

### The Experience of Integration in the Dental Curriculum of the World's Accredited Universities and How to Apply it in Iran

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**Introduction:** The aim of this paper is to study the experiences of the twenty-first century general dentistry curriculum in the world's prestigious universities and use it to revise the curriculum in Iran.

**Methods:** The research method is a qualitative type of historical research. Firstly, with library studies and with the analysis and interpretation of data, various types of integration in the dental program of some of the reputable universities of the world were investigated and then a picture of the situation in Iran was presented. Finally, methods to use the global experience to improve the dentistry curriculum of Iran were studied.

**Results:** The findings show that two types of integration in the dentistry curriculum have been applied during the first decade of the twenty-first century: horizontal integration and vertical integration. In terms of number, the cases of vertical integration are more numerous; two horizontal integration and forty vertical integration cases were identified.

**Conclusion:** The benefits of the integration over a long period of six years of dentistry are remarkable. These benefits are from an educational perspective to ease of learning, continuity of retention, reminding speed, and careful utilization, each of which is sufficient to redefine curricula in this field. In addition, these empirical reasons, along with the pressure of aligning with global programs and meeting social needs and adapting to labor market conditions, have made it necessary to revise curricula based on integration criteria and, of course, benefit more to the universities that have brought them to action on the basis of global experience and timely action.

**Keywords:** Medical education, curriculum, integrated curriculum, integration, general dentistry

### دراسة تجربة الدمج في مناهج طب الأسنان في الجامعات الرائدة في العالم وكيفية إستخدامها في إيران

**المقدمة:** الهدف من هذه المقالة هو دراسة تجارب الدمج في مناهج طب الأسنان العامة في القرن العاشر والعشرين في جامعات العالم الرائدة واستخدامها لإعادة النظر في المناهج الدراسية في إيران.

**طريقة العمل:** طريقة البحث هي نوعية ومن نوع البحث التاريخي. أولاً، مع الدراسات المكتبية ومع تحليل وتفسير المعلومات، تم عرض أنواع التكامل في برنامج طب الأسنان لبعض الجامعات الرائدة في العالم. تم عرض صورة للوضع في إيران. وفي النهاية، تمت دراسة طرق استخدام التجربة العالمية لتحسين مناهج طب الأسنان في إيران.

**النتائج:** تشير النتائج إلى نوعين من التكامل في المناهج الدراسية لطب الأسنان تم استخدامها في العقد الأول من القرن العشرين: تكامل أفقي وتكامل عمودي. من حيث العدد، تكون حالات التكامل العمودي أكثر عدداً، بحيث تم تحديد حالتين تكامل أفقي وأربعين حالة تكامل عمودي.

**النتيجة:** والنتيجة هي أن فوائد التكامل في فترة السنوات الست الطويلة من طب الأسنان مهمة جداً. هذه الفوائد من منظور تعليمي مرتبطة بتسهيل التعلم، استمرارية التحفظ، سرعة التذكير والاستخدام الدقيق، وكل منها يكفي لإعادة النظر في المناهج ضمن هذا المجال. وبالإضافة إلى ذلك، فإن هذه الأسباب التجريبية إلى جانب الضغوط المتمثلة في التوافق مع البرامج العالمية وتلبية الاحتياجات الاجتماعية والتكيف مع ظروف سوق العمل، جعلت من الضروري إعادة النظر في المناهج الدراسية القائمة على معايير التكامل، وبالطبع، جلب المزيد من الفوائد للجامعات، والعمل بناء على التجربة العالمية وفي الوقت المناسب.

**الكلمات الدلالية:** التعليم الطبي، المناهج الدراسية، المنهج المتكامل، التكامل، دورة طب الأسنان العامة.

### دنيا کی معتبر یونیورسٹیوں میں ڈینٹل نصاب تعلیم کے منضم کرنے کے تجزیوں کا جائزہ لینا اور یہ دیکھنا کہ ایران میں اسے کس طرح سے لاگو کیا جاسکتا ہے

**بیک گراؤنڈ:** اس مقالے کا ہدف اکیسویں صدی میں دنیا کی معتبر یونیورسٹیوں میں ڈینٹل نصاب تعلیم کے منضم کئے جانے کے تجزیوں کا جائزہ لینا اور اس کی روشنی میں ایران میں ڈینٹل نصاب پر نظر ثانی کرنا ہے۔

**روش:** یہ ایک تاریخی تحقیق ہے۔ شروع میں کتابوں اور تجزیوں اور مختلف طرح کی معلومات سے، دنیا کی معتبر یونیورسٹیوں میں ڈینٹل نصاب کے منضم کئے جانے کا جائزہ لیا گیا اور اس کے بعد ڈینٹل تعلیم میں ایران کی صورتحال پیش کی گئی۔ آخر میں اس عالمی تجربے سے ایران میں ڈینٹل نصاب کو بہتر بنانے پر کام کیا گیا۔

**نتیجے:** اس تحقیق کے نتائج سے معلوم ہوتا ہے کہ اکیسویں صدی میں ڈینٹل نصاب کو منضم کرنے کے لئے جو طریقے اپنائے گئے تھے ان میں ایک طریقہ افقی انضمام کا ہے اور دوسرا طریقہ عمودی انضمام کا ہے۔ تعداد کے لحاظ سے مغربی ملکوں میں عمودی انضمام زیادہ ہے، اور افقی انضمام صرف دو عدد دیکھے گئے ہیں۔ عمودی انضمام کے چالیس کیسز ہیں۔

**سفارش:** ڈینٹل نصاب تعلیم کے انضمام سے چھ سال کی طولانی مدت میں نہایت اہم نتائج حاصل ہونگے، تعلیمی لحاظ سے اس سے بہتر معیاروں پر تعلیم دی جاسکے گی، اور طلباء مسلسل تعلیم حاصل کرتے رہیں گے اور ان کے تعلیم حاصل کرنے کے عمل میں تیزی آجائے گی، یہ سارے امور ڈینٹل نصاب کی تیاری میں موثر واقع ہوتے ہیں۔

یونیورسٹیوں کو دنیا کے تجربے سے فائدہ اٹھانے کے لئے فوراً اقدام کرنا چاہیے۔

**کلیدی الفاظ:** ڈینٹل نصاب، انضمامی تعلیمی طریقہ، طبابت کی تعلیم۔

### بازنگری تجربہ تلفیق در برنامه درسی دندانپزشکی دانشگاه‌های معتبر جهان و چگونگی استفاده از آن در ایران

**مقدمه:** هدف این مقاله، بررسی تجربیات تلفیق در برنامه درسی دوره دندانپزشکی عمومی در قرن بیست و یکم در دانشگاه‌های معتبر جهان و بهره‌گیری از آن برای بازنگری برنامه درسی در ایران است.

**روش کار:** روش پژوهش، کیفی از نوع تحقیق تاریخی است. ابتدا با مطالعات کتابخانه‌ای و با تحلیل و تفسیر اطلاعات، انواع تلفیق در برنامه‌درسی دندانپزشکی برخی از دانشگاه‌های معتبر جهان بررسی و سپس تصویری از وضعیت ایران ارائه شد. در نهایت، راه‌های استفاده از تجربه جهانی برای بهسازی برنامه‌های درسی دوره دندانپزشکی ایران مورد بررسی قرار گرفت.

**یافته‌ها:** یافته‌ها نشان می‌دهد دو نوع تلفیق در برنامه‌های درسی دوره دندانپزشکی طی دهه اول قرن بیست‌ویکم اعمال شده است: تلفیق افقی و تلفیق عمودی. به لحاظ تعداد، موارد اعمال تلفیق عمودی دارای تعداد بیشتری است؛ به گونه‌ای که دو مورد ادغام افقی و چهل مورد ادغام عمودی شناسایی شد.

**نتیجه‌گیری:** نتیجه این که مزایای تلفیق در دوره طولانی شش‌ساله دندانپزشکی، بسیار قابل توجه می‌باشد. این مزایا از نگاه آموزشی به سهولت یادگیری، استمرار یادداری، سرعت یادآوری و دقت بکارگیری مربوط هستند که هر یک از آنها برای بازنگری برنامه‌های درسی این رشته کافی می‌باشند. علاوه بر این، این گونه دلایل تجربی به همراه فشار همسویی با برنامه‌های جهانی و پاسخ‌گویی به نیازهای اجتماعی و انطباق با شرایط بازار کار، سبب شده است بازنگری برنامه‌های درسی بر اساس معیارهای تلفیق، امری ضروری جلوه کند و البته فایده بیشتری را برای دانشگاه‌هایی به ارمغان آورد که بر اساس تجربه جهانی و به موقع اقدام بدان نمایند.

**کلمات کلیدی:** آموزش پزشکی، برنامه‌درسی، برنامه‌ریزی درسی تلفیقی، تلفیق، دوره دندانپزشکی عمومی

## INTRODUCTION

Dentistry is one of the branches of medical sciences that should be in the context of up-to-date educational changes in the world and in responding to the needs of society in the third millennium. In its 80th session in the Comprehensive Care Unit, the United States Dental Education Association has suggested that dental clinical curriculum in the 21st century should be patient-oriented and based on ability. The need to pay attention to the modern methods of information transfer with emphasis on the progress of electronic tools, being student-oriented, clinical stimuli, and the double emphasis on the combination of medicine and pathology, behavioral and social sciences in dentistry education is necessary in today's world. These scientific-social foundations have led to a clear focus on the need to integrate theoretical and practical aspects of social issues into account in recent advances in dentistry education and curriculum planning (1).

There are different approaches to integrating curricula. The initial idea is that in the integration approach, theoretical and practical courses are combined, while this type of integration is the minimum outcome of an integrated approach (2). In spite of the tradition governing dentistry curriculum that has been divided into "basic sciences" and "clinical sciences" separately, the realities of the new scientific and social world indicate that in order to have a successful curriculum in teaching practical sciences, such as dentistry, theoretical and practical education need to be coordinated and integrated (3). Integration means the mixing of content or topics that are separately included in the curriculum of educational centers in the traditional educational systems (4-5). Integrating curriculum is associating and integrating content and curriculum processes to achieve the goal of the coherence of learning experiences in learners (6). Integration of medical education is divided into horizontal and vertical categories: the purpose of horizontal integration is to integrate courses that are taught in one stage. The integration of basic sciences with each other falls into this category (e.g. embryology, histology, pathology, etc.), or the integration of clinical courses with one another (e.g. preventive medicine, psychiatry, geriatrics, etc.). Therefore, this integration involves a series of courses that are presented at one stage, and the time they are presented as a program is considered a "unit." (7-8). The goal of vertical integration is to integrate courses that are consecutively placed after one another. Integrating basic sciences with clinical sciences can be mentioned here. Vertical integration between basic sciences and clinical sciences with problem-based learning method deepens learning. In fact, vertical integration involves early student contact with patients in the first semester in basic sciences as well as basic science education in clinical curriculum, which has been given particular attention by the Ministry of Health and Medical Education in recent years (9). In this regard, the purpose of this study is to investigate the experiences of the general dentistry curriculum in the twenty first century at prestigious universities of the world and to use it to revise the curriculum in Iran.

## METHODS

This is a historical research which is considered a qualitative research. In its implementation, it has been tried to study the integration of the dental curriculum with an analytical perspective using available resources and documents. Historical research examines certain issues at a specified time, and the researcher evaluates the integrity of the material to interpret and analyze the information (10). Given the theoretical nature of the research, the data gathering tool was taking notes through the study of documents. For this purpose, the literature on the integrated curriculum was studied and the documents were used to collect information about the general dental curriculum in Iran and other reputable universities in the world. This review has been limited to a specific time frame: it was limited to examining the status of Iran during the period covering the current program and foreign universities from 2000, which are among the newest examples. In order to access resources, in addition to referring to prestigious universities in Iran (Faculty of Dentistry of Shahid Beheshti University of Medical Sciences, Faculty of Dentistry of Tehran University of Medical Sciences, Faculty of Dentistry of Islamic Azad University, Shahed University, Kerman, Isfahan, and Tabriz Universities of Medical Sciences), the study of scientific and research documents was also carried out using the "Spider's Web" method. In this method, each source can provide clues from other sources and lead the research to new information. This method was especially used to obtain information about sources outside of Iran. To collect information, a targeted, organized search was used. To access a wide range of scientific texts, Google Scholar and Alta Vista search engines were used. Also, medical databases such as PubMed and MEDLINE were used, and to access bibliographies, databases such as ERIC and RDRB were used. In these databases, keywords such as integration, integrative curriculum, dental school, dental curriculum, higher education, the basics and elements of dentistry syllabus, types of integration, and other related terms were used to search for theoretical literature and research backgrounds since 2000. Therefore, methods such as document analysis, comparative study, and review of documentation were used during the study. In general, in this method, the initial plan of information is compiled based on the main questions and is being sought in the resources. To analyze the data, the method of theoretical analysis focused on the questionnaire was used. In this method, the data are combined to form a comprehensive and logical answer, and their defensible organization is the basis for determining the validity of the method.

## RESULTS

### (A) Revising the curriculum for general dentistry in prestigious universities in the world

In this review, the experience of revising in forty dental faculties in the world was reviewed and were summarized using the basic concepts of curriculum. The two main types of integration with the themes of "horizontal integration" and "vertical integration" were the basis for organizing and combining data. Totally, after reviewing the curriculum of

Table 1. Main topics of vertical integration in the dental curriculum of the studied universities

Row	Title	Row	Title
1	The integration of basic sciences in clinical practice and vice versa, for example: early contact with the patient	21	Basic pharmacology as a relationship between the use of drugs in practical dentistry
2	Integration of dental diseases with general diseases (Integration of medicine and surgery (human diseases) General Dentistry Curriculum = Integration of Medical Sciences and Dentistry	22	Integration of Microbiology Course with Periodontics Course
3	Integration of communication skills in all clinical skills of dentistry (integration of sociology, psychology, communication skills, education of patient-dentist relations, detecting special needs of oral medicine and dentistry)	23	Integration of periodontics and restorative dentistry
4	Integration of New and Biomedical Sciences, Critical Thinking with the Emphasis on Dentistry Topics	24	Integrating Preventive Dentistry With Pediatric Dentistry
5	Integration of computer sciences and research methods in dentistry	25	Integrating pediatric dentistry with pre-clinic of restorative dentistry
6	The integration between clinical dentistry and informatics, bioengineering, nanotechnology, molecular biology, and so on.	26	Prevention of caries and educating oral hygiene to children and families
7	Integration between basic sciences and clinical research findings	27	Integration of Pediatric Dentistry Emergency Unit in Pediatric Dentistry Unit
8	Integrating clinical sciences of the comprehensive clinic	28	Integration of Students Learning Objectives with Clinical Management and Treatment
9	Integration of professional ethics and behavior in dentistry	29	Integration of community-based education in dentistry curriculum
10	Integration of group work with oral hygiene team, dentists and dental nurses and management of this team in dental topics (management and leadership of oral and dental teams)	30	Integration of training through simulation in dentistry
11	Integrating internship dentistry	31	Integration of qualitative evaluation in the dental evaluation program
12	Integration of ethical and professional approaches to traditional dentistry education	32	Integration of Emergency Medicine in Dentistry
13	Integration of patient care in clinical education	33	Integration of control and management of pain and anxiety and trauma in the clinical topics of dentistry
14	Integrating theoretical lessons into practice for improving student's learning (PBL-Hybrid inter disciplinary theoretical courses and Comprehensive Patient Care courses).	34	Practical elderly dentistry skills (dentistry for the elderly)
15	Vertical integration of system organs based on basic medical sciences and clinical communication of topics	35	Integration of Biomedical, Behavioral and Clinical Sciences in Dentistry
16	Integration of Simulated Computer Patient in Curriculum	36	Introduction of Comprehensive clinic in the clinical course of dentistry
17	Integration in the department of restoration includes surgical, fixed and removable prostheses	37	Integrating the Scenario for Diagnosis and Treatment of New Health Problems in the Dental Education Program
18	Content changes in dental anatomy and dental materials that have been trained in the pre-clinic and in the clinic.	38	Integrating new sciences at all levels of the dental program
19	Physiology is taught in the form of vertical integration with the theme of dental programs, at levels 1 and 2.	39	Integrating oral hygiene with public health
20	Integration of Oral diseases and oral surgery: Oral diseases and oral pathology are closely associated with oral and maxillofacial surgery.	40	Integration of periodontal diseases with genetic polymorphism, biomarkers and cellular biology

the world's leading universities, it was concluded that since 2000, the degree of vertical integration was larger than the horizontal integration. In this study, it was found that common types of horizontal integration in two cases and common types of vertical integration were used in forty cases as presented in Table 1.

**Horizontal integration in dentistry curriculum:** This type of integration becomes necessary when new sciences emerge. In dental field, this was also evident due to scientific developments in other fields. New advances in computer sciences, information and communication sciences, behavioral sciences, basic sciences and management sciences

have led to the integration of this progress with dentistry with more success in this field. Accordingly, two methods of horizontal integration in dental programs were pursued:

- 1) Integration of basic sciences, behavioral sciences and clinical sciences in all four years of dentistry education; and
- 2) Integration of basic sciences with dental topics (basic sciences of dentistry).

**Vertical integration in the dentistry curriculum:** Vertical integration generally takes place in the topics of a discipline or field. Although it has a history, this type of integration was not as close to horizontal integration as was noticed in the last decade of the twentieth century and early twenty first century. By integrating basic sciences in clinical practice and vice versa, students' motivation to learn both sciences improves. Also, integration education rationalizes the educational resources, so that all faculty members come together in each discipline and subject at a college and are given the right person to take the responsibility of teaching each part and learning resources can be shared. Based on this, in the last ten years, vertical integration has been undertaken in various forms.

Since it is not possible to discuss all types of integrations in detail in this article, a few cases are mentioned based on the practice of the universities and the results are reported.

**University of Marquette:** This University has launched the Comprehensive Patient Care Program in 2010-2011. In this plan, the clinical curriculum of the Faculty of Dentistry is based on the General Practice Model. The philosophy of this model is that a qualified comprehensive program, without dividing it into disciplines or individual specialties in dental care, is more successful (11). The program is patient-oriented and managed by general dentists. This allows the integration of behavioral sciences, basic sciences and clinical sciences into patient care and treatment (12).

**University of Connecticut:** This University has presented a unique program on Biodontics in the form of the introduction of new biologic sciences and research in dentistry. The main goal of the new curriculum is the use of new discoveries such as molecular biology, biotechnology and informatics that utilize these sciences in teaching dentists to serve more to patients. Part of this program includes translational research training and clinical trial programs designed to integrate basic sciences in clinical applications and new technologies such as Probiotic, Dental Laser and Electronic Patient Record System. The highest level of Biodontics education has been documented in a formal admission of assistants leading to formal education certificate after two years (11, 13).

**University of Texas:** The curriculum was reviewed at the university to revise the program in terms of its use of the new sciences at all levels, and the critical evaluation approach was used in this direction. The main achievement of the review of the dental curriculum of this university can be described in three main approaches: 1) Students and professors should experience evidence-based practice; 2) Students and professors should be able to evaluate critically in all educational and therapeutic areas; 3) Clinical teaching strategies should be followed when teaching to students. In this curriculum, known as CAT, new information is

integrated into the dental curriculum and private practice setting, giving students an opportunity to actually get acquainted with the form of dentistry that is fundamentally mixed with new sciences and technology (14-16).

Considering that vertical integration is widely seen in dentistry curricula, Table 2 refers to global experiences in integrating different dental curricula. It should be noted that the detailed report for each of the 40 commonly used vertical integrations in the dental colleges of the studied universities is not included in this article, and only a few examples have been mentioned.

**B) The experience of reviewing the dentistry curriculum in Iran:** The first dentistry curriculum after the Islamic Revolution and the Cultural Revolution, was established on the basis of the statute of the dental schools approved on March 1, 1983 by the headquarters of the Cultural Revolution Administration. According to the regulations approved by the Cultural Revolution Administration, the total units of this course were 213 theoretical units and 20 units of internship at the medical centers and the provincial capital. The second training program from the second review, approved by the Supreme Planning Council dated June 17, 1988, was based on the constitution of the Islamic Republic of Iran and the goals of the World Health Organization - which the Government of the Islamic Republic of Iran was bound to assume - with the aim of restoring wellness for the people of Iran, changes were made to the courses. The program consists of 202-205 courses and a period of 6 years. After two years of teaching 68 units of general and basic science courses, students enter the clinical course (pre-clinic and clinic) and continue their education with the presence of patients. At the end of the six-year period, students present their thesis and graduate. The third review was carried out in 1999 by the Dental Education Review Committee of Shahid Beheshti University of Medical Sciences. After the approval of the Secretariat of the Council for Dentistry and Specialized Medicine, the Board of the Medical Sciences Planning Council was approved by the Supreme Council on May 20, 2000. One of the key points in this review and in the direction of its correction was the importance that the training of human resources in the dentistry sector should lead to the goal of providing, maintaining and promoting oral and dental health in the community, which unfortunately has not yet been achieved. And on the other hand, in the past few years, disagreements regarding the contents of the curriculum of dentistry has begun and increased. According to the above, the review of the program, which is an essential component of the development of education, was accepted as a definite necessity and implemented (17).

Considering that it is not possible to address all the patterns of dental education curriculum in Iranian universities of medical sciences, only one example of the integration of curriculum is mentioned here which is based on the studies conducted in the current Iranian dentistry curriculum and the examination of existing types of integration of the curriculum of the world-renowned universities, they are considered as a model for integrating Iran's dentistry curriculum (2). This pattern, implemented at the dental

faculty of Shahid Beheshti University of Medical Sciences, includes a curriculum that runs over a period of six years

in five stages, and each stage introduces topics with more detailed description Table 3 (18).

**Table 2. Global Experiences in the Integration of Different Dentistry Curricula (19-48)**

Row	Examples of universities that have implemented this integration	Topic of Integration	Type of Integration	Compliance with the current status of Iran's current program based on native requirements
1	Toronto, UK, Texas, Marquette	Integration of basic sciences together; (horizontal integration of the content of basic sciences in the form of body systems in the dentistry curriculum); (integration of the contents of basic science courses in the form of basic science education packages). For example, for each organ, anatomy, histology and of that same organ is provided.	Horizontal	Courses which need integration that are included in the current curriculum.
2	Harvard, Japan	Integration of Basic Sciences in Clinical Sciences; (Vertical integration of clinical course content in basic sciences (and vice versa)	Vertical	*
3	Baylor, Louisville	Integrating oral hygiene with public health; creating a unit called essential dental care (dental care)	Vertical	*
4	Ankara, Sheffield	Integration of Pediatric Dentistry Emergency Unit in Pediatric Dentistry Unit	Horizontal	*
5	Connecticut	Integrating Preventive Dentistry and Pediatric Dentistry Unit	Horizontal	*
6	Germany, Netherlands	Integration of microbiology course with periodontitis	Vertical	*
7	Pennsylvania, Toronto	Vertical integration of system organs based on basic medical sciences and clinical communication of topics	Vertical	*
8	Virginia, Harvard, Boston,	Integration of Oral Disease Unit, Oral Pathology and Oral and Maxillofacial Surgery	Horizontal	*
9	Sweden, Switzerland, Indonesia	Integration of Pre-Clinic in the Department of Pediatric Dentistry with Pre-Clinic of Restoration and Endodontics Department	Vertical	*
10	Sydney, Pennsylvania	Integrating research into dental curriculum (research design, advanced critical and applied statistics in research	Vertical	Courses which require revision with integration view that are available in the current curriculum.
11	England, Baylor, Wales, Germany	Integrating the Medical Approach in Clinical Dental Services (Integrating Dental Diseases with General Diseases) (Integrating Medical and Dental Education)	Vertical	*
12	Connecticut, Canada (Toronto), Virginia, Marquette	Integrating education on issues of prevention of the types of caries and oral hygiene in children and their families	Vertical	*
13	New Jersey, Indiana	Integration of professional ethics and behavior in dentistry; (Strengthening and reviewing the topic of appropriate professional and moral behavior and integrating it throughout the six-year period of dentistry)	Vertical	*
14	England, Baylor, Wales, Germany	Integration (introduction) and application of sciences into dentistry rounds based on disease in the curriculum; (Integration throughout the six-year period of dentistry)	Vertical	Introduction of required and new courses to complete the current curriculum
15	Netherlands, Belgium, Sweden, Switzerland, Dundee	Integrating (introduction of) medical emergencies in the dentistry curriculum; (adding emergency medicine courses and recovering injuries and first aid and integrating them throughout the six-year period of dentistry)	Vertical	*
16	Austria, Taiwan, Colombia	Integration (introduction) of evidence-based dentistry in the curriculum (Evidence-based dentistry, throughout the six-year period of dentistry)	Vertical	*
17	Switzerland, Dundee	Integrating new sciences in dentistry (adding new sciences related to dentistry, and teaching them throughout the six-year period of dentistry)	Vertical	*
18	Colorado, Columbia, Illinois	Integration (introduction) of the treatment plan in the dentistry curriculum; (adding, designing the treatment, and integrating it into the clinical course of dentistry)	Vertical	*

Table 3. Revisions of dental education curriculum at Shahid Beheshti University of Medical Sciences (18)		
Stages	Title	Features
1 <sup>st</sup> stage	Basic Medical Sciences	<p>At this stage, basic sciences and general courses will be presented during three semesters with the following modifications:</p> <ol style="list-style-type: none"> <li>1. Adding courses to build self-centered learning capabilities by adding information technology courses, studying and finding dental evidence.</li> <li>2. The horizontal integration of the content of basic medical sciences in the form of body systems.</li> <li>3. Vertical integration of the theoretical content of traditional courses of "internal diseases" and pathology in the content of courses of the body. In this section, most common or important diseases will be considered from the perspective of a dentist.</li> <li>4. Adding Basic CPR Course.</li> <li>5. Adding general communication skills.</li> <li>6. Adding early patient contact.</li> </ol>
2 <sup>nd</sup> stage	Basic Dental Sciences	<p>This phase, which is intended as a one-semester course, contains courses that provide students with specific topics in basic dental sciences with the following changes:</p> <ol style="list-style-type: none"> <li>1. Vertical integration of histology and pathology in the form of oral histology-pathology.</li> <li>2. Vertical integration of embryology with congenital oral diseases as a course of Dentofacial growth and development</li> <li>3. Presentation of Pharmacology in the Integration of Oral Microbiology and Oral Antimicrobial Pharmacology</li> <li>4. Vertical integration of oral diseases in the above courses</li> <li>5. The presentation of new courses: Physics of radiology and protection, occlusion and masticatory system, and Local Anesthesia and Nerve Blocks</li> <li>6. Continuing communication skills training in clinical communication skills training.</li> <li>7. Continuing to organize the topic of community-based dentistry during this phase during the course of the "Foundations of Oral Health".</li> <li>8. The new organization of English in the curriculum in this phase has been seen in such a way that by changing the content, students at the end of this phase will be able to study dentistry references.</li> <li>9. The new organization of the topic of research in the curriculum that begins with the presentation of the research methodology course at this stage.</li> </ol>
3 <sup>rd</sup> Stage	Preclinical Dental science	<p>The duration of this phase is 2 years. The purpose of this phase of student preparation is to assume the responsibility of the patient's administration as a general dentist with the following modifications:</p> <ol style="list-style-type: none"> <li>1. Theoretical and practical integration (pre-clinic and clinic) of clinical courses in specialized departments.</li> <li>2. Integration of dental materials courses in clinical departments.</li> <li>3. Continuing the training of evidence-based dental positions in this phase during the two periods of critical appraisal of dental literature and "Evidence-Based Dentistry".</li> <li>4. Continuing education of emergency medical units in this phase by providing a new course of advanced CPR and medical emergencies.</li> <li>5. Continuing education of community dentistry in the curriculum by providing a new course "Preventive Dentistry 1 &amp; 2" and finally "Promoting Individual Oral Health".</li> <li>6. Promoting student responsibility at the patient's administration (the role of dental assistant for students at this stage).</li> <li>7. Continuing teaching English at the level of achieving the goals of speaking English as a dentist.</li> <li>8. Continuing the teaching of ethics and professional behavior as "Ethical vignette case discussion".</li> <li>9. Starting offering selective courses for dental students.</li> </ol>
4th stage	Dental clerkship	<p>The duration of this phase is 18 months. The purpose of this phase is to gain experience, develop skills, strengthen decision-making power, increase self-esteem and complete the development of thought through direct confrontation of trainee with oral and dental health issues and assign responsibility for oral health of the patients with the following features:</p> <ol style="list-style-type: none"> <li>1. Provide clinical experience in general clinics.</li> <li>2. Training under the supervision of an educational preceptor.</li> <li>3. Teaching based on the tasks of dentists</li> <li>4. Continuing English language education at the level of achieving English Writing Objectives.</li> <li>5. Continuing ethical education and professional behavior as "Ethical Consultation Sessions".</li> <li>6. Continuing medical emergency care training as "Disaster Management".</li> <li>7. Continuing community education in the curriculum by providing longitudinal courses as "Community oral health promotion" and "system-based dental practice".</li> </ol>

Table 3. Continued		
Stages	Title	Features
5 <sup>th</sup> stage	Integrated dental Internship	<p>This phase is a completely new experience in this curriculum based on the real goals and commitments of the Oral Health Care System in the community. In this phase, the students have completed the integrated study in the oral and dental clinics and, while experiencing independent dental practice, provide oral health care to the community as a general dentist under the following conditions:</p> <ol style="list-style-type: none"> <li>1. The first-level provider of oral care services, regardless of age and sex of the patient</li> <li>2. Effective use of health resources through coordinated care and collaboration with other health care providers in oral health care in the country's health care system.</li> <li>3. Providing individual services, taking into account the specific circumstances of the individual, family and community.</li> <li>4. Establishing a lasting consultation advice through effective communication between the dentist and the patient.</li> <li>5. Provide continuous long-term care services (in accordance with the needs of patients)</li> <li>6. Diagnosis and treatment of acute and severe oral diseases</li> <li>7. Promoting health through effective and appropriate interventions</li> <li>8. Responsible for oral and dental health of the community</li> </ol>

By examining the current pattern of dentistry curriculum in Iran and other features that govern it, such as the separation of basic sciences from one another and from clinical sciences, subject-orientation and neglecting to establish horizontal and vertical links between topics, it can be said that the principles of the integrated curriculum is not mentioned in this curriculum. Therefore, due to the effects and consequences of applying the integration into the dental curriculum (7), updating the dental curriculum in Iran requires appropriate integration approaches in the dental curriculum considering the Iranian ecosystem.

**DISCUSSION**

The "Institute for Medicine" Committee in 1995, in a report entitled "Dentistry in Dilemma: Challenges and Changes," recommended that: "Dental students and professors should be involved in clinics in which the professors provide Comprehensive care." Based on the Comprehensive Caregiving Model provided by the committee, each student is responsible for providing care to all patient's therapeutic needs, and training should not be based on separate specialized disciplines, but each faculty should have a separate department of general dentistry (49-50). In this regard, the need to adapt to new social conditions on the one hand and the need to pay attention to new methods and means of medical education on the other hand, are the main factors requiring a revise of the traditional dentistry curriculum (51-52). Considering the benefits of the integrated curriculum, such as enhancing student learning motivation, increasing the level of education, increasing the level of educational goals from knowledge to the application of knowledge, strengthening problem solving skills in students, increasing the communication and cooperation of professors, making education resources more rational, unity and communication between medical students, dentists and curriculum specialists (7), a general overview of the dental curriculum, especially in the topics needed to integrate basic sciences in pre-clinics and general-dentistry clinics. Therefore, the present study was conducted with the aim of

studying integration experiences in general dentistry curriculum in reputable universities of the world and using it to review the dentistry curriculum in Iran. The results of this study showed that the patterns of European universities (53), with regard to the facilities and necessities, were more relevant to the integration of practical and theoretical courses, and American universities (11) were more sensitive to the integration of theoretical and practical courses; The sooner the students paid special attention to the clinical environment, and in most cases, from the first year of the dentistry, they provided an educational environment to connect the student with the clinical environment as quickly as possible. Since world standards have been accepted by dental schools, most dental curricula have been revised; and six new dentistry fields in the world (e.g., critical thinking, professional skills, interpersonal communication skills, oral health promotion, and management of treatment and patient care) have been introduced to their new integration plans. In Iranian models that are designed for higher education curricula, they are also largely addressed to the big scale curriculum level and policy and do not pay attention to the intermediate and micro level of the curriculum, and practically the levels that lead to the implementation of the curriculum are more or less ignored. Also, in the dental reform model of Shahid Beheshti University of Medical Sciences (2), most of the practical topics of the curriculum have been targeted and based on this, the curriculum has been developed. Therefore, in this model, the basics and theoretical topics of the curriculum have not been raised, since principally the "development of curriculum" has been raised, not the development of curriculum guidelines. By reviewing the integrations in the dentistry curriculum of these universities, and by comparing these integrations with the current curriculum in Iran, changes to the current curriculum of dentistry were proposed with respect to the global integrations implemented in the world:

1. Integrating the courses that are currently in the curriculum (courses needed to integrate into the current curriculum)
2. Courses need to be reviewed in the current curriculum

3. Integration in the form of adding new courses to the current curriculum to complete the current curriculum. Based on the results obtained from the examination of the cases presented in Table 2, two major policies should govern the development of general dentistry curriculum: (1) horizontal integration by reducing the number of courses; (2) vertical integration through early clinical activities. Therefore, the current curriculum can be modified as

described in Table 4 and is considered an integral part of the general dentistry integration curriculum. Finally, based on the studies carried out in the present Iranian dentistry curriculum and the study of the types of integration available in the curricula of the world's leading universities, the proposed integration model for the general dentistry curriculum in Iran presents a program that is implemented in a six-year period:

Table 4. Revision of the current curriculum of dentistry based on the principles of the integrated curriculum				
Type of Action	Type of Course	Suggested Courses	Titles of integrated Courses	
	General	-	-	
		Oral Histology and Pathology	Histology, Pathology	
		Oral Anatomy and Embryology	Embryology, Anatomy	
		Basic dental care	Oral Health and Public Health	
		Surgery and Oral Diseases	Oral diseases, Oral pathology and Oral surgery	
		Pharmacology in dentistry	Pharmacology, Oral Microbiology	
		Pre-clinics of the Preventive Dentistry	Pre-clinics of the Pediatric Dentistry Department, Preventive Dentistry	
		Pre-Clinics of Endodontics-Restorative Dentistry	Pre-clinics of restorative dentistry, pre-clinics of endodontics	
	Integrating current courses with new courses	General	-	-
		Basic	Teaching oral and dental care to the family	Prevention of caries and oral hygiene
			Oral microbiology training package with oral infections	The vertical integration of clinical course content in basic sciences (and vice versa), with an emphasis on dental topics (oral and dental diseases, along with their basic sciences)
			Professional behavior skills	Medical ethics, appropriate professional behavior
			Educational package for Oral and General Diseases	Dental Diseases, General Diseases
			Preventive Pediatric Dentistry Package	Preventive Dentistry and Pediatric Dentistry
		Research in dentistry	Research design, advanced and applied critical statistics in research	
		Pediatric Dentistry Emergency Package	Emergency of Pediatric Dentistry, Pediatric Dentistry	
		Specialized Dentistry English	English	
General		-	-	
		Communication skills training, learning and study	Reading and learning skills, behavioral sciences, public psychology and professional psychology	
		Teaching Skills and Information Technology	Information Technology	
		Critical Thinking Training	Critical Appraisal	
		Communication skills	Interpersonal and professional communication skills	
	Skill of writing a scientific paper and evaluating it	Skill of writing scientific paper, evaluation and critique of scientific articles		
	Emergency in dentistry	Emergency medicine (recovering the injuries and first aid)		
Specialized	Evidence-based dentistry	Evidence-based dentistry		
General	Primary Clinic (First Year)	Early contact with the patient		
	Pain and Anxiety Management	Pain and anxiety management (local anesthetics, nerve block)		
	Case-based dental round	Application of case-based dental round		
	New sciences in dentistry	New sciences related to dentistry		
	Dental treatment plan	Treatment plan in clinical course of dentistry		

**1st year:** Basic behavioral sciences and learning: communication skills, self-centered and lifelong learning ability, study skills, dental resources research, early exposure to the patient, English language learning, professional ethics in dentistry, informatics and information resources, evidence-based dentistry.

**2<sup>nd</sup> Year:** Basic Medical Sciences: Horizontal integration of the content of the basic medical sciences in the form of body systems, vertical integration of the content of the theory of traditional courses of "internal diseases" and pathology in the content of courses of the body. In this section, the most common or important diseases are considered from the perspective of a dentist. Adding the basics of resuscitation and medical and dental emergencies, adding the course of early contact with the patient, and dental genetic tests.

**3<sup>rd</sup> year:** Basic sciences of dentistry: Students' acquaintance with the specific topics of basic sciences in dentistry, dental research, introduction of new sciences in dentistry.

**4<sup>th</sup>Year:** Dental Pre-clinics: The purpose of this phase is to prepare the student to assume responsibility for managing the patient as a general dentist. The features of this phase are theoretical and practical courses (Phantom and Clinics) integrated into the clinical departments, which have been seen as providing training in relevant specialized departments. Also, by defining the new role of dental assistant for students in this phase, students play a greater role in managing the patients than in the traditional program, and are willing to write a scientific paper and evaluate and criticize scientific papers for research experience.

**5<sup>th</sup> year:** Dental clerkship: The goal of this stage is to acquire experience, develop skills, strengthen decision-making power, increase the reliance on self-esteem and complete the development of thought through direct confrontation of the student with oral and dental problems and the assignment of responsibility for oral and dental health of patients to them. At this stage, evidence-based dental approach is applied.

**Sixth Year: Internship in the Dentistry Society:** This phase is fully integrated into this program, which is based on the goals and commitments of the Oral Health System in the community. In this phase, integrated care students will attend oral and dental health clinics covered by the university and, while experiencing independent medical practice, will provide public health care as a general dentist under the following conditions and under the supervision of a consultant professor:

1. Providing the first level of oral care services, regardless of the age and gender of the patient
2. Effective use of health resources through coordinated care and in collaboration with other members of oral health care groups in the country's health care system.
3. Providing individual services, taking into account the particular circumstances of the individuals, their families and the community.

4. Establishment of a last in counseling relationship through effective communication between clinician and patient.
5. Providing continuous long-term care services (in accordance with the needs of patients)
6. Diagnosis and treatment of acute and chronic oral diseases
7. Promoting health through effective and appropriate interventions.

## CONCLUSION

This study emphasizes the need for dental professionals to pay attention to integration of the curriculum of dentistry education with regard to the changes in the world of dental education. It was also shown that horizontal integration (integrating basic sciences together; integrating oral health with public health; creating a unit called basic dental care; integrating pediatric dentistry emergency unit into pediatric dentistry; integrating dental units in pediatric prevention and dentistry ; Integration of Oral Diseases, Oral Pathology, Oral Surgery, Oral and Maxillofacial Medicine); Integration of Basic Science in Clinical Sciences; Integration of Periodontal Microbiology Course; vertical Integration of the System Organ Based on Basic Medical Sciences; Clinical Relationship; Integration of Pre-Clinic in the Pediatric Dentistry Department; With pre-clinic of restorative dentistry department and Endodontics; Integrating research into dentistry curriculum; Integrating the medical approach in clinical dentistry services; Integrating education in preventing the various types of caries and oral health in children and their families; Integrating ethics and appropriate professional behavior in dentistry; Integrating and applying case-based dentistry, the integration of medical emergencies in the dentistry curriculum; the inclusion of new sciences in dentistry; and integration of the treatment plan in the dentistry curriculum of Iran in accordance with Integration standards that are needed in the world's dental curriculum. Therefore, one of the effective ways to improve the general dentistry curriculum in Iran is applying the integration of the curriculum. To accomplish this, it is suggested that working groups be set up to review the dentistry curriculum, support the management of educational and research projects, and provide sufficient resources to achieve this.

To sum up, it can be concluded that in all these dental curriculum models, the goal is to achieve methods in which new sciences are introduced to dentistry.

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