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Development of Core Entrustable Professional Activities for Iranian Pre-Graduate Dental Students: A Pilot Study

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Abstract

Objectives: Entrustable professional activities (EPAs) are independent tasks or responsibilities that trainees can perform once they have competence. This article presented the development of EPAs for general dentistry, focusing on oral surgery and restorative dentistry. The study aimed to create a set of EPAs that can be utilized to train and evaluate dental students in Iran. **Methods:** This qualitative pilot study was conducted in multiple phases. First, a focus group was formed, and their opinions were collected in three alternating rounds. After extracting the statements focusing on two fields of general dentistry curriculum, they were refined, and the importance and occurrence of the tasks were evaluated. Then, the EPA statements were categorized and validated based on the modified criteria. The EPAs were also evaluated regarding the competencies defined by the Ministry of Health of Iran and the American Dental Education Association. **Results:** The study identified six EPAs for general dentistry in the fields of oral surgery and restorative dentistry. These EPAs encompassed various tasks such as gathering patient information, making accurate diagnoses, developing treatment plans, performing surgical and restorative procedures, and demonstrating advanced skills in treatment implementation. The EPAs aligned with the expected competencies for a dental graduate and could serve as a framework for curriculum design, assessment planning, and tracking students' progression. **Conclusion:** EPA development in general dentistry, specifically in oral surgery and restorative dentistry, offered a standardized and comprehensive approach to evaluating the competence of dental learners. By integrating EPAs into dental education, educators can ensure that students acquire the necessary abilities in independent dental practice. Although this study provided a solid foundation for implementing EPAs in dental education, further research and evaluation are necessary to assess their effectiveness and practicality.

Keywords: Medical Education; Undergraduate; Dental Education; Professional Competence; Professional Practice

Introduction

Advances in dental education training have focused on competency-based education, systematic assessments, and entrustable professional activities (EPAs).[1, 2] EPAs are units of professional practice, defined as tasks or responsibilities that trainees are entrusted to perform unsupervised once they have attained sufficient specific competence. EPAs are independently executable, observable, and measurable in their process and outcome, making them suitable for entrustment decisions.[3] These activities have been proposed to make capabilities as objective as possible and to facilitate the training and evaluation of learners in these fields. However, concepts and examples of capabilities are often very abstract and ambiguous for learners and teachers, lacking the necessary transparency for implementation in natural environments.[4] To define the boundaries of 'competency' and 'EPA,' it is important to note that a key characteristic of an EPA is that its performance necessitates the integration of various competencies, often spanning multiple domains.[5] EPAs evaluate a trainee's competence in performing tasks and training and reinforce them during education.

Assessing the capabilities of health professionals through their level of entrustability is a novel concept in medicine that has recently been introduced in dental education.[6] The framework of entrustment is generally defined in five levels by Ten Cate et al. as 1: no permission to act, 2: permission to act with direct, pro-active supervision present in the room, 3: permission to act with indirect supervision, not present but readily available on request, 4: permission to act with supervision not readily available, but with distant supervision and oversight, or 5: provide

supervision to junior trainees.[7]

EPAs have been widely accepted in educating and evaluating learners of different disciplines. In other words, this concept has been incorporated into specialized medical courses, and recently, in addition to the general medical program, it has been used in other health-related professions such as nursing [8] and midwifery.[9] Despite the expansion of the concept of competency-based education and more than a decade after the proposal of EPAs in general and specialty courses of medical sciences, they have not been developed specifically for general dentistry yet. However, in 2018, a team from the University of Michigan and Tufts in the United States began to create EPAs and proposed these activities to the American Dental Association for endorsement.[10] Afterward, Wolcott et al. cited the development of EPAs as the starting point for improving the dental curriculum and moving towards competency-based education.[11] They suggested 15 activities at the University of North Carolina, and Goodle et al. proposed seven activities to integrate oral health into primary care training.[12] Hawkins et al. developed ten EPAs for postgraduate orofacial pain residency programs.[13]

Briefly, general dentistry students in Iran are accepted through the national entrance exam and, after six years of training, graduate with 217 credits with a professional doctorate. Of 144 clinical modules, nine units are dedicated to restorative dentistry and 11 to oral and maxillofacial surgery.[14] In most of the country's universities, the current graduation criteria emphasize passing course units instead of demonstrating minimum competence. Isfahan School of Dentistry is undergoing a shift to the development of a competency-based education model and a desire for a more cautious assessment framework to ensure graduates are accomplishing the intended outcomes. Integrating the concept of entrustable professional activities (EPAs) into the current score-based curriculum can be challenging but achievable. The first strategy that can facilitate bridging the gap is mapping EPAs to existing curricula to identify overlaps and find where they naturally fit. To achieve this objective, we have assembled the entrustable professional activities specific to general dentistry focusing on oral surgery and restorative dentistry for the training and assessment of students in Iran.

This pilot study was designed to determine the EPAs of dental professionals in surgery and restorative dentistry for future integration and development of a revised educational system.

Methods

The National Agency for Strategic Research in Medical Education, Tehran No.980308, approved this project's methods and ethical issues. This pilot developmental project was conducted based on the curriculum of general dentistry's surgical and restorative departments. The core EPAs that were to be designed were a subset of all the graduation requirements of a dental school necessary for any practicing dentist.

This study was conducted through seven phases as follows:

I. *Expert team formation and holding a focus group meeting:* This team consisted of three faculty members from each of the restorative and surgical departments of the dentistry school, two experts of medical education, and a lecturer general dentist. In the first session, one of the project's facilitators presented information about competency-based education/assessment. This presentation aimed to acquaint the group members with the scientific principles and achieve a common conceptual framework to continue the project. Team members were asked to brainstorm and answer the question: "What does a general dentist do in surgery and restorative dentistry fields during a typical workweek?"

Pivotal and radial information was collected from the members and recorded at the end of the session. Following the meeting, the submitted items were reviewed to assess their relevance to the question and the quality of writing.

II. *Enrichment of the statements:* The received items from the focus group were refined and subsequently sent to a virtual group of six general dentists with three to ten years of practical experience. The group was given a list of ‘common general dentists' tasks and invited to express their opinions and suggest additional items. The research team then reviewed the opinions and suggestions of the general dentists and finalized the list in a subsequent meeting.

III. *Determining the importance and occurrence of final tasks:* The next stage involved scoring of the finalized titles based on importance and occurrence. This was done by a group of seven general dentists and the expert team, who expressed their opinions about each title in a matrix. The degree of importance was rated on a scale of 1 to 5, with 1 representing ‘completely insignificant’ and 5 representing ‘very important’. The occurrence rate was also scored on a scale of 1 to 4, with 1 representing ‘rarely’ and 4 representing ‘definitely every day’. This matrix was created in Google Forms and shared with the virtual group. After completing the panel comments, the frequency of responses was analyzed. Items that received an importance score of 3, 4, or 5 and an occurrence score of 2, 3, or 4 were selected as ‘high importance and high

incident.' Items considered 'less important and less incident' were removed from the final list. The final list was then prepared without any specific order of the propositions to proceed to the next step.

IV. *Categorization of the statements:* The concept map method of Trochim M [15-16] was used for this part of the study. The results of the previous session were shared with participants, who were asked to categorize the final items according to any criteria they deemed appropriate. Participants were instructed to assign each item to only one category, and if an item could not be categorized, it had to be classified as a separate item. The panel's opinions were then collected regarding the categorization of propositions.

V. *Analysis of categories:* The classification results were entered into Excel software. A separate sheet was created for each participant, and the number of items was placed in the row and column of each sheet. The categories were then assigned to each item by placing a number (1) in the corresponding category at the intersection of the row and column of the item. All sheets were then compiled into a separate one in which each cell indicated the sum of all corresponding ones. The sum sheet was then exported to SPSS software, version 23. After that, possible categories were identified using multidimensional scaling and hierarchical cluster analysis (HCA) methods. HCA belongs to the family of multifactorial exploratory approaches. It clusters individuals based on the distance between them.[17] Agglomerative clustering was used, which fuses the individuals into groups.

The following research group discussion determined the final number of categories and titles of each category. The SPSS output, cluster membership tables, point chart, and dendrogram chart were shared and discussed with different defaults. After reviewing the content of proposed models with 5, 6, and 7 categories and discussing the themes and titles of each category, the model with six categories was accepted based on the opinion of the research panel.

VI. *Writing an entrustable professional activities list (EPA):* The titles were revised based on the principles of scientific writing and the definition of EPA. According to the Ten Cate criteria, EPA titles should be accurately written and easily understood, with phrases stated as a task and modified from an empowerment or educational standpoint. Additionally, the titles were kept as concise as possible.[18]

VII. *Validation of EPA based on modified QUEPA criteria:* Based on the proposed criteria for evaluating the structure and content of EPAs, the qualitative validity assessment of the finalized dental EPAs was carried out, looking up 'quality, usability, educational impact, practicality, and acceptability.' A modified tool that was more concise and efficient was adopted for dental settings and handed out to an expert panel to find out their opinion.[19,20]

VIII. *Assessment of competency-EPA matrix:* During this phase, a matrix was formed by extracting competencies defined by the Ministry of Health of Iran for graduates of general dentistryand the competencies described in the American Dental Education Associationfrom the literature.[14,21] The panel of experts was then asked to mark the relevant boxes in the matrix to indicate which competencies each EPA covers.[22,23] The expert team members then completed the EPA/ competencies matrix independently, holding face-to-face and virtual meetings.

Results

I. Refining EPA List

Within the first phase, the statement regarding the 'routine dentist's work in surgery and restoration during a week' was developed, which comprised 56 tasks. These typical general dentist's tasks comprised 31 for restoration and 25 for surgery fields, which were obtained and reflected experts' opinions. After that, their responses about the importance and occurrence of the tasks were briefed as demonstrated in Table 1 for restoration and Table 2 for surgery.

Table 1 - Frequency of importance and occurrence of responses in the area of questions related to Dental Restoration (9-members expert panel)

Item	Procedures	HH*	LL#
1	Obtains a complete systemic and dental history from the patient	8	1
2	Performs intra- and extra-oral examinations	8	1
3	Assesses the patient's risk of caries	7	2
4	Prescribes and interpreting necessary radiographs	7	2
5	Accurately diagnoses various degrees of enamel and dentin caries	6	3
6	Administers local anesthesia by an appropriate method for both upper and lower jaws	8	1

Table 1 - Frequency of importance and occurrence of responses in the area of questions related to Dental Restoration (9-members expert panel)			
7	Properly prescribes non-invasive dental treatments for pits and fissures	7	2
8	Diagnoses caries requiring restoration intervention	8	1
9	Diagnoses problematic composite and amalgam restorations	8	1
10	Decides on the appropriate use of amalgam or composite restorations	7	2
11	Properly performs pit and fissure sealant therapy	6	3
12	Properly performs preventive resin restoration for indicated teeth	6	3
13	Properly performs Class I to V and build-up amalgam restorations with or without base and liner	8	1
14	Properly performs Class I to V and build-up composite restorations with or without base and liner	8	1
15	Properly restores moderate dental destruction in endo treated teeth with amalgam and composite restorations	7	2
16	Applies appropriate intra-dentinal pins and intracanal pins	7	2
17	Performs isolation of the teeth and the oral environment	7	2
18	Evaluates the occlusion of teeth before and after dental restorations.	6	3
19	Identifies the need for a crown	6	3
20	Identifies suspicious cases of endodontic therapy	6	3
21	Select and performs proper base and liners	7	2
22	Checks and creates functional occlusal after amalgam restoration	7	2
23	Prevents dental overhang in amalgam	7	2
24	Performs the cusp coverage technique when necessary	5	4
25	Provides patients with education on proper hygiene based on risk factors	5	4
26	Identifies and refers for cosmetic restorations such as closing spaces, bleaching, and composite or ceramic laminates	4	5
27	Refers complex and challenging restorations to specialists	4	5
28	Properly identifies teeth that require crowns and recommends them	7	2
29	Can splint traumatized teeth	2	7
30	Can perform temporary restorations for traumatized teeth	2	7
31	Diagnoses and treats congenital dental lesions	3	6

*HH: High Importance, High Occurrence #LL: Low Importance, Low Occurrence

Table 2- Frequency of importance and occurrence of responses in the fields related to Oral Surgery (7-member expert panel)			
Item	**Procedures**	**HH***	**LL#**
1	Performs intraoral and extraoral examinations	2	5
2	Properly manages dental treatments for medically- compromised patients	6	1
3	Prescribes and interprets necessary radiographs properly	7	0
4	Performs local anesthesia injection through infiltration method properly for upper and lower jaws	6	1
5	Performs local anesthesia injection through block method properly for upper and lower jaws	7	0
6	Extracts anterior teeth using the proper method and tools	7	0
7	Extracts posterior teeth using the proper method and tools	6	1
8	Extracts wisdom teeth using the proper method and tools	2	5
9	Performs proper surgery on residual roots	2	5
10	Performs proper surgery on impacted teeth in soft tissue	3	4
11	Performs proper surgery on slightly impacted wisdom teeth in hard tissue	2	5
12	Performs biopsy of oral lesions properly	1	6
13	Properly diagnoses acute infections of the jaws, performs emergency treatment, and refers the patient properly if necessary	5	2
14	Chooses the appropriate tool for extracting each tooth	4	3
15	Recognizes different types of surgical elevators and applies them correctly	5	2

Table 2- Frequency of importance and occurrence of responses in the fields related to Oral Surgery (7-member expert panel)			
16	Recognizes different types of surgical forceps and applies them correctly	5	2
17	Identifies the complications of extracting upper wisdom teeth	4	3
18	Identifies the complications of extracting lower wisdom teeth	4	3
19	Controls unusual bleeding during surgery	4	3
20	Diagnoses the relationship between the roots of posterior teeth and the sinuses	2	5
21	Performs splinting in case of fracture of a part of the alveolus	1	5
22	Properly performs mandibular support during extraction of lower teeth	5	2
23	Prescribes antibiotics when necessary	6	1
24	Diagnoses disorders of the temporomandibular joint and performs conservative and non-surgical treatments	4	3

*HH: High Importance, High Occurrence #LL: Low Importance, Low Occurrence

At the end of this phase, statements with more frequent 'low importance and occurrence' responses than 'high importance and occurrence' responses were removed. Therefore, 5 out of 31 statements in the restorative dentistry section and 7 out of 24 in the dental surgery section were removed. According to the research team's opinion, the remaining statements were combined into a special list of 40 items.

In the next phase, a list of 40 propositions resulting from refined and edited expert panel comments was emailed to them to categorize the final items. Then, the classification results were entered into the Excel software and analyzed using SPSS version 23. A scattered chart of the statements (Figure 1) and a dendrogram chart for different clusters were proposed to the expert panel. Appendix I presents and discusses the clusters attributed to different defaults.

For preparing the EPA list, after reviewing the arrangement of the proposed 5, 6, and 7 cluster models in the research panel and discussing the theme and content analysis of each category, the 6-clustered model was finally preferred. The categories and titles assigned to each category are tabulated in Table 3.

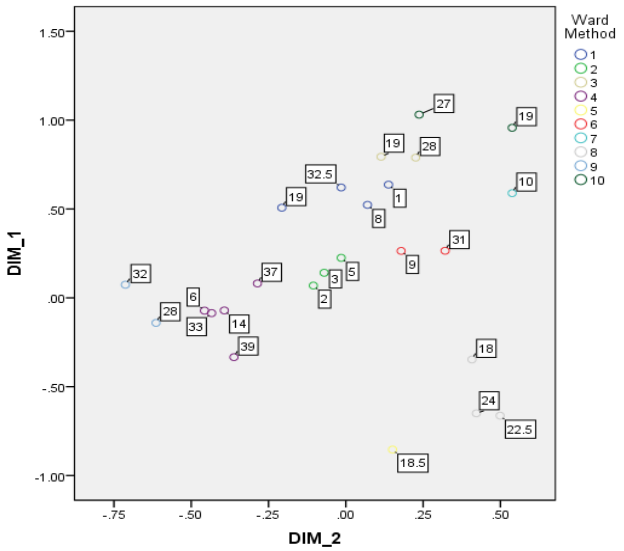

Figure 1 - Scatter plot of propositions

Table3 - Entitled Entrustable Professional Activities of general dentists in 'Oral Surgery' and 'Dental Restorative' fields and including items based on statistical analyzes and panel opinion		
No	**EPA Statement**	Item number
1	Collection and gathering of clinical and paraclinical patient information	1-8-12-25-26-40
2	Achieving an accurate diagnosis based on available clinical and non-clinical evidences	2-3-5-9-10-31
3	Clinical analysis, reasoning, and development of a logical treatment plan based on up-to-date knowledge and the patient's condition	4-19-20-34-36
4	Possessing the **necessary minimum** ability and skills to perform major surgical procedures	6-14-17-22-32-33-35-37-38-39
5	Possessing the **necessary minimum** ability and skills to perform major restorative procedures	7-11-13-15-21-23-28-30
6	Having **advanced and precise** skills during the implementation of the treatment plan	16-24-29

II. Validity examination by modified QUEPA criteria and EPA-Competency matrix

After gathering the completed forms about Quality, Usability, Educational impact, Practicality, and Acceptability, their assumption was summarized in the research panel. If most of them, i.e., at least 5 out of 6 people, rated the criteria positively in each EPA statement, that criterion was considered valid. In this way, all six propositions obtained acceptable criteria.

Subsequently, through holding a few face-to-face and

virtual meetings to coordinate and explain the details of the matrix, the panel's response to 'state which capabilities each EPA covers' was extracted. If half plus one of the members in the expert panel ticked a cell, it was ticked in the finalized table. The results obtained in the EPA/Competencies matrix are presented in Table 4. As presented, almost all the EPAs, due to two majors of dentistry activities, covered the identified competencies for a dental graduate in more than three areas.

Based on the driven EPAs, an assessment tool for dental students was proposed at the end of this project, as demonstrated in Table 5.

Table 4 - Matrix of Competencies for a newly graduated dentist – EPAs in two fields of Oral Surgery and Restorative Dentistry driven in this study

EPA statements / ***Competencies***	Ethics and professionalism, liability and medical rights	Communication skills	Development of individual skills and continuous learning	Prevention and promotion of health at the individual and community level	Decision making, reasoning and problem solving	Patient care including diagnosis, treatment and rehabilitation	Clinical skills
Collection and gathering of clinical and paraclinical patient information	✔	✔	✔	✓	-	-	✔
Achieving an accurate diagnosis based on available clinical and non-clinical evidences	-	-	-	✓	✓	✓	-
Clinical analysis, reasoning, and development of a logical treatment plan based on up-to-date knowledge and the patient's condition	✓	✓	✓	-	✓	✓	✓
Possessing the necessary minimum ability and skills to perform *major surgical procedures*	✓	-	-	✓	-	✓	✓
Possessing the necessary minimum ability and skills to perform *major restorative procedures*	✓	-	-	✓	-	✓	✓
Having advanced and precise skills during the implementation of the treatment plan	-	-	✓	-	-	✓	✓

Table5 - Suggested 'Evaluation Tool' for the level of trust: "To what extent do you trust this student to perform his tasks?"

Expected Professional Activities in the final year dental student	**This student can:**					
Collection and gathering of clinical and paraclinical patient information	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter
Achieving an accurate diagnosis based on available clinical and non-clinical evidences	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter
Clinical analysis, reasoning, and development of a logical treatment plan based on up-to-date knowledge and the patient's condition	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter
Possessing the necessary minimum ability and skills to perform major surgical procedures	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter
Possessing the necessary minimum ability and skills to perform major restorative procedures	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter
Having advanced and precise skills during the implementation of the treatment plan	Just observe	Perform under direct supervision	Perform under indirect supervision	Perform independently	Supervise other students as well	I haven't had any encounter or interaction with this student regarding this matter

Discussion

Recently, a significant focus has been on EPAs in medical and healthcare education. EPAs are specific tasks or

activities that professionals should be able to perform independently and safely after training. [1,6,9] This study aimed to construct a set of dentistry EPAs that senior dental students should demonstrate before starting their practice. The present study findings identified EPAs in a dental setting and suggested that this concept can be successfully introduced into the dental education system in Iran.

Similar to studies in medical education, the implementation of EPA-based assessments in dentistry can provide a more comprehensive and standardized evaluation of dental students' competence.[1-3,5] By aligning EPAs with the missioned competencies for dental graduates, it is ensured that learners' performance would be measured across essential tasks and skills required for professional practice.[12,14,24,25] The American Dental Education Association (ADEA) Compendium EPA Workgroup recently reported a list of 11 core EPAs vetted by dental educators for dental education.[26] Drawing inspiration from successful models in other universities, via this project, a list of general EPA headings for final-year dental students was extracted as the first phase of the transition to a competency-based dental education system.[3,5,12,13,20,23,26]

The research employed qualitative methods, gathering opinions from practitioners and academic experts while drawing insights from established models in medicine and pharmacy. Expert panels from each department shaped and refined the EPA list. Additionally, feedback was sought from general dentists using brainstorming methods to capture routine dental practices. All responses were meticulously categorized, and the expert panel agreed upon the final EPA headings. The ADED project by Ramaswamy et al. also used qualitative methods such as Delphi and literature studies.[26]

Experiences from the other fields of health education indicate that integration should be gradually started by integrating a few EPAs that align closely with existing assessments. This allows for a smoother transition and provides a model for further integration. The second strategy is blending EPAs with score-based assessments or hybrid assessment models. For instance, a practical examination can include both a scored component and an EPA assessment to ensure students are knowledgeable and competent. Moreover, developing detailed rubrics and checklists can achieve each EPA alongside traditional scoring methods.[27]

Similar EPAs have been proposed in other healthcare fields where information gathering is a fundamental skill for diagnosis and patient care. Diagnostic competency-based EPAs are well-established in medical education and have been shown to enhance clinical decision-making and reasoning. [28,29] Surgical and procedural EPAs have been implemented in medical specialties, emphasizing the importance of hands-on training for skill development. A study from the University of Michigan developed a framework for assessing EPAs in predoctoral dental education using a modified Delphi process. This framework defined the core tasks that a graduating dentist needs to perform independently and facilitates the assessment of competencies as they manifest in these tasks.[24] Therefore, the two EPAs defined in this study were specific to the surgery and restorative majors and focus on developing procedural skills.

The findings of this study indicated that the extracted EPAs for dentistry effectively covered the missioned competencies expected of a dental graduate. We tried to merge internationally defined competencies and a nationally valid legal document to extract these competencies.[14,21] The results demonstrated that our EPAs encompassed a broad range of competencies, including ethics, communication skills, individual skill development, continuous learning, decision-making, patient care, and clinical skills related to treatment planning.

Overall, preparing EPAs in dentistry in restorative and surgery is the first phase of the new model integration process. The shortcomings of this study can be addressed in the development stages in other disciplines. At the same time, implementation solutions such as awareness and engagement of the faculty and students, feedback to the students, and changes in the official curriculum should be considered. The training and evaluation of dental students are expected to be more robust, comprehensive, and learner-centered. Goodell KH et al. in 2019 provided a list of seven EPAs for oral health in primary care, establishing a benchmark for what a primary care provider should know and be able to do to facilitate adequate oral health care for patients without immediate access to a dentist. They emphasized that the great challenge is the implementation of EPAs in education and assessment rather than the creation. [12]

According to a recent scoping review by Ehlinger et al., six articles regarding EPAs in dentistry at the undergraduate level have been published. The study found that while EPAs are beneficial for standardizing assessment practices and ensuring that trainees meet societal expectations, their use in dental education is still occasional.[25] Despite the different wording of some EPA titles, almost all covered similar topics. The most cited topics, which were similar to our defined EPAs, were ‘clinical examination,’ specific dentistry or care procedures such as ‘performing orofacial pain procedures,’ history taking, diagnosis, and treatment planning. Patient communication, pain, anxiety management, managing oral emergencies, providing oral care for special care groups, health promotion, coordinating care, referring, and working collaboratively were also mentioned in some studies.[25]

Although this study draws valuable insights from other fields, it also recognizes its strengths and weaknesses. On the horizon of future research projects, it is planned to include more professors and explore other dental specialty areas. As the implementation of EPAs progresses, their reliability should be regularly evaluated in at least five other dental schools. Since the country's student

evaluation system has a defined structure, the opportunities for refining and complementing existing evaluation methods should be explored to foster continuous improvement in dental education and development of competent dental graduates.

A limitation of this project was that the implementation of EPAs had not yet been assessed. One reason was that the dental education environment inherently resisted changes due to the complexity of planning and the combination of theoretical, phantom, and practical courses. Therefore, integrating or changing the training and evaluation system based on EPAs, even for pilot evaluation purposes, required the determination of all stakeholders. Another limitation was that our mapping was only confined to EPAs and competency domains used for restorative and surgery departments. The rationale was to start the work with more cooperative departments, intending to generalize the list of EPAs to other departments at this stage. However, it will ultimately be essential to work with all stakeholders in dental school to integrate the EPAs into routine curricula.

This study aimed to revise a dental school's educational and evaluation systems in a developing country. It showed that professors' approaches agreed with those of other developed countries and highlighted common obstacles to the practical implementation of this change.

Conclusion

Aiming to implement the competency-based dental education program in Iran, this study yielded encouraging results through the development of EPAs in two pilot departments within a dental school. The EPA list formulated during the study included patient data collection for accurate diagnosis, analyzing and developing treatment plans based on current knowledge, possessing skills for major surgical and restorative procedures, and implementing treatment plans with advanced precision. They comprehensively encompassed the expected competencies outlined for pre-graduation. The integration of student assessment and education within this system requires further development.

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Authors' contributions: IA and MP were mainly responsible for completing the project proposal and securing the grant. MP and MD conducted and facilitated the group discussions. IA convinced dental experts to provide responses and opinions at various stages of the study. BM and MHD were experts in the oral surgery part of the study, while PG experts in the restorative dentistry part, and they made valuable contributions to this project. IA prepared the interim reports and the final manuscript. All authors read and reviewed the final draft before submission.

List of Abbreviations

EPA**:** Entrustable Professional Activities

Ethics approval and consent to participate: The proposal of this project was reviewed by the National Agency for Strategic Research in Medical Education, Tehran, Iran and achieved the ethical and legal permission. The other ethical approvals were not applicable.

Consent for publication: The authors of the manuscript have given their consents for publication to the corresponding author.

Availability of data and materials: Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Competing interests: The authors declared that they have no conflict of interest for the finding of this project.

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Informed Consent Statement: The participants have signed the informed consents.

Conflict of Interest: No Conflict of Interest Declared. ■

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Appendix I. Possible classifications and propositions of each of the clusters based on the default number of categories

Item	10 Clusters	9 Clusters	8 Clusters	7 Clusters	6 Clusters	5 Clusters	4 Clusters	3 Clusters
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	1	1	1
3	2	2	2	2	2	1	1	1
4	3	3	3	3	3	2	2	1
5	2	2	2	2	2	1	1	1
6	4	4	4	4	4	3	3	2
7	5	5	5	5	5	4	4	3
8	1	1	1	1	1	1	1	1
9	6	6	6	6	2	1	1	1
10	7	7	6	6	2	1	1	1
11	5	5	5	5	5	4	4	3
12	1	1	1	1	1	1	1	1
13	5	5	5	5	5	4	4	3
14	4	4	4	4	4	3	3	2
15	5	5	5	5	5	4	4	3
16	8	8	7	7	6	5	4	3
17	9	9	8	4	4	3	3	2
18	8	8	7	7	6	5	4	3
19	10	3	3	3	3	2	2	1
20	3	3	3	3	3	2	2	1
21	5	5	5	5	5	4	4	3
22	9	9	8	4	4	3	3	2
23	5	5	5	5	5	4	4	3
24	8	8	7	7	6	5	4	3
25	1	1	1	1	1	1	1	1
26	1	1	1	1	1	1	1	1
27	10	3	3	3	3	2	2	1
28	5	5	5	5	5	4	4	3
29	8	8	7	7	6	5	4	3
30	5	5	5	5	5	4	4	3
31	6	6	6	6	2	1	1	1
32	9	9	8	4	4	3	3	2
33	4	4	4	4	4	3	3	2
34	3	3	3	3	3	2	2	1
35	9	9	8	4	4	3	3	2
36	3	3	3	3	3	2	2	1
37	4	4	4	4	4	3	3	2
38	9	9	8	4	4	3	3	2
39	4	4	4	4	4	3	3	2
40	1	1	1	1	1	1	1	1