigate the problem, but no system will fully circumvent the problem if only because students must be trained and such training must occur on patients. While it may be possible to develop licensure exams that do not require human subjects (Buchanan 1991; Meskin 2000), dental education itself will always involve patients.

If the problem is real and serious, and can only be mitigated but never resolved fully by structural changes in the curriculum, is there an ethically sound manner of handling it? The problem at hand is probably best understood in reference to the warning of the German ethicist Immanuel Kant (1724-1804): Never treat another human being as a mere means to someone else's ends, but always also as an end in himself or herself. Applied to the area of oral health care, Kant's warning means that patients

and thus the interests of future patients—does not violate Kant's maxim outright. After all, the patients are not merely used for the students' interests; the patients' own needs are met as well. The patients in dental school clinics are not like guinea pigs, involved solely to be experimented on by dental students. Nevertheless, the patients are treated as guinea pigs to the extent that they serve the students' educational needs rather than their own clinical needs. It is this "instrumental use" of patients that poses the ethical problem.

Consider the analogous ethical problem of scientific experimentation with human beings. Even so-called therapeutical experimentation where patients may benefit from their participation in the experiment, remains an ethically troublesome endeavor precisely because the patients serve a secondary interest, that of the researcher: gaining new knowledge. Granted, scientific progress is possible only if we experiment with human beings. But the great good of scientific progress does not yet justify using human beings as passive instruments to other people's ends, not even if the experiment is therapeutic. The only way to resolve the problem of instrumental use of human beings is by asking them to volunteer. It is generally believed that if patients truly volunteer to participate in an experiment, they become in some sense participants in the research rather than the mere object of the experiment. They are no longer "used" by the researcher—akin to a flask or a rat—be-

Informed Consent for Treatment by Dental Students

If the analogy between the world of dental research and dental education is fair, the answer to our ethical quandary appears rather simple: informed consent. The treatment of patients by dental students can be ethically justified even if that treatment is determined in part by the students' educational needs rather than the patients' own clinical needs, provided each patient has granted informed consent to such treatment.

Most assuredly, students are required to obtain the patient's consent to treatment before treatment can be initiated. But are patients properly and fully informed prior to consenting, specifically where such conflicts of interests are concerned? We have already pointed out that patients who come to dental school clinics know that they will be treated by dental students who are there to learn. They should know that treatment may take longer because the student is not yet as proficient and the work will be interrupted repeatedly for check-ups by supervising faculty members. While serious and irreversible errors should not occur, certain steps in the treatment plan may have to be repeated in order to be truly satisfactory. All of this the patients coming to a school clinic should know. But is it reasonable to expect that they also know about the students' conflicts of interests?

Most patients probably do not. They do not expect that students at times are motivated by urgent educational requirements. Patients trust dental students precisely because those students are already part of the profession of dentistry. Patients assume that dental students will always give priority to the patients' health problems in the same way as they expect dentists to be altruistic. By not informing patients of the existence of conflicts of interests, students are dishonest in exactly the same way as the clinician-researcher who does not reveal his or her research interests, or the dentist who seeks to boost his or her own income by talking the gullible patient into an expensive but elective cosmetic procedure. Patients in dental school clinics not only must be made aware that they are being treated by students, which may take extra time and the involvement by supervising faculty members, if students experience difficulties. They must also be told that the educational interests of students may compete with their own health interests.

We know that students must introduce themselves as students, not as dentists. They must readily admit to the patient when an error occurred that now must be corrected. Likewise, students must openly and honestly divulge to the patient that the patient's missing tooth could be replaced with an implant, but it would be much appreciated if the patient would allow the student to place a bridge instead. It is not at all a violation of the patient's autonomy and respect, nor of the student's own duty to beneficence, to recommend an indicated and effective treatment because the student needs it as well, provided the patient is honestly informed. Any other way of getting the patient to consent to the bridge—either by demeaning the alternative treatment options or by simply offering only one option, hoping the patient will not inquire about alternatives—is a violation of the "profession" of the profession of dentistry.

The second component of informed consent concerns the free choice by the patient. Freedom of choice means that the patient must be able to say "no." The very fact that many of the patients treated in dental school clinics would not be able to get treatment elsewhere is a reminder that these are vulnerable patients. Many cannot say "no" for they have no place else to go. Moreover, many of these patients may be hesitant to assert their own wishes against the recommendations of the student, fearing that they may lose out on treatment altogether.

This brings us to the issue to payment. There is general agreement that a participant in an experimental research project should not be paid, because payment is likely to induce many people, and particularly indigent people to consent. Any form of stipend, even a small amount, can become an ethical problem. On the other, it seems equally unfair to charge people for their participation in a study, even if the experiments are therapeutic. Hence, the research institution commonly absorbs the excess treatment cost of the patients enrolled in clinical trials.

In this perspective, it seems appropriate that the dental school, rather than patients, pays for the treatments that the students need. This phenomenon, however, is rare. Most often, the patients simply pay the school for the treatment provided. Granted, the fees generally are much lower than those charged by private dentists, which is probably the main reason why most patients visit the dental school clinic rather than a private dentist, and not their altruistic commitment to the advancement of dental school education. Indeed, if a patient is honestly told that a bridge is recommended over the implant because the student needs to do a bridge to fulfill educational requirements imposed by the school, the patient may be willing to accept the bridge, but probably not if he or she has to pay for the difference as well.

It seems only reasonable to expect some sacrifice on the part of society for the sake of educating future generations of dentists. However, we should not lose sight of the fact that those treated in dental school clinics typically are the marginalized and indigent, whereas those who will benefit the most from well-trained dentists are the upper and middle classes of society. The history of biomedical experimentation has clearly shown that the burden of research has largely been born by the vulnerable (e.g., minorities, mentally handicapped patients, prisoners, soldiers) and the poor. We can safely assume that the same is true in regard to medical and dental education.

Concluding Remarks

Dental education can be thought of as a unique practice arrangement wherein not only the clinical needs of patients but

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also the educational needs and graduation requirements of students must be accommodated. Unfortunately, these different interests do not always coincide and at times are incompatible. Dentists in private practice are morally obligated by virtue of their professional status not to let their own financial interests dictate the nature and extent of the care provided to patients. Dental students and faculty have an obligation to treat patients according to this same ideal.

The moral risk of treating patients, and particularly marginalized and vulnerable patients, for the sake of meeting educational needs of students is serious, but informed consent can largely remedy this ethical problem. That is not to say that a requirement system no longer carries any ethical risks as long as patients grant informed consent. For example, there remains the problem of the patient becoming identified with the lesion and turning into the "Class II gold mine I found yesterday." When students are under pressure, there is ever more risk that the patient's lesion becomes the primary concern instead of the person. This reductionist perspective not only frustrates the provision of conservative and comprehensive care; it also hinders a true appreciation of the patient as fellow human being. Informed consent does not address this issue. However, open and honest communication with patients, a serious and consistent attempt to foster freedom of choice for these patients, and genuine respect and appreciation for their willingness to share in the burden of training future generations of dentists, would go a long way to protect the moral integrity of our dental schools.

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A Brief History of Conflicting Ideals in Health Care

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Abstract

Three medical traditions were in conflict in fifth century B.C. Greece. The Aesculapian view was grounded in illness as a mystery and remedies based on authority. The Cnidian School emphasized early views of disease and science. The School of Cos, commonly associated with the name Hippocrates, was patient and practice based. The history of medicine is a complex intertwining of these traditions. Each developed its own epistemology—theory of how we come to know things and what basis is used to ground truth. These three traditions can be found in dentistry today. Even taken together, however, they fail to account for modern dental practice.

In the fifth century B.C. in Greece there were three medical traditions, further apart in their approaches to health care than allopathic, osteopathic, and chiropractic are today. We know in basic terms the philosophical objectives and modes of treatment of these traditions, and can trace their historical development. These three traditions are alive and well in medicine and dentistry twenty five hundred years later.

The received view of medicine was the cult of Aesculapius. Ancient Greeks believed in the fates. Illness, and even injury, were either flaws of character or behavior or the intentions of the gods (there wasn't much distinction among these alternatives) and cure meant discerning the gods' will and placating them if possible. Aesculapius was a demi-god apprentice to Apollo who had the health job centuries before him. Taking the cures meant retreating to a consecrated place to be ministered to by priests who interpreted dreams. Natural remedies and ritual were a significant part of the healing process. The overhead in the Aesculapian tradition was high, and patients were definitely the fee-for-service crowd.

The other two traditions can be traced to the island of Cos, just a few miles from the coast of what is currently Turkey. On one peninsula was the Cnidian School. Although this tradition disappeared for hundreds of years in western medicine, it has a very current ring to it. Practitioners of this tradition are oriented toward disease. The art of the healer is grounded in the science of pathology. Medicine is the practice of understanding disease entities and their natural history and symptomatology and then identifying and controlling these wherever they occur. The fact that the disease might manifest itself differently in various patients matters little. It is the disease that is being treated not the individual who has it.

The third tradition, practiced on a different peninsula of the island of Cos, carries the name Coan. These practitioners focused on the patient. Illness was neither divine retribution nor the working of disease in the natural world but an imbalance of the natural forces within individuals. In particular, it was thought that there were four humors: blood (sanguine), yellow bile (melancholic), black bile (bilious), and phlegm (phlegmatic). The role of the healer was to identify excesses or imbalances in the humors and then work with the patient's natural curative processes to restore balance. Practitioners in this tradition emphasized diagnosis and prognosis, working with the patient and his or her family, and an ethical code of respect for patients. Today, we know this tradition by the name of one of its prominent practitioners, Hippocrates.

The three traditions just described have become woven together in the healing professions from their first distinct inceptions until today. In fact, the history of medicine could be told as the interaction among these three views, worked out over the past two thousand years. Disease as a mystery to be confronted by ordained authorities has gradually given way to disease as a natural phenomenon to be understood through scientific investigation. In the meantime, health as a personal and partially commercial relationship between professionals and their patients has remained only loosely associated with these other changes.

Mystery and Authority

The three traditions in medicine have distinct epistemologies. That is a fancy word meaning how things are known or how things are demonstrated to be true. The authority tradition tracing its

roots to the cult of Aesculapius works from the authority of deductive logic. General principles are established, such as "extension for prevention," or "patients will pay anything for esthetics if properly motivated" and the logical consequences of these principles become the guiding forces for action. As a general rule, authority is aligned with cults of personality. It frequently happens that a useful general principle grows outdated but is never challenged because of the authority with which it is cloaked.

An extreme example of deduction from authority is the second century figure Galen who combined "research" and practice. When the politics were right, Galen became rich practicing on the wealthy in Rome. He was harsh and unrelenting in his attacks on the credibility of his competitors. He was also a scientist, well ahead of his time in performing dissections and making observations to support his practice.

The tragedy of Galen is the authority with which he invested his work. He wrote that no one needed to confirm his findings since he had seen them himself and found them to conform to his views of nature and divine purpose. In fact, no one did check his findings for well over a thousand years. The teaching of medicine in mediaeval universities consisting of the professor reading Galen to his students. The doctor, in the classic meaning of the term as one who teaches not one who heals, practiced very little and then only on high profile patients. "Doctor" was as much a social position or academic rank as a description of the work one did. Dissection demonstrations were ritual events, usually held once a year. The dissection was conducted by a journeyman surgeon who did his thing more or less independently of the professor. Surgeons were not expected to understand Latin and doctors were not expected to do manual work. In fact, surgeons were a distinct cast well below the physician, and the Hippocratic Oath specifically forbids physicians from performing certain surgeries. Lest one become too smug in looking down on medieval medicine,

this model can frequently be found in current American continuing education programs.

So strong was Galen's authority that it blinded practitioners to both scientific

discovery and the evidence of their own experience until well into the fifteenth and sixteenth centuries. The father of modern anatomy, Vesalius, detected numerous inaccuracies in Galen anatomical descriptions but declined for the most part to publish or teach these corrections. Much of Galen's dissection was performed on monkeys and dogs. Galen believed in the four humors and a fifth, unobservable substance called pneuma that entered the body through the lungs and might best be described as the "breath of life." He also believed that the blood was pumped out of the heart but never returned to it. If you apply pressure on a vein in your leg or arm sufficient to restrict the flow of blood, it is easy to see by inspection or feel by palpation that the vein quickly fills when pressure is released on the side closest to the heart. School children, common laborers, and perhaps even professors must have made this simple observation during the almost fifteen hundred years since Galen said it isn't so. There are times when the certainty that comes from authority is a precious commodity, and the human mind is very inventive in explaining away seemingly contradictory evidence. Today we snicker at the doctors of the University of Salamanca who proved that the world is flat years after it was circumnavigated and the ecclesiastical authorities who threatened to burn Galileo just to prove that the sun travels around the earth. At the time, most people sided with the authorities, just as they do with certain cannon in dentistry which will seem strange to those who follow us.

A more contemporary example of authority in medicine is germ theory and the idea that inoculations and antibiotics can eliminate disease given sufficient application of this technology. Rudolph

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Virchow was the father of modern histopathology and a prototypical late nineteenth century proponent of this view. He even served for twenty years in the Prussian assembly in order to promote the perfection of society through science. Today, we understand that bacteria, viruses, and fungi have dynamic cultures of their own that are evolving and may even be stimulated to our detriment through our efforts to control them. We also understand that disease takes place in a human context and that methods used to control it that are appropriate in upper class Western culture may not be effective in other environments.

Disease and Science

The second tradition in medicine, the Cnidian tradition, uses science to fight disease. The ideas of overall quality of life, and even of longevity, are secondary to the tasks of identifying the manifestation of a disease or trauma in specific parts of the body and either reversing the processes or providing therapeutic replacements where damage has progressed. This view has become so pervasive that many modern practitioners would regard it as the only conception that ever existed or could exist. In dentistry, this view is carried to such efficiency that codes exist for therapeutic interventions when none are available to characterize differences among patients or states of health.

The disease concept of health is closely aligned with the scientific approach to knowledge. The epistemology of the scientific method is called a hypothetico-deductive model. Deduc-

tions are made, not from assumed truth as in the case of the method based on authority, but from hypotheses and data. If observations support theoretical conjectures, those hypotheses are retained as so far not disproved. The little p-values in experimental research quantify the likelihood that a particular operational test under certain circumstances might be due to chance. Data supporting a theory do not mean that other theories are wrong. Usually, Ockham's razor is used to make the final choice. Ockham was a scholastic philosopher in the fourteenth century who developed the notion that simple explanations are preferable to complex ones even when both have equal support in data. The Ptolemaic system used to explain perceived motion in the heavens as though planets and stars were on giant, invisible disks accounts for celestial observations about as well as the heliocentric model does. It is just too complex.

The history of medicine in the last five hundred years has been the history of the scientific localization of disease in smaller and smaller entities. The sick patient whose humors were out of balance in 1500 became the patient with a diseased organ under the scientific eye of Giovanni Morgani two hundred years later. By the French Revolution, disease was being hunted down in specific tissues. Rudolph Virchow used his microscope to isolate pathologies in cells. Today, thanks to Watson and Craik, our attention has focused on the genetic composition of cells.

All of this science has put distance between the patient and the healer. Reductionism in our understanding of the disease process has necessitated team approaches to care for complex conditions. Even simple maladies involve the ministrations of pharmacists, nurses, technicians, social workers, and (for

sure) claims processors. In 1960, the ratio of auxiliaries per dentist in the United States was less than 2:1: by 2000 the ratio has jumped to 6:1. The number of dentists working for other dentists has more than doubled in twenty years, as has group practice. Care is becoming fragmented.

The disease model of health creates distance between the practitioner and the patient in another sense. When the primary focus of health care becomes the disease, the patient recedes into the background. The rise of the hospital system beginning in the late eighteenth century provided a structure for studying and treating disease while stripping away patients' individuality. This model became notorious in post-revolutionary France and is still evident today in the naming of hospitals for the diseases they specialize in. My father recently remarked he found it strange that his family dentist could not remember my mother's first name but knew in great detail the nature of a fractured root under one of her crowns.

Patient-Based Practice

In the third tradition of healing the individual patient's health is central. Today this includes customized treatment plans for patients, informed consent, risk factor research, and freedom from universal protocols, whether developed by specialty groups for general practitioners or by third party carriers. In the old days this approach to healing was called the

School of Cos, or more commonly the Hippocratic tradition. Among the followers of Hippocrates, and continuing for a century or more, physicians did not describe themselves as performing medicine, as following guidelines, or even as healers. They referred to what they knew and what they did as "the Art."

The art of the practitioner is grounded in both authority and science. But it goes beyond each. The epistemology of practicing dentists is neither deduction from authority nor the hypothetico-deductive logic of science. It is its own, unique way of knowing. Practitioners learn from observation, primarily noting the outcomes of their own actions. This is called induction. Its origins and flowering stem from between 1600 and 1800, especially in England. Intellectually, this period in Western history is known as Age of Enlightenment. It was a time when people freed themselves from the dogma of tradition and the rule of authority. It was also a time when the enquiring mind of individuals was highly regarded. Benjamin Franklin is an excellent example of the Enlightenment mind. He made significant contributions to the science of electricity and surface tension without ever claiming that he was a scientist. Baron Humboldt and the empiricist philosophers John Locke and William James are also examples. (The latter two were actually trained and practiced as physicians.) Inductive reasoning is most strongly asso-

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ciated with the name of Sir Frances Bacon. He is the Elizabethan politician who is sometimes credited with writing some of Shakespeare's works. We know for certain that he did write "The subtlety of nature [practice] is greater many times

over than the subtlety of argument" and "We must also examine and try whether [the knowledge of science] be framed to the measure of those particulars only from which it is derived, or whether it be larger and wider."

Working in the patient-centered tradition or induction, Abroise Paré discovered in his work with war victims in the sixteenth century that wound healing is a natural process aided by and not created by the surgeon. René Laennec, an amateur flute player, invented the stethoscope in 1816 to study lung sounds in tuberculosis patients. He needed a practical way of listening to "lung messages" while avoiding the embarrassment of placing his ear directly against female patients. Leopold Auenbragger was the son of an Austrian beer merchant who watched his father sound the beer barrels with gentle thumps to determine their fluid levels. Auenbragger developed the diagnostic technique of osculation. An indispensable foundation for patient care is the power of trained, experienced observation. As the great American historian Yogi Berra noted, "You can hear a lot just by listening."

Unlike deductive approaches to knowing, induction allows for only probable conclusions. A series of observations, each tending in the same direction, gives credibility to a general explanation. The fact that induction does not provide certainty is normally not a difficulty of practitioners who understand that they live in a generally uncertain world and are careful to compare their observations and practices with those of their professional colleges.

How Practitioners Know

The claims of authority and of science require a higher warrant of validity than do the claims of induction. This is true because authorities and scientists advanced their claims as being binding on others. Practitioners seek only the knowledge that allows them to practice most effectively in their own environments. Most practitioners consider the claims of experts and the scientific literature as ex-

amples of observations, much like the observations they make in their own practices. Authority and science are, in other words, part of the inductive logic of practitioners. This is bad news for the proponents of evidence-based dentistry who believe that the knowledge of sci-

ence is automatically better than the knowledge of practice.

Good induction requires systematic observation and careful classification. Two practitioners can look at the same general phenomena and one will be enlightened while the other is confused. This is not because one is intelligent or caring and the other is not. The difference is usually a function of the categories one chooses to emphasize. Purpose drives observation. When Lois Pasteur spoke to the Lille Faculty of Science on that December evening in 1854, he did not exactly say that chance favors the prepared mind. He emphasized that chance favors *only* the prepared mind.

The relationship between knowledge and practice is certainly not straightforward. History gives us numerous examples such as Vesalius who wrote reasonably accurate books on human anatomy but applied virtually none of this knowledge to his own professional practice. The stories of the interaction between knowledge and practice in childbirth fever and general anesthesia are remarkable examples. For different reasons, neither is a dignified moment in the evolution of professional medicine.

In the 1850s, a Hungarian country physician named Ignac Semmelweis came to Vienna as a resident and was appalled to see that upwards of half the women giving birth to children in the Viennese hospitals died of infections. Through careful observation, including the observation that mortality following births outside of hospitals was closer to

15%, Semmelweis proved the iatrogenic cross-contamination of hospital patients. This scientific finding was stubbornly resisted by the medical community, and as much as forty years later, his position was being vitriolically attacked in the scientific journals.

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On the other hand, William Morten, a dentist and American contemporary of Semmelweis was an overnight sensation in demonstrating the usefulness of ether as a general anesthetic. Morton, Horace Wells (another dentist who suggested general anesthesia to Morton), and Charles Jackson (a chemist who helped Morton) all died bitter and financially destitute. They tried unsuccessfully to capitalize on the instant success of a procedure that had, to that point, been chiefly a party pastime.

Joseph Lister's antiseptic theories also had a hard time moving from the realm of science to practice. For more than a thousand years, surgeons prided themselves on speed, strength, and the ability to psychologically withstand the rantings of patients during the operation and the appalling failure rates following surgery. The badge of a surgeon was a repeatedly used black coat spattered with dried blood and other tissue.

The white coat, the symbol of prestige and professionalism among healers, is a recent phenomenon. On the other hand, it is a very ancient tradition. The work entitled "Physician" which is part of the Hippocratic Corpus begins with these words. "The dignity of a physician requires that he should look healthy and as plump as nature intended him to be: for the common crowd consider those who are not of this excellent bodily condition to be unable to take care of others. Then he must be clean in person, well dressed, and anointed with sweet-smelling unguents that are beyond suspicion."

Recommended Reading

* Berlin, Isaiah (1956). *The Age of Enlightenment: The 18th century philosophers*. New York, NY: The New American Library. ISBN (none); 282 pages; about $1 in 1960.

   The book is part of a series intended to make philosophical schools of thought in various centuries more accessible to the public. The period from 1700 to 1800 was known as the Age of Enlightenment because the great natural science discoveries of the preceding century (Newton, Galileo, Copernicus, etc.) demonstrated that the world could be understood through observation rather than deductive reasoning (the seventeenth century) or through authority (the preceding thousand years) and because it sparked the dream of rational perfection of mankind and society. Berlin was a philosopher who taught at Oxford around the Second World War. The book alternates between introductory and explanatory passages from Berlin and passages from the original works of the eighteenth century philosophers.

* Craik, Kenneth J. W. (1943). *The nature of explanation*. Cambridge, England: Cambridge University Press. ISBN (none); 126 pages; about $1 in 1960.

   Craik was a fellow at Cambridge during WW II who argued in defense of materialism grounded in the view that the brain is a machine that parallels the world through perception and inference and can predict future perceptions. "The very essence of explanation is generalization." "I have not claimed to give a logical proof of the existence of the external world nor of causal action; that, I contend, is continually shown by the fact that experiment is possible at all."

Foucault, Michel (1973). *The birth of the clinic: An archaeology of medical perception*. A. M. Smith (trans.). New York, NY: Vintage Books.

   Traces the history of medicine from before to after the French Revolution. Foucault is a modern French philosopher and this is hard reading, but worth the effort to understand how much of what we take for granted in medicine came into being in a very short span of years and under intense political pressures.

* Nuland, Sherwin B. (1988). *Doctors: The biography of medicine*. New York, NY: Vintage Books. ISBN 0-679-76009-1; 515 pages; about $16.

   A history of medicine in fifteen episodes from Hippocrates to today's implant teams. The scientific advances are developed through very personal biographies, and issues are explored such as focus on the patient or focus on disease, the relationship between science and practice, the manner in which medicine reflects the tenor of the times, and the tension between observation and authority as a foundation for science and practice. Marvelously written, with a rich blend of detailed science and personal warmth. Nuland never loses sight of his professionalism. Prepare for many hours that resemble a comfortable chat with a wise friend. You will learn how recent much of what we believe characterizes medical practice really is, much that is unexpected, and some insights into the origins of ideas or events. Don't hurry, and have a dictionary at hand; Nuland expects much of his reader.

Starr, Paul (1982). *The social transformation of American medicine*. New York, NY: Basic Books.

   A well-written blend of history and sociology describing the American century in medicine—the late nineteenth and twentieth century when the profession was transformed from a loose collection of practitioners who enjoyed modest income and status to a complex enterprise of enormous power.

Editor's Note

Summaries are available of the three recommended readings preceded by an asterisk (*). Each is about four pages long and conveys both the tone and content of the book through extensive quotations. These summaries are designed for busy readers who want the essence of these references in fifteen minutes rather than five hours. Summaries are available from the ACD Executive Office in Gaithersburg. A donation to the ACD Foundation of $15 is suggested for the set of summaries on the history of medicine; a donation of $50 would bring you summaries of all the 2001 leadership topics.

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