

### An Integrated Model for the Iranian General Dentistry Curriculum

### تقديم نسط موهده للبرنامج التعليمي لطب الأسنان العام الإيراني

Maryam Safarnavadeh<sup>1</sup>,  
Samira Ebrahimpour  
Koumleh<sup>2</sup>, Nematollah  
Mousapour<sup>3\*</sup>  
<sup>1</sup>Educational Deputy of  
Ministry of Health and  
Medical Education, Tehran,  
Iran  
<sup>2</sup>Department of Educational  
Science, Science and  
Research Branch, Islamic  
Azad University, Tehran,  
Iran  
<sup>3</sup>Elementary Education  
Department, Nasibeh  
Teacher Education College,  
Farhangian University,  
Tehran, Iran  
  
\*Farhangian University  
Marzadaran Ave.,  
Tehran, 1463773111,  
IRAN  
  
TEL: +9821 44230828  
Fax: +9821 44250504  
Email:  
n\_mosapour@yahoo.com

**Background:** The purpose of this study is to present an integrated model for the Iranian general dentistry curriculum.

**Methods:** In this study, the qualitative method of focal groups was used. First, using library studies and analysis and interpretation of the resulted information, possible types of integration in the dental curriculum and real experiences of some of the world's leading universities were studied. Then, based on theoretical arguments and experimental achievements of the accredited universities, the design of the optimal integrated curriculum of the general dentistry was done and the validity of the designed model was validated through an interview with the experts of the field of dentistry using the Delphi method.

**Results:** Studying the experiences of different universities in integrating the dentistry curriculum, it was concluded that the experience of these universities regarding the integrated curriculum model resulted in positive outcomes. In general, the focus of the activities of modifying the curriculum in these universities was on integrated approaches focused on "learning with research", "evidence-based dentistry" and "introduction of new sciences" in dental curriculum design.

**Conclusion:** The integrated dental education curriculum model has three levels (academic level, field of study level, level of thematic program or content of the course); by deciding on four elements (goals, content, method and evaluation) and by following four principles (simultaneous integration at micro and macro levels; diversity of methods and multi-dimensionality; the balance between content and process-oriented nature of the integrated program; and completion of internal and external integration) aims at producing curricula.

**Keywords:** General Dentistry, Integrated Curriculum, Model

### ارائه الگوی تلفیقی برنامه درسی دندانپزشکی عمومی ایران

**زمینه و هدف:** هدف این پژوهش، ارائه الگوی تلفیقی برنامه درسی دندانپزشکی عمومی ایران است.

**روش:** در این پژوهش از روش کیفی از نوع گروه‌های کانونی استفاده شد. ابتدا با مطالعات کتابخانه‌ای و تحلیل و تفسیر اطلاعات حاصل از آن، انواع تلفیق ممکن در برنامه درسی دندانپزشکی و تجارب واقعی برخی از دانشگاه‌های معتبر جهان بررسی شد. سپس بر بنیاد استدلال‌های نظری و دستاوردهای تجربی دانشگاه‌های معتبر، به طراحی الگوی مطلوب برنامه درسی تلفیقی دوره دندانپزشکی عمومی اقدام گردید و اعتبار مدل طراحی شده از طریق مصاحبه با صاحب‌نظران رشته دندانپزشکی با استفاده از روش دلفی اعتبارسنجی شد.

**یافته‌ها:** از بررسی تجارب دانشگاه‌های مختلف در تلفیق برنامه درسی دندانپزشکی، این نتیجه حاصل شد که عنایت این دانشگاه‌ها به الگوی تلفیقی برنامه درسی با پیامدهای مثبت همراه بوده و در مجموع، محور فعالیت‌های تغییر و اصلاح برنامه درسی در این دانشگاه‌ها را تمرکز بر رویکردهای تلفیقی با محوریت «آموزش توأم با پژوهش»، «دندانپزشکی مبتنی بر شواهد» و «ورود دانش‌های جدید» در برنامه‌ریزی درسی دندانپزشکی تشکیل داده است.

**نتیجه‌گیری:** الگوی برنامه درسی تلفیقی آموزش دندانپزشکی عمومی الگویی است که در سه سطح (سطح حوزه علمی، سطح رشته تحصیلی، سطح برنامه موضوعی یا محتوای درس)؛ با تصمیم‌گیری درباره چهار عنصر (اهداف، محتوا، روش و ارزشیابی) و با رعایت چهار اصل (تلفیق همزمان در سطح خرد و کلان؛ تنوع روش‌ها و چند بعدی بودن؛ تعادل بین محتوا - فرایندمحوری برنامه تلفیق؛ و مکمل بودن تلفیق از درون - تلفیق از بیرون) به تولید برنامه‌های درسی می‌پردازد.

**واژه‌های کلیدی:** الگو، برنامه درسی تلفیقی، دوره دندانپزشکی عمومی

**الخلفية والمعرف:** الغرض من هذه الدراسة هو تقديم نموذج موهده لتعليم طب الأسنان العام في إيران.

**الطريقة:** في هذا البحث، تم استخدام طريقة نوعية من نوع المجموعات المركزية. أولاً، مع الدراسات المكتبية وتحليل وتفسير المعلومات الناتجة. تمت دراسة الأنواع الممكنة للتكامل في مناهج طب الأسنان والخبرات الحقيقية لبعض الجامعات الرائدة في العالم. بعد ذلك، استناداً إلى الحجج النظرية والإنجازات التجريبية للجامعات الرائدة، تم تصميم منسج التجميع الأمثل في طب الأسنان العام وتم التحقق من صحة النموذج المصمم من خلال مقابلة مع خبراء مجال طب الأسنان باستخدام طريقة دلفي.

**الماصل:** من دراسة تجارب مختلف الجامعات في دمج مناهج طب الأسنان، استنتج أن هذه الجامعات كان تتأجبراً إيجابية مع المنسج المتكامل، وبشكل عام، وركز تعديل مناهج الدراسة وأنشطة الإصلاح في هذه الجامعات على المنسج الموهده. التركيز على "التعلم مع البحث"، و"طب الأسنان القائم على الأدلة" و"إدخال المعرفة الجديدة" في تخطيط المناهج الدراسية.

**النتيجة النهائية:** إن نموذج المناهج الدراسية المتكاملة لطب الأسنان هو نموذج له ثلاثة مستويات (مستوى المجال الأكاديمي، مجال الفرع الدراسي، مستوى البرنامج أو المحتوى الدراسي)؛ من خلال تحديد أربعة عناصر (الأهداف، المحتوى، الطريقة والتقييم) واتباع أربعة مبادئ (التكامل المتزامن على المستويات الجزئية والكلية؛ تنوع الطرق والأبعاد المتعددة؛ التوازن بين المحتوى - العملية المحورية؛ عملية دمج البرنامج؛ واستكمال التكامل من الدمج الداخلي والدمج الخارجي) إلى إنتاج المناهج.

**الكلمات الدالة:** المنسج، منسج التجميع، طب الأسنان العام.

### ایران میں مختلف ایرانی اور اہم عالمی یونیورسٹیوں کے ڈینٹل نصاب کو مد نظر رکھ کر جنرل ڈینٹل میڈیسن نصاب کی تدوین

**بیک گراؤنڈ:** اس تحقیق کا هدف ایران میں مختلف نصابوں کو مد نظر رکھ کر ایک جامع ڈینٹل میڈیسن نصاب پیش کرنا ہے۔

**روش:** اس تحقیق میں دو گروہوں کو شرکت دی گئی۔ سب سے پہلے کتب خانوں سے حاصل شدہ مواد کا تجزیہ کیا گیا، اس میں مختلف قسم کے ڈینٹل پروگرام اور ڈاکٹروں نیز اساتذہ کے ذاتی تجربات اور نظریات کو شامل کیا گیا۔ اس کے بعد جنرل ڈینٹل میڈیسن نصاب کی تدوین کی گئی، اس مواد کے تعلق سے ڈینٹل ماہرین کی نظر لی گئی اور یہ نظریات ڈلفی روش سے حاصل کئے گئے۔

**نتیجے:** مختلف یونیورسٹیوں کے ڈینٹل نصابوں کا موازنہ کرنے سے یہ نتیجہ حاصل ہوا کہ یونیورسٹیوں نے جامع نصاب کا خیرمقدم کیا ہے اور اس سے انہیں فائدہ پہنچا ہے۔ اس سے فائدہ اٹھاتے ہوئے یونیورسٹیوں نے تعلیم و تحقیق کو ساتھ ساتھ رکھا ہے اور کلینیکل بیسڈ ڈینٹل سائنس پر زیادہ توجہ دی ہے۔ اس کے علاوہ یونیورسٹیوں نے سائنس کی نئی روشوں کو بھی اپنے نصاب میں شامل کر لیا ہے۔

**سفرار:** چونکہ مختلف عناصر کے مفید پہلوؤں کو جنرل ڈینٹل سائنس کے نصاب میں شامل کرنے سے تعلیم کے متعدد مراحل جیسے تعلیمی اہداف، نصابی مضامین، اور روش تدریس نیز طلباء کی صلاحیتوں کی جانچ پڑتال میں مثبت طرح سے مدد ملتی ہے لہذا اس روش کو اپنانے کی ضرورت ہے۔

**کلیدی الفاظ:** ماڈل، جامع ڈینٹل میڈیسن نصاب، جنرل ڈینٹل نصاب۔

## INTRODUCTION

In today's complex and changing world, in order to meet the needs and expectations of dentists and society in a comprehensive way, dynamic training in various sciences, including dentistry is required. However, many dental students still receive a discontinuous education; in such a way that even after obtaining official certificates, they have no understanding of the association of some of the learned basic sciences or they lack the knowledge of the link between research and practice. For this reason, the general dentistry curriculum must have content that meets the needs of the new world (1). The experience of teaching in the twentieth century and scientific confrontation with the real issues of practice at the beginning of the 21st century, led to the achievement that an "Integrated Dental Education Curriculum" is one of the practical and tested ways to deal with these issues. Integrating curricula means connecting and integrating curriculum content to the coherence of student learning experiences (2). An integrated curriculum model includes the points of views and guidance provided by an expert (medical education and curriculum planning) for the optimal and successful organization of the content of the curriculum (3).

The general dentistry's curriculum which is currently practiced in dentistry faculties of the country was approved at the 126th meeting of the Supreme Planning Council dated June 17, 1988. In the current dentistry curriculum, courses were divided into three groups of general, basic and specialized courses. In this curriculum, the courses are divided into thematic units and each subject is individually planned. Although in vertical organization, courses are planned in such a way that the relevance of each course is preserved as "prerequisite", and basic sciences have been proposed as a prerequisite for clinical sciences, the horizontal relationship between courses belonging to different scientific disciplines has been pursued in the least possible way. From the perspective of the subject of this study, two features of the present curriculum of dentistry in Iran are: the separation between theoretical and practical training and one (practical) being based on another (theoretical); and the separation between theoretical and practical courses based on disciplines and branches of science. These two features are based on the decision of the dentistry curriculum planners on how to apply two types of "communication" between the content components of the curriculum, which are referred to as the "vertical relation" and "horizontal relation", respectively (4).

By investigating the current pattern of dentistry curriculum in Iran and other features governing it, such as the separation of basic sciences from each other and from the clinical sciences and being subject-oriented and neglecting horizontal and vertical relations of the topics, it can be said that the principles of integrated curriculum is not included in this program. Therefore, due to the effects and consequences of applying integration into the dental curriculum (5), updating dentistry curriculum in Iran requires the use of appropriate integration approaches in the dental curriculum suitable for the country. Hence, the

proposed model is the result of studying and reviewing the literature and the history of integrating and reviewing the curriculum of dental faculties of the world's accredited universities which seeks to provide a comprehensive image of the discussed topics in integrating the dental curriculum for implementation in Iran's ecosystem.

## METHODS

The present study is a mixed research (qualitative and quantitative). In the qualitative section, using the available sources and documentation, the integration of the dental curriculum with an analytical perspective was examined. At this stage, the data gathering tool was note taking. For this purpose, the literature on the integrated curriculum and documents related to the general dental curriculum in Iran and 40 validated dental faculties such as Marquette and Connecticut dental schools (6,7) were investigated. In addition to referring to accredited medical 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 scientific documents and research were also studied using the "Spider's Web" method. In this method, each source could provide clues from other sources and lead the research to new information. To achieve a wide range of scientific texts, the purposeful search was conducted through Google Scholar and AltaVista search engines. PubMed and MEDLINE databases were also used, and to access bibliographies, the ERIC and RDRB databases were used and keywords such as integration, integrative curriculum, dentistry faculty, dental curriculum, higher education, the basics and elements of dentistry curriculum and types of integration were used to search for theoretical literature and research backgrounds from the year 2000.

In order to increase credit in qualitative research, a semi-structured interview was used in addition to reviewing the documentation. For this purpose, using focal groups, attempts have been made to obtain the opinion of dental specialists regarding the pattern of dental curriculum. In this regard, the current status of general dentistry curriculum, the characteristics of courses and integrated programs, the principles and foundations for designing an integrated syllabus model in higher education and dentistry and methods to move towards integration in this area were questioned. Therefore, 15 experts related to the subject, who are the head, deputy, manager, dentistry board members and other faculty members in two areas of dentistry and curriculum planning, as well as dental residents were identified by purposeful sampling method and were interviewed. Due to the theoretical saturation, this number was considered as adequate. Based on the studies, an integrated model of dental curriculum was designed. The validity of the designed model was evaluated through a questionnaire and an interview with the experts in the field of dentistry and curriculum planning in Delphi method (in three stages). In order to select experts, expertise, knowledge, experience in the field of dentistry and

curriculum planning, teaching years and having papers and compilations on related topics were considered. Through judgment sampling, 21 experts, 15 members of the board of dentistry of the country and 6 faculty members of Allameh Tabataba'i University, Tehran University and Farhangian University were included. After selecting the members of the experts' group, the three rounds of the Delphi method were conducted from October 2010 to January 2011. In the first round, a list of integration factors in the dental curriculum that had been extracted from earlier studies was provided to members to determine their importance. In addition, they were asked to submit their comments on factors which were not included in this list. In the second round, factors suggested in the first round by the Delphi panel, were given to determine their significance. In the third round, regarding factors that were identified as important and very important in the first and second rounds, the members' opinions were asked again. The Delphi method ended after the third round and a favorable consensus was reached. In the quantitative part of the study, descriptive statistics (frequency percentage) were used to validate the proposed model. In examining the content validity of the curriculum, opinions of 15 experts in dentistry who were members of the board of dentistry in the country were used, and regarding the structural dimension of the model, the opinions of 6 faculty members were used to judge the proposed curriculum. Three criteria have been introduced in this validation: being logical (defensibility based on curriculum knowledge), coherence (internal consistency of the elements and the proper relationship between them) and applicability (adaptation to social policy conditions and real conditions of the curriculum).

## RESULTS

Findings of the library study showed that the current dental curriculum only focuses on the purpose and content, and no integration was conducted, and the courses are taught separately. If a student does not complete the first two years of basic sciences, he would not be able to enter the pre-clinics and the clinics which follows the pre-clinics. Practically, dental courses are provided in three separate periods, and in each period, courses are taught in a completely separate form. In addition, studying the native needs of changing dental curriculum, referring to the oral health department of the Ministry of Health, revealed that the necessities of dental health include the status of dental schools of the country, the Epidemiology of oral and dental diseases in the area regarding geography, and cultural and social status of various regions of Iran. Therefore, proper and practical integration of dentistry courses into educational packages is crucial for solving this issue and improving oral and dental health. In order to achieve the proper method for integration of the dentistry curriculum, international experiences have been reviewed and localized. Global experiences in dental curriculum reform show that integration in dentistry education is divided into horizontal and vertical types. Horizontal integration has been used quantitatively in curriculum (for example, integration of basic sciences, behavioral sciences and clinical sciences in all

four years of dentistry education), but vertical integration is commonly seen in curriculum (for example, integration of basic sciences in clinical sciences and vice versa, the integration of computer sciences and research methods in dentistry). Generally, in order to plan a desirable integrated curriculum for dental education in Iranian universities, based on the experience of modeling in the curriculum (8,9), modeling for curriculum in Iran (10-12) and in other countries (since 2000) and based on the requirements of dental education in Iran and the experiences of dental curriculum in prestigious universities of the world (13), three essential components of the integrated dentistry curriculum model were identified as follows:

1) The basics of the integrated dental curriculum; 2) Principles of the integrated dental curriculum; 3) Components of the integrated dental curriculum. There is a "cyclic" relationship between these three parts of the integrated dental curriculum; the basics propose the information infrastructure to the principles, and principles propose requirements for any measure in relation to the component, and any kind of measure in the components can help develop the basic information (14).

Each component has its own dimensions. When determining the "connection" between "components" and between "dimensions and parts of components" in the dentistry curriculum, considering the quality and the method in which the components of the curriculum are linked, results in "integrated dental curriculum" to emerge (15). The facts about dentistry curriculum in Iran and other countries (13) show that the following four categories of principles in the curriculum in the field of practical and theoretical education are important: 1) knowledge of the human's nature "philosophical foundations" 2) knowledge of the community "social foundations" 3) personal knowledge "psychological foundations". 4) Knowledge of the tools and means that can be used to teach "technological foundations" (16).

Also, the basis for change and reform is based on principles that can be described as "the principles of the integration of dental curriculum." These principles have been introduced in the context of curriculum studies and applied to the conditions of the universities of Iran:

Principle 1: simultaneous integration at micro and macro levels: Based on this principle, both interdisciplinary and multidisciplinary integrations must be considered (17,18).

Principle 2: Variety of methods and multi-dimensionality: the pattern of curriculum integration should not be treated dogmatically and fanatically (19).

Principle 3: Balance between content and process-orientation of the integration: The curriculum integration model should lead to a balanced mix of content-based and process-based curricula (13, 20, 21).

Principle 4: Complementary nature of internal and external integration: The integration model should focus on both general types of "internal integration" and "external integration". External integration means the design of a curriculum and the organization of content in a form that is integrated with the curriculum. The internal integration is related to learning activity and is an action taken by students (4, 22, 23).

Table 1. Components of the integrated dental curriculum				
Curriculum's levels	Objectives	Content	Method	Evaluation
Scientific field	Macro Objectives	Structure of Curriculum	Macro Orientations of education	Fundamental principles of curriculums' evaluation
Field of Education	Detailed objectives representing the graduate's qualifications	Practical and theoretical content categorization	Approaches regarding types of presentation (virtual or tradition)	Evaluation of educational progress
Thematic level	Functional goals of specific topics	Unit selections based on content and topic	Meaningful and diverse regulation methods to suite the audience	Methodology and Schedule and Learning Achievement Tool

In order to observe the principles of the integrated planning of dentistry courses and based on the global experiences of dental curriculum planning, a framework for integrating the dental curriculum based on three levels (23) and four elements (4) was arranged. Accordingly, by combining these two dimensions, the curriculum components were identified and determined. The curriculum is considered at three levels of scientific, field of study, and subject (17, 22). The four curriculum elements are: objectives, content, methodology, and evaluation (19). At each level and for each element of the curriculum, it is necessary to make decisions which result in the achievement that can be called "curriculum pillar". Table 1 lists the components of the curriculum for applying in dentistry education that are derived from cross-linking of curriculum levels and elements.

In a deeper search for the integrated curriculum model used at the studied universities (6, 7, 24-51), 40 cases of dental curriculum integration were identified which were the basis of the design of the first phase of the Delphi questionnaire.

At the end of the first phase of the Delphi questionnaire, a question was asked to obtain expert opinions regarding other integration factors in this syllabus. The first round's results indicate that 37 factors are effective in integrating the dental curriculum. In the second round, the opinion of the members was evaluated about the extent of the impact of the integration factors introduced in the first phase. The results of the second phase of Delphi show that 35 factors are effective in integrating into the dental curriculum. In the third step, the comments of each member of the panel in the preceding periods were sent to them and they were asked to correct their previous opinions, if necessary. The results of this phase showed that 33 integrations were accepted as presented in table 2.

Based on the explanation given, the proposed model framework for an integrated dental curriculum is presented in figure 1. With regard to the proposed model framework of the integrated curriculum, the expanded model of this program can be presented in figure 2.

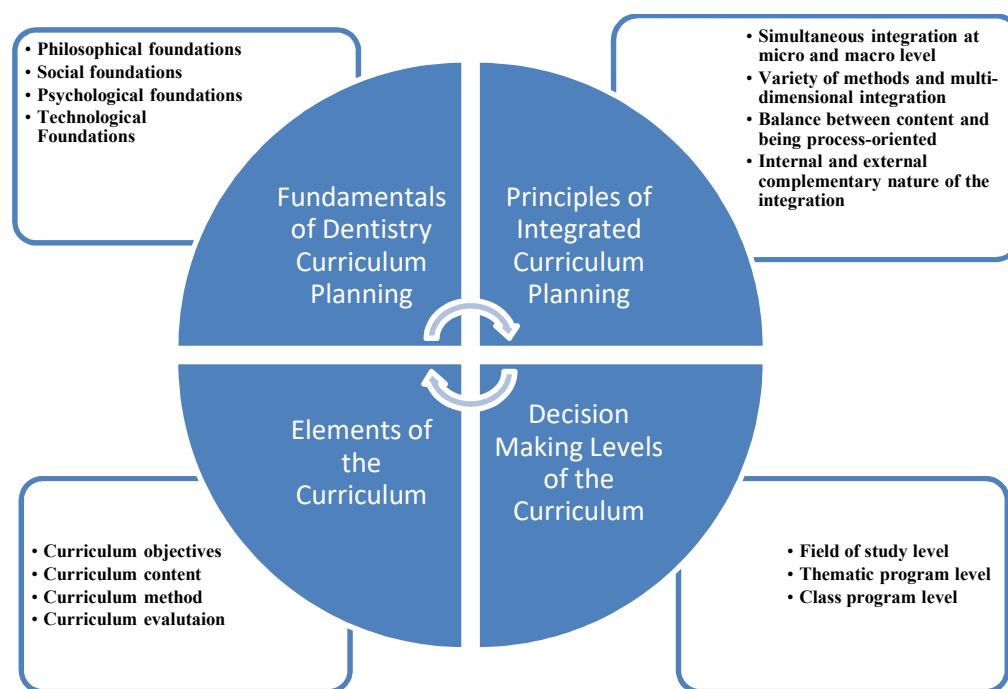


Figure 1. Proposed Model's Framework of the Integrated Dental Curriculum

Table 2. Applied integrations in the curriculum of different universities			
No.	Integration's Topic	No.	Integration's Topic
1	Integrating Basic Sciences in Clinical Sciences and Using Clinical Examples in Basic Science Education	18	Basic elderly dental practice skills (Dentistry in the Elderly)
2	Case-based dental round integration of sciences in the curriculum	19	Integration of Dental Diseases with General Diseases (Integration of Medical and Dental Education)
3	Introduction of evidence-based dentistry in the curriculum	20	Integration of ethics and good professional behavior in dentistry
4	Strengthening the Medical Approach in Clinical Dental Services	21	Integrating oral health with public health
5	Educating student as a self-taught person in the field of basic medical sciences, behavioral sciences and clinical sciences after graduation throughout the course of dentistry	22	The establishment of a unit called Basic Dental Care, training on the prevention of various caries and oral hygiene in children, and the integration of pediatric dentistry emergency dentistry unit in pediatric dentistry unit
6	Introduction of medical emergencies in dentistry curriculum	23	Integrating preventive dentistry unit and pediatric dentistry unit
7	Considering New Sciences in Dentistry	24	Integration of Pre-Clinic of Pediatric Dentistry with Pre-Clinic of the Restoration and Endodontics
8	Community-based education in dentistry curriculum	25	Vertical integration of system organs based on basic medical sciences and clinical communication of topics
9	Adding information technology courses, studying and searching skills for electronic resources, informatics and information resources in dentistry curriculum	26	Integration of Oral Diseases Unit, Oral Pathology and Oral Surgery (Oral diseases and pathology should be closely integrated with oral and maxillofacial surgery).
10	The horizontal integration of the content of the basic sciences of medicine into the form of body systems in the dentistry curriculum	27	Integration of microbiology course with periodontitis
11	The skill of writing a scientific paper and evaluating and criticizing scientific articles in the curriculum	28	Integration of periodontitis and restorative departments
12	Registration of treatment plan in dentistry curriculum	29	Integration of endodontics and restorative departments
13	Early clinical experiences and learning opportunities and community-based experiences	30	Integration of Basic Pharmacology with Drugs in Practical Dentistry
14	Research in dentistry, research design, advanced and applied critical statistics in dental research in curriculum	31	Integrating theoretical and practical courses to improve the quality of student's learning and education (Theoretical courses by PBL Hybrid Interdisciplinary Theory and clinical courses by Comprehensive Patient Care.)
15	Teaching English in such a way that the student, as a dentist, can speak English with a hypothetical patient and write a scientific essay.	32	Integration of communication skills in all clinical skills of dentistry (integration of sociology, psychology, communication skills, training the patient-dentist relationship, diagnosis of special needs of oral medicine and dentistry)
16	The integration of all clinical sciences into integrated treatment for comprehensive patient care in the dental curriculum	33	Integration of ethical and professional approaches to traditional dentistry education
17	Integration of the topics of pain management and anxiety and trauma control in clinical topics of dentistry		

The findings of this study showed that 15 dental specialists believe that all mentioned items should be applied unconditionally to the curriculum. In total, 89% of dental specialists approved the proposed integration for general dentistry curriculum, and only 5% explicitly opposed this kind of "integration". This agreement and the type of position adopted ultimately resulted in a credibility of 93.3% for the model. This agreement showed that if the predicted integration items (33 titles) listed in table 2 are applied in the

current dental curriculum, the combined dental education curriculum would be resulted. To validate the structural value of the designed model, the opinions of six experts were used to judge the curriculum. The results of this validation show that what is called the integrated dental curriculum model is adequately valid (88.9%), but this overall agreement was accompanied by some corrective suggestions, while at the same time have shown different validities in each of the examined criteria.



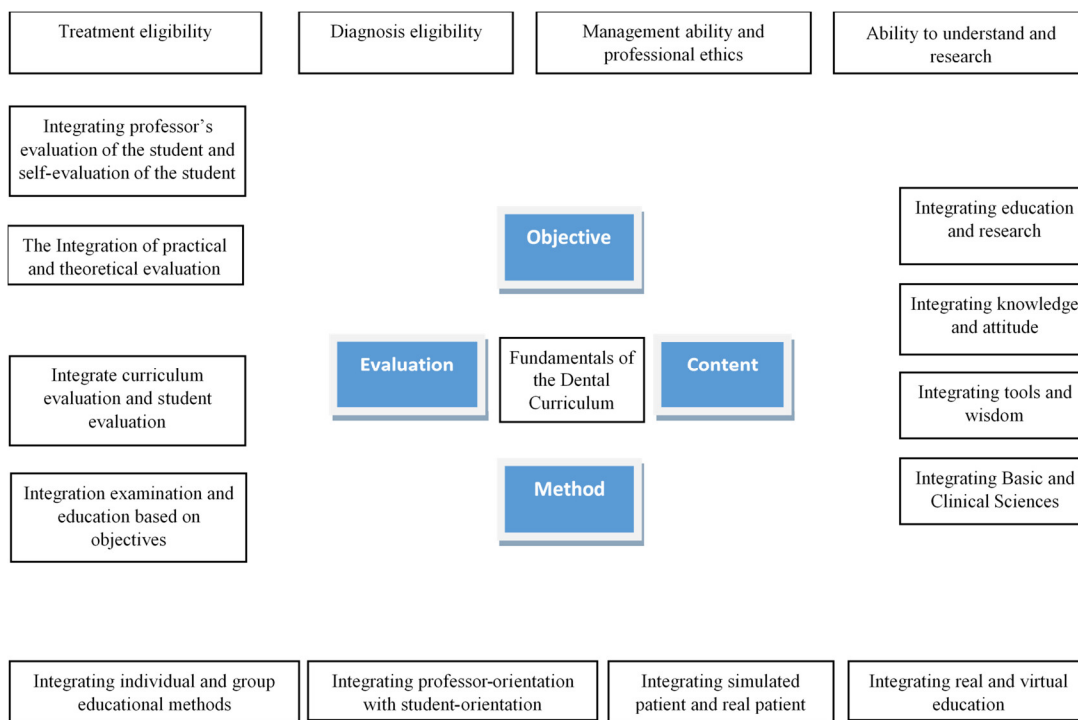


Figure 2. Expanded model for the proposed integrated curriculum of dentistry

## DISCUSSION

By examining global experiences, it has been concluded that most dental schools in the world have integrated their dental sciences into their curricula (6, 7, 24-51), and it seems that the favorable situation of Iranian dental curriculum is due to the fact that the current curriculum which is run by a separated approach, moves toward an integrated curriculum. Therefore, by examining indigenous needs and international experiences, it was concluded that the optimum condition of Iranian dental curriculum is also achieved through the use of an integrated curriculum.

By studying Iranian models, especially the Shahid Beheshti University's model (20) and numerous foreign models, especially the American Marquette and Connecticut universities (6, 7) regarding the dentistry curriculum integration, it was concluded that the of change and modification of the dental curriculum was based on the introduction of three approaches into the curriculum: "The approach of education along with research in dentistry", "Evidence-based dental approach" and "The approach of introducing new knowledge to dentistry." Nevertheless, the focus of these three approaches has not prevented a variety of measures taken regarding specific reforms in curriculum; although these were not general, but among the three approaches mentioned above, achieving the ways in which new sciences enter into dental topics were more emphasized. It has also been increasingly focused on research over the past years. The following modifications have been introduced in the reform programs of the universities: 1) The integration of basic

sciences, biomedical, behavioral sciences and clinical sciences throughout the course of dentistry; 2) the establishment and introduction of a unit of case-based dental rounds 3) Creating early clinical experiences and learning opportunities for community-based experiences; 4) integrating biomedical sciences with clinical sciences; 5) introducing informatics and information resources into the curricula; 6) predicting scientific writing of papers and evaluating and criticizing scientific papers; 7) designing curriculum for education and research design and critical statistics; 8) curriculum and education based on evidence-based dentistry.

These studies showed that different types of vertical and horizontal integrations were proposed based on internal and external integration methods for dental education curricula of different universities of the world. Accordingly, a total of 33 corrective measures have been taken in the process of dental curriculum reform, most of which are considered "vertical integration".

Theoretical validation of the proposed model considering the content and structure showed that the issues raised were not sufficiently considered in the current dentistry curriculum. Dental specialists also stated that almost all of the items in the proposed general Iranian dentistry curriculum should be unconditional applied, and a number of them should be applied in the current curriculum under some conditions. The main concern of experts was the issue of "being native" or "imitation". They emphasized that the adaptation of these achievements to the conditions of the Iranian universities should be considered, and the model produced should be implemented "experimentally and with

the participation of dentists". The judgments made showed that the credibility of the proposed model was 93.3%. At the same time, the structural aspect of the integrated dental curriculum model was judged by curriculum experts on the basis of three criteria (coherence, feasibility, and logic), which confirmed the structure of the designed model to about 88.9%.

Finally, the proposed model has focused on the subject beyond the domestic and foreign models, and has been able to focus on both aspects of the curriculum modeling approach (which focuses on theoretical aspects) and the desired dental curriculum (which clearly focuses on practical aspects and diverges from the theoretical ones), and presents a pattern of "equilibrium" between "theoretical" and "practical" aspects. In the foreign models of dental programs, the theoretical topics and the basics of the curriculum are not "obvious" and do not seem to be taken into account (13). The reason for this is probably the highlighted aspect of "practicality" in the field of dentistry. Also, in most Iranian models that are designed for higher education curricula, attention is paid to the macro level of curriculum and policy, and the moderate and micro level of the curriculum are neglected and practically the levels that lead to the implementation of the curriculum are more or less ignored (10, 52, 53). In the dental reform model of Shahid Beheshti University of Medical Sciences (20), most of the practical topics of the curriculum have been considered and based on this curriculum development. Therefore, in this model, the basics and theoretical subjects of the curriculum have not been raised, since principally the "production of the curriculum" has been raised and not the production of a curriculum guide. However, in the proposed model in this study, both theoretical and the basis of the curriculum were considered, and both theoretical and practical aspects were "simultaneously" considered. Another feature of the innovative suggested model is that the four principles of this model are not considered in any of the fields of the curriculum. These principles are, in fact, a compilation of all disciplines in the field of integration in the curriculum. If the two aspects of the proposed model are related to the main two aspects of the curriculum (theoretical) and the dentistry (practical), then given that the curriculum is a theoretical discipline and dentistry is a practical field, the resulting model is practically an "interdisciplinary" model linking both theoretical and practical domains. Although this is a

conceptual model, it is a good guide for action so that it provides the basis for designing dental curricula.

Based on the studies carried out in the current Iranian dentistry curriculum and the study of the types of integrations available in the curriculum of the accredited universities of the world, and using the specialized views, three integration approaches in the present Iranian dental curriculum have been presented: 1) Integrating the items currently available in the curriculum (courses need to be integrated into the current curriculum); 2) courses need to be revised in the current curriculum; 3) integration in the form of adding new and required courses to complete the current curriculum. The results of this study showed that two major policies should govern the production of Iran's general dental curriculum: first, horizontal integration by reducing the number of courses, and second, vertical integration through early onset of clinical activities.

In general, it can be concluded that the designed model of the integrated dental general curriculum has a strong and well-founded theoretical basis and extensive research background that is well known for the general dentistry field in Iran.

Interdisciplinary research with "disorientation" and "distrust" problems are addressed by the custodians of each of the disciplines involved in interdisciplinary research, which was actually experienced in the present study; what dental professionals said in order to regulate current curriculum was hardly accepted by curriculum specialists. Though researchers have tried to overcome this disorientation and distrust, it is suggested that this model be disseminated in dental groups, and this can be done by holding workshops.

#### ACKNOWLEDGEMENT

The authors would like to thank all dentistry curriculum planning experts who helped researchers to accomplish this study.

**Financial support:** This article is derived from the Ph.D. thesis at Allameh Tabataba'i University (code 176708). Authors thank the Vice-Chancellor for Research and Education at Allameh Tabataba'i University for their supports.

**Conflict of interest:** The authors state that there is no conflict of interest.

#### REFERENCES

- Ahmadi P, Mehrmohammadi M. Designing an Integrated curriculum model and comparison with existing curricula in elementary schools of Iran. Ph.D. Dissertation. Tarbiat Modarres University, 2001. [In Persian].
- Mehrmohammadi M. Adaptation of integrated approach to constructivism theory. A collection of the integrated approach to curriculum. Tehran: Parents and Coaches Association; 2003. [In Persian].
- Augsburg T. Becoming inter disciplinary: An introduction to interdisciplinary student. New York: Routledge; 2005.
- Tyler, Ralph. Fundamentals of curriculum planning and education. Translated by Ali Taqipour Zahir, 9th Edition, Tehran: Agah; 2013.
- Executive Instructions for reviewing curriculums. Staff Committee of Establishment of Rules and Framework Review for Curriculums, Secretariat of Supreme Council for Medical Planning, Deputy Head of Educational and Academic Affairs, Ministry of Health and Medical Education, 2003. [In Persian].
- School of Dentistry, Marquette University. [Cited 2017 May 15]. Available from: <http://www.marquette.edu/dentistry/>
- University of Connecticut, School of Dental Medicine. [Cited 2017 May 8]. Available from: <https://dentalmedicine.uconn.edu/>
- Klein F, Tye KA, Wright JE. A study of schooling: Curriculum. The Phi Delta Kappan

- 1979; 61(4): 244-8.
9. Taylor DL, Cordeiro PA, Chrispeels JH. Pedagogy. In: Young MS, Crow GM, Murphy J, Ogawa RT. (editors). Handbook of research on the education of school leaders. New York: Routledge; 2009.
  10. Arefi M. Study of curriculum in educational sciences in Iran's higher education and strategies for its improvement (Case study: educational management attitudes). PhD. Dissertation. Faculty of Humanity Sciences, Tarbiat Modarres University, Tehran, 2004. [In Persian].
  11. Saketi P, Khayyer M, Fallahi V, Mohammadi M, Parsa A. Investigating the relationship between employment in a non-governmental sector and individual characteristics of the field of study and economic activities of graduates working in the southern provinces of Iran. Institute for Applied and Higher Education Planning, Integrated Plan for Advanced Human Resource Needs Assessment; 2001. [In Persian].
  12. Fathi Vajargah K. Towards a model for modifying and reviewing curricula for humanity sciences in universities and educational institutions. A collection articles of the annual conference of the Association of Curriculum Studies of Iran, Tabriz University; 2009. [In Persian].
  13. Accreditation Standards for Dental Education Programs. Commission on Dental Accreditation. American Dental Association. [Cited 2010 Jun 19]. Available at: [www.ada.org](http://www.ada.org)
  14. Mousapour N. Curriculum structure in higher education. Lecture of the Curriculum Planning Association; 2011. [In Persian].
  15. Mehrmohammadi M. Curriculum, views, approaches and perspectives. Tehran: Publications of the Organization for the Study and Compilation of the Universities' Human Sciences Books; 2014. [In Persian].
  16. Mousapour N. Challenges in higher education curriculum. Speeches of the Curriculum Planning Association; 2006. [In Persian].
  17. Bahador H, Soltani Arabshahi SK, Salmanzadeh H, Biabangardi Z. Review of medical curriculum. 1st ed. Tehran: Tohfeh; 2006. [In Persian].
  18. Neary M. Curriculum studies in post-compulsory and adult education: A study guide for teachers and student teachers. England: Nelson Thornes; 2002.
  19. Richard NK, Jordan JC. Can quality medical education survive health care reform? [Cited 1996 Jul 15]. Available from: <http://www.cosmosclub.org/web/journals/1996/knappcohen.html>
  20. Yazdani Sh, Hosseini F, Homayounizand R. Modifications of the general medicine's curriculum. 1st ed. Tehran: 137 Publications; 2007. [In Persian].
  21. Komabayashi T, Raghuraman K, Raghuraman R, Toda S, Kawamura M, Levine SM, et al. Dental education in India and Japan: Implications for US dental programs for foreign-trained dentists. J Dent Educ 2005; 69(4): 461-9.
  22. Plasschaert AJM, Holbrook W P, Delap E, Martinez C, Walmsley AD. Profile and competences for the European dentist. Eur J Dent Educ 2005; 9(3): 98-107.
  23. Mousapour N. Developments and the status of curriculum planning in Iran. Tehran: Ministry of Education Research and Planning Organization; 2008. [In Persian].
  24. Faculty of Dentistry, University of Toronto. [Cited 2017 April 12]. Available from: <https://www.dentistry.utoronto.ca/>
  25. London School of Medicine and Dentistry; University of Cambridge. [Cited 2017 April 18]. Available from: <https://www.cam.ac.uk/external-affiliations/london-school-of-medicine-and-dentistry>
  26. UT Health School of Dentistry: School of Dentistry. [Cited 2017 June 9]. Available from: <https://dentistry.uth.edu/>
  27. Harvard School of Dental Medicine. [Cited 2016 June 10]. Available from: <https://hsdm.harvard.edu/>
  28. Tokyo National School of Dentistry. [Cited 2017 July 12]. Available from: <http://www.dent.tmd.ac.jp/english/clinical.html>
  29. Baylor University. [Cited 2017 June 15]. Available from: <https://www.baylor.edu/>
  30. School of Dentistry - University of Louisville. [Cited 2017 June 15]. Available from: <http://louisville.edu/dentistry/>
  31. Ankara University. [Cited 2017 June 17]. Available from: <https://en.ankara.edu.tr/>
  32. The School of Clinical Dentistry; The University of Sheffield. [Cited 2017 June 14]. Available from: <https://www.sheffield.ac.uk/dentalschool>
  33. Medical School-Charité- University Medicine Berlin. [Cited 2017 June 4]. Available from: <http://www.fu-berlin.de/en/einrichtungen/fachbereiche/fb/medizin/index.html>
  34. Academic Center for Dentistry Amsterdam; University of Amsterdam. [Cited 2017 May 3]. Available from: <https://www.uva.nl/en/disciplines/dentistry>
  35. Penn Dental School. [Cited 2017 May 14]. Available from: <https://www.dental.upenn.edu/>
  36. Department of Dentistry-University of Virginia School of Medicine. [Cited 2017 April 19]. Available from: <https://med.virginia.edu/dentistry/>
  37. Dental School - Boston University. [Cited 2017 May 20]. Available from: <http://www.bu.edu/dental/>
  38. Dental Programme. Sahlgrenska Academy, University of Gothenburg. [Cited 2017 May 12]. Available from: <https://sahlgrenska.gu.se/english/education/degree/dental/?r=ss>
  39. Study Dentistry in Switzerland. [Cited 2017 April 25]. Available from: <http://www.spainexchange.com/study-abroad/subjects2-en-68-CH.htm>
  40. Dentistry Universitas Indonesia. [Cited 2017 July 27]. Available from: <http://www.ui.ac.id/en/bachelor/dentistry.html>
  41. Faculty of Dentistry, University of Sydney. [Cited 2017 April 18]. Available from: <http://sydney.edu.au/dentistry/>
  42. School of Dentistry-Cardiff University. [Cited 2017 April 5]. Available from: <https://www.cardiff.ac.uk/dentistry>
  43. Dental Schools in New Jersey. [Cited 2017 June 7]. Available from: [https://study.com/dental\\_schools\\_nj.html](https://study.com/dental_schools_nj.html)
  44. Indiana University, School of Dentistry. [Cited 2017 March 15]. Available from: <https://www.dentistry.iu.edu/>
  45. School of Dentistry. International students. Faculty of Medicine, KU Leuven, Belgium. [Cited 2017 June 21]. Available from: <https://med.kuleuven.be/eng/internationalisation/international-students-school-of-dentistry>
  46. Dundee Dental School. [Cited 2017 April 16]. Available from: <http://dentistry.dundee.ac.uk/>
  47. Medical University of Dentistry in Vienna, Austria. [Cited 2017 July 3]. Available from: <http://europe-studies.com/medical-university-of-dentistry-in-vienna-austria/>
  48. National Taiwan University - Academic Programs - School of Dentistry. [Cited 2017 April 16]. Available from: <http://www.ntu.edu.tw/oldenglish/academics/dentistry.html>
  49. Columbia University, College of Dental Medicine. [Cited 2017 April 19]. Available from: <https://www.dental.columbia.edu/>
  50. University of Colorado, School of Dental Medicine. [Cited 2017 March 8]. Available from: <http://www.ucdenver.edu/academics/colleges/dentalmedicine/Pages/DentalMedicine.aspx>
  51. The University of Illinois at Chicago, College of Dentistry, Department of Oral and Maxillofacial Surgery. [Cited 2017 March 23]. Available from: <https://dentistry.uic.edu/>
  52. Noorozzadeh R, Mahmoudi R, Fathi Vajargah K, Naveh Ebrahim A. The status of the participation of universities in the review of curricula. Quarterly journal of research and planning in higher education 2006; 42: 71-93. [In Persian].
  53. Vaziri M. Curriculum system in Iran's higher education (Features and directions). Ph.D. Dissertation. Faculty of Humanity Sciences, Tarbiat Modarres University, 1999. [In Persian].