Dental Education in a Flat World: Advocating for Increased Global Collaboration and Standardization


Abstract: Globalization is a broad term referring to the increasing connectivity, integration, and interdependence of economies, societies, technologies, cultures, and political and ecological spheres across the world. This position paper was developed by a working group of the 2007 American Dental Education Association (ADEA) Leadership Institute. The authors explore the effect that globalization has had on dentistry and dental education to date and hypothesize what dental education could look like in the years ahead. While the paper is written from a North American perspective, some of the authors bring international expertise and experience to the topic of global dental education in a flat world. Specific issues and barriers addressed in this position paper include variations in accreditation and licensure requirements in dental education throughout the world; the historical development of dental education models (odontontology and stomatology) and the need for congruency of these models in the global environment; the competency-based model of education and its relevance to development and implementation of global dental competencies; and the slow adoption of technological advances in dental education for promoting collaborations and encouraging resource sharing among countries. These challenges are discussed as they affect the implementation of a standardized global dental education that can lead to improved access to oral health care services and better oral and overall health for the citizens of the world.

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Globalization is a broad term that refers to economic, social, technological, cultural, and political interrelationships that are driven by human migration, international trade, the rapid movement of capital, and the integration of financial markets across national borders. An incredibly strong and unstoppable force, globalization increases interdependence, integration, and interaction among people, corporations, and governments in disparate regions of the world. Globalization has significant economic, social, and geopolitical consequences, one of which has been a leveling of the global economic field, also known as the “flattening” of the world.1

This flattening of the world is being brought about by the rapid growth of previously underdeveloped economies and a comparable slowing of established economies. The current growth in underdeveloped areas is happening so quickly that it is difficult to foresee the impact on the more established economies in the immediate future. The effects on health care access and delivery in the vastly different and changing scenarios of the future are even harder to predict.

Globalization has had a significant impact on the operation and survival of businesses worldwide; the business of dentistry has not been immune. The “offshoring” of the examination glove and dental laboratory industries from the United States to other countries and the rapid growth of “dental tourism,” in which patients travel the world for low-cost dental care, are two examples of the impact of globalization on the profession.2 While these examples provide perspective within the practice of dentistry, the impact of globalization on the higher education sector is still unrealized. To date, dental education does not appear to have fully recognized nor taken advantage of the benefits of globalization.
Ensuring adequate access to oral health care services and improving the level of oral health in developing countries are increasingly major concerns of health policy. Dental education needs to be engaged in these public health policy debates. There is a high level of unmet consumer demand for oral health care in countries that are now more prosperous because of the effects of globalization, such as India and China. This demand will be met only partially, at best, by increasing the already large number of dental schools. In many instances, these schools are of questionable quality and lack standardization and quality assurance measures such as accreditation. It is possible through the globalization of dental education that the difference in quality between academic dental institutions, dental professionals, and dental educators trained in the developing and developed worlds could diminish due to the flattening of the world via technology and trade. For example, international standards for accreditation of dental schools is now a feasible goal, given the ability of all regions of the world to communicate almost instantly with each other and their capacity to share information about training strategies via technologies such as the Internet.

One of the challenges for the dental profession in expanding global access to oral health care will be that developed areas of the world will offer greater financial incentives and thus will be more attractive practice locations for dental professionals trained in less developed countries. Many dental professionals practicing in developed countries will resist this influx of foreign-trained dental professionals in order to protect the existing profession from competition and/or to maintain their ideals of the quality of care being provided. The developing countries, on the other hand, are challenged to keep their skilled dental professionals at home to enhance the quality of education and care in those countries and avoid the “brain drain” that can be caused by globalization.

An ideal approach to the globalization of dental education is for all countries to work together to identify common challenges, share experiences, and pool intellectual resources. Currently, this approach is hindered by pronounced variations in implementation of dental education that exist around the world. The variation in dental education metrics and practice regulations makes it difficult to develop a set of globally acceptable standards for curriculum structure and outcomes (e.g., competencies to be attained by dental school graduates).

In this position paper, we will address four issues that currently serve as barriers to the globalization of dental education: the diversity of accreditation and licensure requirements; the incongruence among various dental education models; the lack of global competencies; and the slow adoption of technological advances to promote collaborations and encourage resource sharing among countries. In the conclusion, a series of recommendations are proposed as mechanisms to focus academic dentistry around the world on a common set of strategies to globalize dental education. It is our belief that the globalization of dental education will result in enhancing dental education worldwide, thereby improving the quality of dental treatment across the globe and providing greater accessibility to oral health services to broader segments of the population.

Accreditation and Licensure in Dental Education

Accreditation and licensure requirements help ensure that oral health care of the highest possible quality will be provided and that patients will be protected from dental professionals who do not meet established standards in the areas of knowledge, skills, and attitudes. However, accreditation and licensure to practice dentistry are handled in very different ways around the world (Tables 1 and 2). This diversity has implications for the mobility of dental practitioners within and across countries, as well as the provision of oral health care and dental education. (See the Glossary for definitions of terms used in this position paper.)

In some countries of the Commonwealth, such as the United Kingdom, Ireland, and Australia, an external examiner accreditation system is often used in parallel to, but separate from, the accreditation site visit system. In this system, the external examiner is a subject expert from another university whose role is to ensure that the degree program contains appropriate structure and content and is comparable with that of other universities and that the examination process is both rigorous and fair. The external examiners sometimes examine the students directly, but more commonly participate as external evaluators in the school’s assessment of students and then write a report for the university’s board of education. Accreditation site visits are conducted by a regulatory authority (for example, the General Dental Council, GDC, in the UK) and generally in collaboration with
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<td>USA</td>
<td>Commission on Dental Accreditation (CODA)</td>
<td>The Commission on Dental Accreditation (CODA) is responsible for the accreditation of dental education and operates with participation from a number of agencies and associations such as the American Dental Association (ADA), American Dental Hygienists’ Association (ADHA), American Dental Education Association (ADEA), American Association of Dental Examiners (AADE), dental licensing community, and the public. The accreditation process evaluates dental schools, dental hygiene and dental assisting programs, and postgraduate programs every seven years. CODA activities include formulating and approving accreditation standards by which programs are evaluated; establishing policies and procedures for conducting the accreditation program; determining and publicizing program accreditation status; and appointing consultants and site visitors to assist in accreditation activities (<a href="http://www.ada.org/prof/ed/accred/commission/epp.asp">www.ada.org/prof/ed/accred/commission/epp.asp</a>).</td>
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<td>United Kingdom</td>
<td>General Dental Council (GDC)</td>
<td>The competent or regulatory authority is the General Dental Council (GDC), and accreditation is conducted in collaboration with the professional dental association (<a href="http://www.gdc-uk.org">www.gdc-uk.org</a>). The GDC conducts site visits once every five years.</td>
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<td>India</td>
<td>Dental Council of India</td>
<td>The Dental Council of India (DCI) is the body responsible for regulating the establishment of dental colleges and the profession of dentistry. There is no provision for the subsequent periodic accreditation of those colleges. The DCI is regulated and financed by the government (<a href="http://www.dciindia.org/index.htm">www.dciindia.org/index.htm</a>).</td>
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<td>China</td>
<td>Ministry of Education</td>
<td>Medical education in China, including stomatology education, is supervised and approved by the Ministry of Education of the People’s Republic of China. The Ministry of Education strives for uniformity of educational programs as a cornerstone of quality and conducts the accreditation process for all dental schools in China. In addition, the Stomatological Educational Committee, which is a division of the Chinese Stomatological Association, coordinates and monitors dental education in China. It is not clear from the literature or the ministry website whether there are provisions for subsequent periodic accreditation (<a href="http://www.moe.edu.cn/english/index.htm">www.moe.edu.cn/english/index.htm</a>).</td>
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<td>Denmark and most of the European Union (EU)</td>
<td>Ministry of Education</td>
<td>A government agency under the Ministry of Education is responsible for accreditation and is the same for all professional studies. The accreditation cycle is usually five years. This process is similar in most EU countries, but there is no universal system of accreditation in Europe. There has been an EU-funded network (DentEd; <a href="http://www.dented.org">www.dented.org</a>) that has carried out a number of visits, but they are not accreditation visits utilizing a common European standard. Each country usually ensures quality independently, sometimes using a site visit and sometimes using external examiners. A system of external examiners that typically reports to the government rather than the school is used in the United Kingdom and Ireland.</td>
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<td>Mexico</td>
<td>CONAEDO, the National Commission on Dental Education</td>
<td>Accreditation is granted by CONAEDO (Consejo Nacional de Educación Odontológica), the National Commission on Dental Education, which has two branches: one devoted to practice certification and the other to program accreditation. The first program accreditation was granted in 1999; since that time, over thirty programs have received accreditation from this body. Mexican representatives have also received assistance from the American Dental Association’s CODA and the Canadian Commission on Dental Accreditation. The University of DeLaSalle located in Leon, Guanajuato, Mexico, has also received accreditation from the California State Dental Board. It is not clear whether CONAEDO has provisions for subsequent periodic accreditation.</td>
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the professional dental association in that nation. Accreditation site visits are conducted on an ongoing basis; for example, the GDC conducts its site visits once every five years. This aspect of accreditation is similar to the accreditation site visit system used in the United States and Canada.

Unlike the Commonwealth system, the Dental Council of India (DCI), which is responsible for regulating the establishment of dental colleges and the profession of dentistry, is a statutory body that is regulated and financed by the government of India in the Ministry of Health and Family Welfare. There is no provision for periodic reassessment after the initial accreditation of a dental school.

Table 2 provides an overview of the principles of licensure around the world and illustrates several different approaches to granting permission to graduates of dental education institutions to practice dentistry. A key difference among nations is whether or not graduation from dental school provides a license to begin the practice of dentistry. In most nations, graduation equals licensure to practice. However, in the United States, Canada, and some other nations, graduates must obtain licensure to practice through a separate process that is not controlled by the dental schools. In the United States alone, individual states have differing requirements for licensure to practice, and not all states offer reciprocity of licensure. This is possible because the U.S. Constitution reserves many rights to the states, and regulation of occupational licenses is deemed to be a state’s right. Thus, while the national process of accreditation to ensure the quality of education is the same for all states, ironically, accreditation does not guarantee the mobility of oral health care providers across state lines. Some in the United States have argued that licensure policies protect the profession rather than the patients by preventing dental professionals trained in other states or even other countries from practicing in certain regions or states.5

In contrast to the U.S. system, in most of Europe and some countries of Asia, students receive automatic licensure upon graduation from an accredited dental school. In many countries, dental professionals can practice in any state within their country as long as they have graduated from an accredited or approved dental institution. However, automatic licensure to practice in neighboring countries within a region is rarely permitted, except in the European Union. In an effort to provide easier mobility for oral health care providers globally, the Commission on Dental Accreditation (CODA) in the United States is currently examining the possibility of accrediting international dental institutions.6

The licensure process in the United States consists of the successful completion of the National Board Dental Examination Parts I and II and then passing a clinical licensure examination with human subjects administered by an independent licensing board (Table 2). Clinical licensure exams conducted on human subjects have been criticized as both unethical and unreliable.7,8 They are considered unethical because the requirement for students to perform a specified list of procedures creates a setting in which patients may be subjected to irreversible and possibly unnecessary procedures. Furthermore, clinical licensure exams have been shown to be unreliable because of the lack of concordance between the results of the clinical exam and other accepted measures of student competency, such as overall grade point average (GPA), National Board scores, class rank, and overall performance in school as measured by faculty.7 It is not uncommon for students who have been deemed competent by their faculty to fail their clinical licensure examination. A judgment of student competency based on multiple faculty evaluations over a period of time is arguably more defensible than a one-shot examination when it comes to validity.

In attempts to address these inconsistencies in the U.S. licensure system, discussion continues among the communities of interest (the dental testing community, the education community, and organized dentistry) regarding a process for national uniform clinical licensure.9 Most recently, collaboration among the Central Regional Dental Testing Service (CRDTS), North East Regional Board of Dental Examiners (NERB), Southern Regional Testing Agency (SRTA), and representatives from the dental boards of Florida, California, and Hawaii resulted in the formation of the American Board of Dental Examiners (ADEX). The goal of ADEX is to develop a uniform clinical licensure exam process with outcome assessments that differentiate between clinically competent and incompetent entry-level dental professionals. ADEX claims that, with the results of such a process, states could make licensure decisions with confidence.10 If states are to continue to require, in addition to graduation from accredited programs, the passage of licensure examinations for the attainment of a license, then a national clinical licensure examination would be at least a step in the right direction from our perspective. However, the ethical issue of using human subjects for licensure requirements remains unaddressed by the various U.S. licensing boards.
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<td>USA</td>
<td>Individual state boards of dental examiners</td>
<td>Each state sets its own requirements for professional licensure, and standards are generally set by state legislation. States choose their own licensing exams with the recent tendency to participate in regional collaborations. There are five regional collaborations currently operating: North East Regional Board of Dental Examiners (NERB), Central Regional Dental Testing Service (CRDTS), Southern Regional Testing Agency (SRTA), Western Regional Examining Board (WREB), and Council of Interstate Testing Agencies (CITA) (<a href="http://www.ada.org/prof/ed/students/handbook/index.asp">www.ada.org/prof/ed/students/handbook/index.asp</a>). Part of the initial motivation for the establishment of regional boards was to enable state boards to standardize their testing methodologies. Although the exams are conducted by the regional boards, only the states have licensing authority. In 2005, NERB and the CRDTS collaborated to develop a national clinical examination for dentistry and dental hygiene (American Dental Licensing Examinations, ADLEX). To date, this national clinical examination is not accepted by all states. States vary on the eligibility of foreign-trained dental professionals, even for faculty. Foreign-trained dental professionals can apply to advanced standing programs in U.S. dental schools and complete their training in two to four years. They must pass the same licensure examinations as all graduates of dental programs, the National Board Part I and II exams, and clinical licensure human subject exams, after which they are eligible to apply for licensure.</td>
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<td>United Kingdom</td>
<td>The competent authority (General Dental Council, GDC)</td>
<td>Dental professionals trained within the European Economic Area (EEA) are automatically eligible for licensure without examination. Dental professionals trained outside the EEA whose qualifications are not recognized for full registration with the GDC (<a href="http://www.gdc-uk.org/Potential+registrant/">www.gdc-uk.org/Potential+registrant/</a>) must pass the International Qualifying Examination (IQE). The GDC allows dental professionals from a large number of countries outside the EEA to work in supervised positions within the National Health Service (NHS). These countries include certain named universities in Albania, Bolivia, Brazil, Chile, India, and China, to mention a few from a long list. Graduates of U.S. dental schools are eligible to work in the NHS and can work in private practice when they pass the IQE.</td>
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<td>India</td>
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<td>India has a state-approved licensure system that covers the entire country. The licensure requirement is successful passing of the written, oral, and internal assessment examinations throughout the dental curriculum with a score of 50 percent or higher. There is no separate state or regional clinical licensing exam (<a href="http://www.dciindia.org/index.htm">www.dciindia.org/index.htm</a>).</td>
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<td>China</td>
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<td>After completion of the five-year course in stomatological education, students are granted a bachelor’s degree in stomatology (B.D.S.). Sixty to 70 percent of the graduates begin the independent practice of dentistry after successful completion of the national licensure examination. The remaining 30 to 40 percent of the graduates are given the opportunity to write the standardized Annual Entrance Examination in order to qualify for admission to a postgraduate program. Following three years of additional study, a master of philosophy or a professional degree is awarded, and following five years in a related research program, a doctor of philosophy is awarded.</td>
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<td>European Union</td>
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<td>Generally, there are no national licensing exams for graduates in the European Union (EU). Licensure in the EU countries is very straightforward. If a dental professional graduated from a dental school in an EU country, he or she is free to move and practice elsewhere in the union according to the laws of free movement of labor. The problem this presents is that dental education is not the same across the European Union and the competences of the graduating dental professional vary tremendously. To help solve this problem, the European Association for Dental Education (ADEE; <a href="http://www.adee.org">www.adee.org</a>),</td>
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(continued)
In North America, the pressure of free trade as a result of the North American Free Trade Agreement (NAFTA) has created challenges for the established dental profession and licensing bodies in the United States. NAFTA encourages licensing bodies to follow the principles of mutual recognition among Canada, the United States, and Mexico. However, the dental licensing boards have yet to embrace these principles, thereby exposing the profession to political intervention. A similar situation occurred in Europe with the establishment of the European Union, when mechanisms to facilitate the free movement of labor among nations were based on social policy decisions made by governments without specific input from the professions. The impact of these developments in Europe and the free trade agreement on licensure in the United States was discussed as far back as 1991, but very little seems to have changed over the past sixteen years. This lack of progress on the free movement of health care labor in the United States was observed as early as 1898 when a U.S. Supreme Court decision authorized states to set their own requirements for licensure of physicians. This decision still serves today as the basis for supporting state over federal regulation in health care licensure, including dentistry. The prospect of fifty different licensing bodies (in fifty U.S. states) agreeing to mutual licensure recognition is tricky at best. Add the complexity of Canada and Mexico to the equation, and it becomes apparent why little progress has occurred in regard to freedom of movement of dental professionals across state and national borders in North America. Recently, legislation was passed in California to allow dental professionals from specific Mexican dental institutions to practice in underserved areas in that state in order to enhance access to care. The dental community has been divided in opinions on this legislation, but this case serves as a clear example of how social and political decisions can be made for a profession when it is perceived as not adequately addressing the needs of citizens.

When licensure limitations restrict the mobility of health professionals, it can ultimately lead to higher costs for health care services because the normal free market economic mechanisms are, in effect, disabled. The increased cost of oral health care can, in turn, result in reduced access to care for all those with financial limitations. In the worst cases, this could lead to no access to care at all. One strategy patients have resorted to is “dental tourism,” in which they travel to regions or countries to receive care where the cost of treatment is within their means. But for

| Table 2. Overview of principles of licensure around the world (continued) |
|-------------------------|-----------------------------|-------------------------------|
| Country                | Body in Charge              | Principles or Comments         |
| Mexico                 | National Ministry of Education | Licensure to practice dentistry is granted by the National Ministry of Education. Upon completion of dental studies, students are required by the Federal Agency of Health (Secretaría de Salud) to complete a mandatory period of one year of social service prior to obtaining licensure. Once licensure is granted, it does not expire, and dentists may practice throughout Mexico. Depending on the institution, different graduation requirements are mandated. Programs may require that students complete a literature review or research project, comparable to a graduate student thesis, while others request a national licensure examination. |

dental tourists, the quality of care they receive is outside the control of their home country and they may have little access to follow-up care and no recourse to remedies—dental or legal—in the event of problems or unsatisfactory treatment.

We believe that internationally recognized standards (i.e., competencies necessary for the unsupervised practice of general dentistry that dental graduates attain through the educational process) that are customized to fit the oral health needs of the local population should form the basis for the core curriculum in dental schools worldwide. The adoption of these internationally recognized standards could facilitate the process of greater standardization of accreditation and licensure globally. Standardization would allow for increased mobility of dental practitioners within and across states and countries, likely lower the cost of oral health care services as a result of increased access, ultimately resulting in greater access to oral health care for broader segments of the population, and in due course improve oral health outcomes for the citizens of the global community.

Dental Education Models

In most dental education systems throughout the world, students begin their dental education upon completion of high school (secondary education), and the dental curriculum typically lasts a minimum of five years. In Canada and the United States, students must complete three to four years of predental education at the college or university level as a prerequisite for admission to dental school, which typically follows a four-year curriculum.

Historically, there have been two philosophical approaches to the practice of dentistry throughout the world: the odontology and stomatology models. The odontology model is prevalent in North and South America, Northern and Western Europe, Japan, India, and Australia and is centered on dental education being recognized as an autonomous discipline. In contrast, the stomatology model of dentistry was developed in other parts of Europe and China and views dentistry as a specialty of medicine. Although there has been increasing convergence in many areas of dentistry and dental education, disagreement persists in three areas: the relationship between medicine and dentistry, the nomenclature used to describe practitioners as either “dentists” or “oral physicians,” and the question of whether the curriculum should primarily emphasize microsurgical technique or scientific and critical thinking.

Stomatology is the “medical” study of the mouth and its diseases within the broader context of overall human health and disease, whereas odontology is a more focused study of the diagnosis, treatment, and prevention of diseases and disorders of the oral cavity. In stomatology-based educational systems, students are enrolled with medical students in a common curriculum that includes basic sciences and clinical rotations in medicine. This educational process typically lasts six years (although the period of instruction varies within and between countries). The technical and clinical aspects of dentistry are often not studied until the fifth year. This results in additional hours of the curriculum being devoted to the recognition and treatment of disorders of the entire body rather than to the treatment and prevention of disorders of the oral cavity. There are various differences in countries that educate using the stomatology model. In China, students receive a bachelor’s degree in stomatology (B.D.S.), whereas in Central, Eastern, and parts of Southern Europe a basic medical degree may be conferred upon the completion of training in addition to a certificate in stomatology.16-18

The odontology-based curriculum is primarily dentally oriented. In the United States, Canada, and some dental schools in Mexico, the dental curriculum is four years or the equivalent in length. In Europe, Japan, India, and other Mexican schools, the curriculum is usually five years. The length of dental education reflects differences in years of schooling prior to matriculation. In academic health centers (AHCs) having both medical and dental schools, joint basic science faculty may teach combined courses with medical and dental students; at some AHCs, there are separate dental sections where dental students may receive less focus on particular body systems and additional focus on the head and neck. In schools where dental and medical students take basic science classes together, divergence in the curricula between medicine and dentistry typically begins during the first year of dental school with the introduction of preclinical dental science and technique courses. Consequently, more hours of the curriculum are devoted to the treatment and prevention of diseases and disorders of the oral cavity in the odontology model than in the stomatology model.

Both educational models have strengths and weaknesses. The stomatological model has a strong emphasis on the study and treatment of general disease processes of the body. With stronger medical
training, stomatologists are likely to better interact with physicians, thus making collaborative efforts between medicine and dentistry more effective. However, a weakness is that dental students learn general pathophysiology at the expense of instruction in essential technical dental topics as well as the frequent omission of preventive dentistry and dental public health instruction.

The odontology model has a strong emphasis on the prevention and restorative treatment of dental caries as well as an increasing emphasis on the prevention and treatment of periodontal diseases. Yet the lack of training in physical diagnosis and reinforcement of the concept that the oral cavity is somehow separate from the rest of the body are often cited as major weaknesses.\textsuperscript{19}

The relationship of dentistry to medicine and whether dentists should become “oral physicians” or remain “dentists” have been debated in recent years.\textsuperscript{20,21} One fundamental issue is that dentists have not been trained to value their professional time and critical thinking abilities when making dental or medical diagnoses for patients. Many dentists believe that they are compensated for completing a procedure, while diagnosing a patient’s medical or even dental problem is seen as not “doing” something. Taking their cue from the profession, third-party payers have adopted this fundamentally flawed thinking in their development of payment systems. This practice rewards the accomplishment of technical skills rather than the development and application of critical thinking skills that are employed in patient assessment and diagnosis. Furthermore, focusing financial rewards on technical procedures perpetuates the notion of the dentist as a highly skilled technician rather than a provider of oral health care in the broadest sense who has specialized knowledge as well as highly developed psychomotor skills.

The education of dental professionals for this century will require increasing knowledge in new technology and of the human body. The future of dentistry depends on the production of educationally qualified, culturally competent, and ethical dentists who are grounded in expert technical skills (odontology) and sound medical knowledge (stomatology). This is made clear by examining the increasing evidence regarding the connection between the oral cavity and systemic diseases and will necessitate that future dental professionals embrace a more holistic view of oral health care that is different from the current procedure-oriented practice of dentistry. The dentist of the future needs to be a technically competent professional with the microsurgical skills necessary for utilizing the ever-changing, and improving, restorative materials, while also being an accomplished diagnostician and critical thinker. The future oral health care professional must be able to manage the complex medical problems of today’s aging society, as well as children who are developing more serious medical problems at a younger age.

We believe that the globalization of dental education should embrace the strengths of both educational models: training dentists who are competent clinicians, while also educating dentists to possess a greater foundation in stomatology than currently exists in many dental education models. A clear starting point is in the development of global standards (competencies) for dental education that more strongly emphasize the stomatology perspective.

\section*{Competencies for Global Dental Education}

The general definition of competency is “the ability of an individual to function in a specific context.”\textsuperscript{22} The term “competency” commonly refers to the qualifications expected of an individual who is ready to begin independent practice of a profession, such as dentistry, and includes the skills, knowledge, and values necessary for successful conduct of that activity.\textsuperscript{23} The term “competency-based” can also be used to refer to a broad educational approach that focuses on measured outcomes to judge the quality of an educational program, such as those used for accreditation purposes. The attainment of professional competency is typically signified by the award of the first professional degree and/or license, as mandated by the laws of each country or global region.

Health disciplines such as nursing and physical therapy have led the way in utilizing competency-based educational models.\textsuperscript{24,25} Numerous and varying competency-based approaches to dental education have been published in the dental literature in recent decades for institutions in Canada,\textsuperscript{26} the United States,\textsuperscript{23} the United Kingdom,\textsuperscript{27} Scotland,\textsuperscript{28} and Europe.\textsuperscript{29} More recently, the American Dental Education Association has requested comments from its individual and institutional members regarding competencies proposed for the new dentist.\textsuperscript{30} While Canada, the United States, the United Kingdom, Scotland, and Europe have led the way in competency-based educational models for dentistry, this is
not the case in many areas of the world. Even if the competency-based education model were embraced globally, the determination of an ideal set of competencies for successful independent practice as a dental professional would be particularly challenging because accreditation and licensure guidelines, dental educational models, and curricula differ greatly worldwide, as discussed above.

In spite of the challenges anticipated, a good argument can be made for a competency-based educational approach to dental education across the globe. The continual development of new materials, technologies, procedures, and devices combined with the significant advances being made in the various health sciences makes it imperative that the dental curriculum meet the complex and dynamic needs of current and future dental professionals. However, incorporation of knowledge from those advances into the dental curriculum has been a challenge for most dental institutions. The general consensus in the dental literature has been that a competency-based approach is most likely to meet those challenges while continuing to support learning and problem-solving in the delivery of comprehensive oral health care to patients worldwide.

Most published descriptions of competency-based approaches to dental education prior to 1994 used different terms to describe the same purpose or had used the same term for different purposes. Chambers and Gerrow offered a standardized terminology for competency-based dental education that has since been used by numerous dental education associations, licensing organizations, dental faculty groups, and others. Since there is value in using an established method and starting with a standardized format, we propose that competencies for global dental education be developed using standardized terminology and format as described by Chambers and Gerrow. We also suggest that core competencies for the independent practice of dentistry worldwide should avoid the use of topical groupings (e.g., diagnosis, practice management) and listing of subcompetencies. The goal is to promote an interdisciplinary and integrated approach to dental education, while concomitantly preventing segmentation within the dental curriculum.

It is important to note that competencies should describe the performance of graduates in independent practice and not solely those within a dental curriculum. The basic level of competencies proposed must also be supported by knowledge of basic biomedical, behavioral, and dental sciences, by psychomotor and cognitive skills, and by ethical, social, and professional values. The integration of basic biomedical sciences with the dental sciences should be considered a key aspect for the successful implementation of competencies. Such competencies will most likely have to be modified in order to adapt to local needs, customs, and jurisprudence limitations, but a core set of competencies should be developed, adapted, and subsequently publicized in order to achieve truly global standards. Competency-based instruction and assessment are most effective when reviewed periodically and revised, and we therefore also propose that the competencies for a global dental professional should be re-evaluated periodically so that the dental curriculum remains up-to-date and meets the demands of future practitioners and practice environments.

From our perspective, a core set of competencies for the practice of dentistry worldwide will promote adoption of common curriculum components and similar learning experiences for students, as well as promote a more uniform approach to assessment of students’ acquisition of these competencies. This approach will facilitate a more direct comparison of global dental educational systems and result in the licensure of dental professionals and dental faculty in parts of the world other than where they were trained, thereby effectively flattening dental education. Second, a more standardized approach to dental education (competency-based with internationally accepted core competencies) could potentially lead to a consistent quality of oral health care services across the globe. Third, increased mobility of dental practitioners would improve accessibility for broader segments of the population.

The Impact of Technology

In his book The World Is Flat, Friedman describes how technology has been instrumental in changing the way we interact and interface with businesses and individuals across the world, thus contributing to the flattening of the world. Friedman provides a chronological examination of the advent and subsequent adoption of technologies that have provided unparalleled opportunities for collaboration. The ten flatteners outlined in his book are Windows-powered PCs, the Internet and the World Wide Web, work flow software, uploading, outsourcing, offshoring, supply-chaining, insourcing, in-forming, and the steroid (digital, mobile, personal, and virtual)
technologies. In just over a decade, many of these world-flattening technologies have become accessible to the average person and hold potential for enhancing collaboration among dental educators. A review of a few of these flatteners will provide the basis for discussion of their application to dental education.

Although the Internet has been in existence since the 1960s, accessibility and use by individuals were only realized in the mid-1990s. Along with the Internet, the World Wide Web emerged as a virtual realm where individuals were able to post digital content for easy access and retrieval with the help of web browsers. These tools collectively created a breakthrough in connectivity between individuals and an environment for global collaboration that had not previously existed. Friedman describes how uploading (transmission of a file from one computer system to another) has had a revolutionary effect on collaboration in a flat world, where individuals anywhere can become producers and not just consumers.

Community-developed software known as “open-source” is an example of this flattener. An example of how this flattening software can work globally is found through examining the Massachusetts Institute of Technology’s OpenCourseWare (MIT OCW) initiative. MIT OCW is a web-based publication of educational materials developed by MIT faculty. This initiative has allowed open sharing of MIT educational materials with educators, enrolled students, and self-learners around the world, creating a truly collaborative global educational environment. MIT OCW has partnered with three organizations that are translating course materials into Spanish, Portuguese, Simplified Chinese, and Traditional Chinese. By examining MIT’s OCW initiative, it is possible to imagine how this flattener could be utilized by dental education. Collaborations, partnerships, and a combining of resources (intellectual, technological, financial) could be accomplished for the development of global core competencies with the end result being increased access and improved oral health for the citizens around the world. A global approach to addressing oral health care education is within reach more than ever via the use of technology and willingness for collaboration.

Two recent phenomena, teleradiology and telemedicine, provide examples of how technology is being applied by practicing medical providers. In an attempt to both reduce costs and compensate for a shortage of trained professionals, several health care systems have invested in outsourcing of services. Health centers have established links with other parts of the world so that, over night, interpretation and report generation can be performed by radiologists in other time zones. An example currently in use in the United States is the company Nighthawk Radiology, which is based in Idaho and operates reading centers in Sydney, Australia, and Zurich, Switzerland, allowing radiologists to interpret exams and report the results to attending physicians across time zones. There are many examples of telemedicine in the literature that demonstrate the advantages of using technology to improve patient outcomes.

Similar examples of the use of technology can be found in dentistry. Through the use of videoconferencing technology, patients and providers in rural locations can link to specialists in distant locations. Digital imaging and intraoral cameras allow the transmittal of clinical information via the Internet so that front-line oral health providers can communicate with dentists and specialists in providing optimum care. These examples illustrate how the practice of dentistry can utilize technology to expand access to oral health care services while at the same time increasing the quality of care provided to patients.

A review of the literature on technology use in dental education in North America demonstrates that there is much work to be done in creating the kind of global collaboration discussed by Friedman and modeled by MIT. As early as 2001, Hendricson and Cohen outlined eleven reform recommendations for dental education including the utilization of computer-based and web-based information technology to enrich student learning. Subsequent studies examined the curriculum, recent innovation, and planned change in North American dental schools. Results indicate that academic program administrators and some faculty in dental schools recognize the need to incorporate and utilize technology within the curriculum, but acknowledge that progress has been slow.

The use of simulator technology has received much attention in health care education. The introduction of virtual reality-based technology (VRBT) designed for the instruction of dental procedures was introduced in the late 1990s. To date, the most extensive research on the use of this technology in dentistry has been conducted by Buchanan who found that student use of VRBT resulted in increased productivity in the lab. Outcomes, measured as final overall grades, were similar for students who used VRBT and for those who learned through traditional means. Student perceptions generally were positive toward the use of VRBT. However, they saw the technology as an adjunct to faculty instruc-
tion and valued the role of the faculty. Drawbacks include the expense and cost of maintenance of these types of technologies. The purchase of VRBTs costs thousands of dollars per unit, so costs incurred for upgrades of both software and hardware along with personnel expenses are limitations. These drawbacks have to date prevented dental schools from embracing this technology widely.

We believe that accomplishments in the business sector due to the use of technological flatteners have great application and potential in global dental education. An example of such flattening is the recent collaboration between the Universities of Adelaide and Sharjah to start a new dental college in Sharjah by sharing curricula, intellectual property, and associated expertise. Using technology to deliver an online curriculum and various multimedia resources, the University of Adelaide has shown how barriers can be overcome.\(^44\)

It is evident from national studies of North American dental programs that the trend is toward a generally increased use of technology. In the same studies, academic dental deans also acknowledged that their dental institution needed to make better use of resources.\(^40\) One of the most valuable resources of any educational institution is its faculty and the faculty’s intellectual contributions. Yet studies have continually substantiated the claim that there is a shortage of dental educators in countries such as the United States.\(^45\)\(^-\)\(^47\) Current curricular design places major emphasis on students’ being physically present for both didactic and psychomotor skills acquisition. Access to learning materials and curricula 24/7 through the use of technology that would allow for less “seat” time in the classroom and more active learning in the lab, clinic, community, and global community are possible today in the delivery of curricula. These examples highlight the advantages of greater adoption of technology in dental education and better use of faculty resources.

The dental education community has historically been slow to adapt to change. A report by the Institute of Medicine described dental education in North America as resistant to change.\(^48\) Curricular change and innovation in teaching/learning and assessment strategies are being addressed by the American Dental Education Association Commission on Change and Innovation (ADEA CCI).\(^49\)

We recommend extension of the efforts of the ADEA CCI to the international dental community, taking into account local issues and considerations. We further advocate faculty development and training programs that will prepare faculty for curricular change including increased use of technology in teaching. It is our belief that better utilization of technology for collaboration and the sharing of resources across institutions and countries could strengthen dental education worldwide.

### Additional Barriers to Global Dental Education

The previous sections of this position paper have discussed barriers that currently limit the implementation of a standardized global dental education: accreditation and licensure issues, differences in dental education models and curricula, competencies, and the slow implementation of technological advances by dental institutions. Other barriers exist that are beyond the scope of this paper, including financial limitations, language barriers in the context of global dental education, and the development of new workforce models to increase access to oral health care services around the globe.

### Conclusion

The practice of all of health care is based on the commitment to the good of the patient. Academic dental institutions have a central role in meeting the common good. To ensure that those in need receive care, attention must focus on the variety of barriers that limit access to oral health care worldwide and thereby negatively affect the overall health and well-being of people across the globe. We have attempted to elucidate some of those barriers in light of globalization.

The emerging globalization process has now captured the attention of the global dental education community, as demonstrated by the recent interest shown by the International Federation of Dental Education Associations, the World Dental Federation (FDI), the DentEd thematic network in the European Union, the Association for Dental Education in Europe (ADEE), the American Dental Education Association (ADEA), the International Association for Dental Research (IADR), and numerous national dental associations. Several of these organizations are working toward creating a profile for the international dental professional as a first step. We support the idea of one international organization, e.g., the International Federation of Dental Education Associations
(IFDEA), serving as a facilitator to bring all of these organizations together to work in concert in addressing the following recommendations:

1. Develop a set of internationally recognized standards that define the educational outcomes of dental education (e.g., competencies that graduates are expected to possess for entry-level performance as they start their practice careers), utilizing standardized terminology and format that can guide curriculum development and revision and facilitate the comparison of dental educational systems at a global level.

2. Develop internationally recognized standards (competencies) for dental education that more strongly emphasize the stomatology perspective.

3. Work with dental education institutions and accrediting and licensing bodies worldwide to develop and adopt internationally recognized standards (competencies) to flatten dental education and thereby increase the mobility of dental faculty and dental professionals around the world.

4. Work with accrediting bodies to ensure that dental education programs interested in pursuing internationally recognized standards (competencies) are of comparable quality by developing and applying benchmarks for quality assurance and devising strategies to assist dental schools in meeting these benchmarks.

5. Collaborate with licensing bodies that support the necessity of a separate examination after graduation for the awarding of a license to practice, in the development of a standardized examination(s) that would be accepted worldwide.

6. Utilize technology to assist in collaborations and sharing resources and faculty expertise across educational programs worldwide with the goal of achieving the highest standard of dental education around the world.

7. Extend the efforts of the ADEA CCI to the international dental community, taking into account local issues and considerations.

8. Collaborate with the international dental community to establish quality faculty development opportunities for dental educators to facilitate curricular change and innovation.

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REFERENCES

33. MIT OpenCourseWare. Massachusetts Institute of Technology, Cambridge, MA.
Accreditation: A nongovernmental, peer review process in the United States that measures education programs and hospital dental services against predetermined national requirements or standards, respectively. The Commission on Dental Accreditation (CODA) acts as a partner with the profession, educational institutions, and health facilities to protect and further the public interest through the accreditation process.

American Dental Licensing Examinations (ADLEX): A series of U.S. clinical examinations, simulated on both computer and manikins as well as clinical performance on patients, used to assist licensing jurisdictions in making decisions concerning the licensure of dentists.

Commission on Change and Innovation (CCI): The CCI’s purpose is to build consensus by providing leadership and oversight to a systemic, collaborative, and continuous process of innovative change in the education of general dentists so that they enter the profession competent to meet the oral health needs of the public throughout the twenty-first century and to function as important members of an efficient and effective health care team.

Commission on Dental Accreditation of Canada (CDAC): Established in 1988 by the Canadian Dental Association as an autonomous body responsible for accrediting dental, dental hygiene, and dental assisting education programs in Canada.

Central Regional Dental Testing Service, Inc. (CRDTS): A testing service made up of fifteen U.S. state boards of dentistry that have joined forces to develop and administer fair, valid, and reliable examinations of competency to practice dentistry and dental hygiene. Members of the CRDTS are the state boards of Colorado, Georgia, Hawaii, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Carolina, South Dakota, Washington, Wisconsin, and Wyoming.

Commission on Dental Accreditation (CODA): The mission of CODA is to serve the U.S. public by establishing, maintaining, and applying standards that ensure the quality and continuous improvement of dental and dental-related education and reflect the evolving practice of dentistry. Its scope encompasses dental, advanced dental, and allied dental education programs.

Competency-based education: An instructional system in which a performance-based learning process is used and the learner demonstrates his and her level of attainment (i.e., competency) in a subject area.

Council of Interstate Testing Agencies, Inc. (CITA): A nonprofit corporation founded in 1975 as a collaborative effort to provide clinical dental and dental hygiene licensure examination administrative services for the U.S. states of Alabama, Mississippi, Louisiana, and North Carolina and territory of Puerto Rico.

Dental tourism: Dental tourism, or dental vacation, is a process in which an individual seeks dental care in another country (e.g., India, Canada, or Mexico) because of the low cost of care in that locale. Tour packages are available to accommodate Americans who are looking for good dental care at Third World costs. This trend is becoming more popular.

DentEd: The thematic network project achieving convergence in standards of output in European dental education.


European Economic Area (EEA): The EEA came into being on January 1, 1994, following an agreement between the European Free Trade Association (EFTA) and the European Union (EU). It was designed to allow EFTA countries to participate in the European Single Market without having to join the EU.

Flattening: The leveling of the global economic playing field.

General Dental Council (GDC): A United Kingdom organization that regulates all dental professionals in the country. Established in 1956 and currently under the Dentists Act of 1984, it keeps an up-to-date register of all qualified dentists and professionals complementary to dentistry such as dental hygienists, dental therapists, dental nurses, dental technicians, and clinical dental technicians. In doing so, it protects the general public from unqualified dental professionals.

Globalization: A multidimensional set of social processes that create, multiply, stretch, and intensify global social interdependencies and exchanges, while at the same time fostering a growing awareness of deepening connections between the local and the distant.

Insourcing: The opposite of outsourcing, insourcing (or contracting in) is often defined as the delegation of operations or jobs from production within a business to an internal (but stand-alone) entity (such as a subcontractor) that specializes in that operation.

Leveling (level playing field): Leveling occurs in an economic environment in which all companies or countries in a given market must follow the same rules and are given an equal ability to compete.

North American Free Trade Agreement (NAFTA): A commercial agreement among Canada, the United States, and Mexico that promised free trade and easier flow of capital among the signatory nations.

North East Regional Board of Dental Examiners (NERB): Founded in 1969 to facilitate the licensure process for candidates and eliminate the need for repetition of state board clinical examinations, NERB is a nonprofit, independent corporation comprised of a consortium of sixteen U.S. state dental boards. NERB develops, administers, scores, and reports the results of its examinations in dentistry and dental hygiene. Each state board whose members participate in NERB accepts the results of these clinical examinations in lieu of its own individually administered clinical examination. States participating in NERB are Connecticut, District of Columbia, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and West Virginia.

Offshoring: The relocation of business processes from one country to another. This includes any business process such as production, manufacturing, or services.

Outsourcing: The delegation of non-core operations from internal production to an external entity specializing in the management of that operation.

Postsecondary education: Any education that occurs after the completion of a high school diploma or high school equivalency diploma.

Southern Regional Testing Agency (SRTA): Founded in 1975, the SRTA provides clinical dental and dental hygiene examinations for the U.S. states of Arkansas, Kentucky, South Carolina, Tennessee, and West Virginia.

Supply chain: A supply chain, logistics network, or supply network is a coordinated system of organizations, people, activities, information, and resources involved in moving a product or service in physical or virtual manner from supplier to customer.

Uploading: The transmission of a file from one computer system to another, usually larger computer system. From the ordinary workstation or small computer user’s point of view, to upload is to send a file, and to download is to receive a file.

Western Regional Examining Board (WREB): The WREB examinations were developed to provide reliable clinical assessments for U.S. state licensing agencies to use in making valid licensing decisions. WREB members are the states of Alaska, Arizona, California, Idaho, Montana, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming. WREB exam results are accepted by dental and dental hygiene licensing agencies in more than thirty states.

World Dental Federation (FDI): A global federation of national dental associations, the FDI has as its main roles to bring together the world of dentistry, to represent the dental profession of the world, and to stimulate and facilitate the exchange of information across all borders with the aim of optimal oral health for all peoples.