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Developing a Competency-based Dental Curriculum in Korea

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ABSTRACT

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Purpose: In recent years, efforts to improve the dental curriculum in South Korea have focused on a shift to outcome-based dental education based on core competencies in dentistry. So far, the field has seen various studies on the development of competencies, performance evaluation, and the importance of outcome-based education, but few studies have documented the development of such an education model. Therefore, this study develops an OBE curriculum for dentistry education and describes the development procedures and then finally this study intends to share our experience to other dental schools.

Methods: This study introduces the development procedure and details of an outcome-based education model for dental education and presents the five stages of an outcome-based education model. In this study, 3 educational experts and 2 dental professor composed the TFT and developed the research method according to the ADDIE model. Step 1 is to conduct quantitative / qualitative research analysis through some survey and interview, Step 2 is to do a survey to revise competency, Step 3 is to develop a materials through consensus and participation of our professors of the dental school, Step 4 is to do some workshops, Step 5 is to prepare and conduct a outcome evaluation.

Results: Step 1 is a required process for developing an educational model: the Job Analysis & Need Analysis stage. Step 2 is the Development of Outcome and Competency stage, which involves revising the competencies that are the basis of the curriculum. Step 3 is developing competency descriptions, competency levels, and evaluation criteria?the Development of Outcomes and Evaluation Standards. Step 4 is the Development of Milestones for Curriculum and Instructional Strategy, which examines the curriculum's problems and analyzes the improvements of each course. Step 5 is the Evaluating Outcomes stage, conducted based on the competencies specified by the target dental school.

Conclustion: The model presented here can serve as a foundation for outcome-based education in other dental schools.

Key words : Competency-based education (CBE), Dental Education, Curriculum Development

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I . INTRODUCTION

In the 21st century, the direction of education for health professionals is changing to focus on competency-based education (CBE) and outcome-based education (OBE).[1] It is important that CBE not only constitute and implement the curriculum, but also define outcomes and assess whether they have been achieved.[2] In the dental context, the dental school accreditation system and national licensing exams have been rightly mentioned as important institutional tools for ensuring that OBE and CBE needs have been met. In fact, the accreditation system has become a key factor for improving the quality of the most basic dental education, and it has also enabled to continue to build outcome-based education.[3] A successfully completed dental license exam earns a national qualification, which guarantees the clinical competencies of dentists. The dental license exam confirms how well would-be dentists are capable of performing. In fact, the licensing exam score is highly correlated with future clinical performance.[4] Thus, it is very important that the evaluation is carried out by a credible party. Recently, a commitment was made to introduce a clinical practical exam into the dental licensing examination in Korea by about 2021. Institutional mechanisms have already been established to perform clinical competency assessments through CPX, OSCE, and benchmark tests. The most important topic in the accreditation standards required by the Korea Dental Education and Evaluation Institute is outcome-based education.

The paradigm shift and steady progress in medical education to a competency-based medical education (CBME) model have been widely commented on.[5] Since the early 2000s, a competency-based curriculum (CBC) has been the most standard form of education.[6] The basic concerns of the accreditation standards of the Korea Dental Education and Evaluation Institute are "outcome-based evaluation" and "fulfilling Global Standards."[7] For this reason, 11 dental schools in Korea are making efforts to develop an outcome-based education model suitable for their environments and to meet national and international accreditation standards.

However, few studies have described concrete implementation experiences (development, operation, evaluation) for dental OBE models.[8] One principle of the OBE approach is that operation and (outcome-oriented) evaluation should be a continuous areas of focus.[9]

Dental education has a high proportion of mandatory subjects in comparison with other majors, and the amount of content to be learned in a short time is vast, so curriculum must be well organized and efficient. Four important elements of OBE that can have a key effect on the organization and efficiency of a curriculum are outcomes, abilities, time-based training, and learner centrality.[8] In other words, comprehensive OBE requires a lot of attention and a significant investment to determine how to define learning performance and how to evaluate it.[10] It is important in this regard to focus on outcome evaluation, including extensive meaning, rather than only on knowledge assessment.[11] Therefore, even though it is institutionally driven, educators on the ground are a key element of the shift to OBE.

To date, most research on OBE has focused on situating it in the context of a certain field, like medical education or engineering education, and on asserting its concepts and value generally. Little work has looked at

design and implementation. This study should therefore be meaningful for universities lacking experience in planning the direction of OBE. Therefore, this study develops an OBE curriculum for dentistry education and describes the development procedures.

Ⅱ. MATERIALS AND METHODS

This study proposes a development model for outcome-based dental education based on the results of implementation of an OBE curriculum at Seoul National University for two years, beginning in 2015. As noted, the procedure is based on the ADDIE model,[12] a general model of educational program development, often in relation to educational technology, consisting of analysis, design, development, implementation, and evaluation.[13] The ADDIE model is the basis of Dick and Carey's (1996)[14] Instructional System Design (ISD) model, and many continuous quality improvement (CQI) models have improved the original ADDIE model. The steps of this process are described in Fig. 1.

To ensure the process is developed accurately for dental schools, each step was developed by three dental education experts with a background in outcome-based medical education, and modified by faculty collaborators. The five-step model that results is presented in the results section.

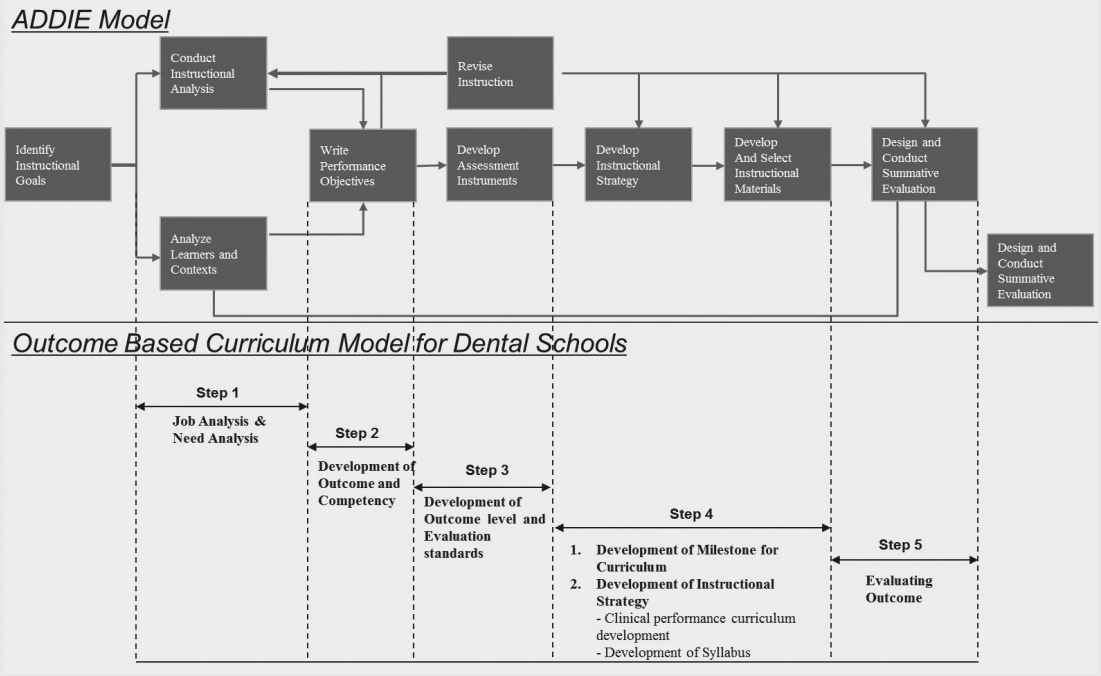

Fig 1. Step-by-step study process based on ADDIE model

Ⅲ. RESULTS

Step 1: Job Analysis & Need Analysis

Need analysis is the indispensable first step in the Human Resource Development (HRD) process; in general, strategic planning is followed by need analysis, performance analysis, and job analysis, in that order.[15] One of the most widely used methods of data collection for need analysis is the questionnaire. Need analysis systematically identifies the differences between "as-is" and "should-be" and determines reasons, related priorities, and solutions to problems.[16] In the present context, this involves analyzing satisfaction with education and the need for improvement based on the current curriculum. The procedure is shown in Fig. 2.

In this study, the questionnaire covered educational satisfaction, core dental competencies, and self-assessment; four basic directions for reform of the outcome-based curriculum were derived.

First, the basic direction of dental education should be competency based. In other words, OBE should adapt to social demands and shift to a balanced education in knowledge/skill/attitude, reflecting core competencies. Second, a spiral curriculum should be used. The current structure of dental education in Korea consists of two years of clinical education after two years of preclinical education; it should be sublated into the OBE curriculum, and all courses from first to fourth years systematically organized to teach core competencies. Third, explicit outcomes must be provided to students. An outcome evaluation system should be introduced

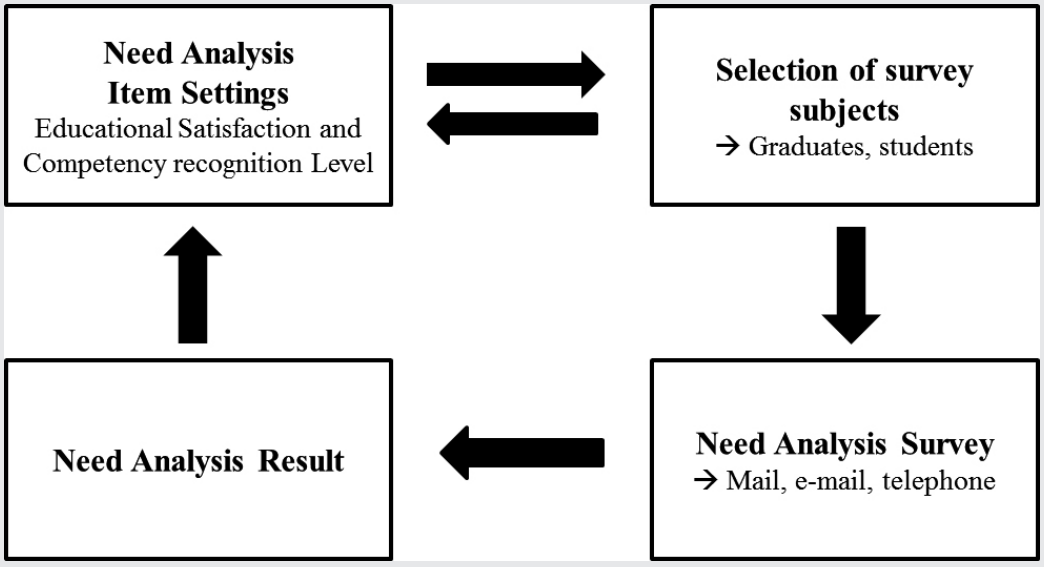

Fig. 2. Need analysis procedure

and employed as the core of evaluation, using clearly defined outcomes. If these outcomes are not achieved, reinforcement education should be put in place. Fourth, clinical-presentation-based curriculum should be employed, integrating basic science and clinical science.

Step 2: Development of Outcomes and Competencies

Step 2 is the step of developing competencies, which is the most important step in an outcome-based curriculum. This procedure is depicted in Fig. 3.

This process should fully define competencies needed for graduation based on ongoing, substantive discussion and consensus among faculty. In order to define educational goals in a given school of dentistry, experts must identify the problems with existing competencies and review core competencies prescribed by dental schools around the world. In this study, this process took about five months, and amendments were made to reflect the results as well as the competencies set by other schools and the results of the need analysis. This led to a shift from 142 existing competencies in seven domains to 45 competencies in six domains, due to overlap among the previous ones. The original competency domains were Professionalism, Communication and Social Skills, Knowledge Base/Information Management/Critical

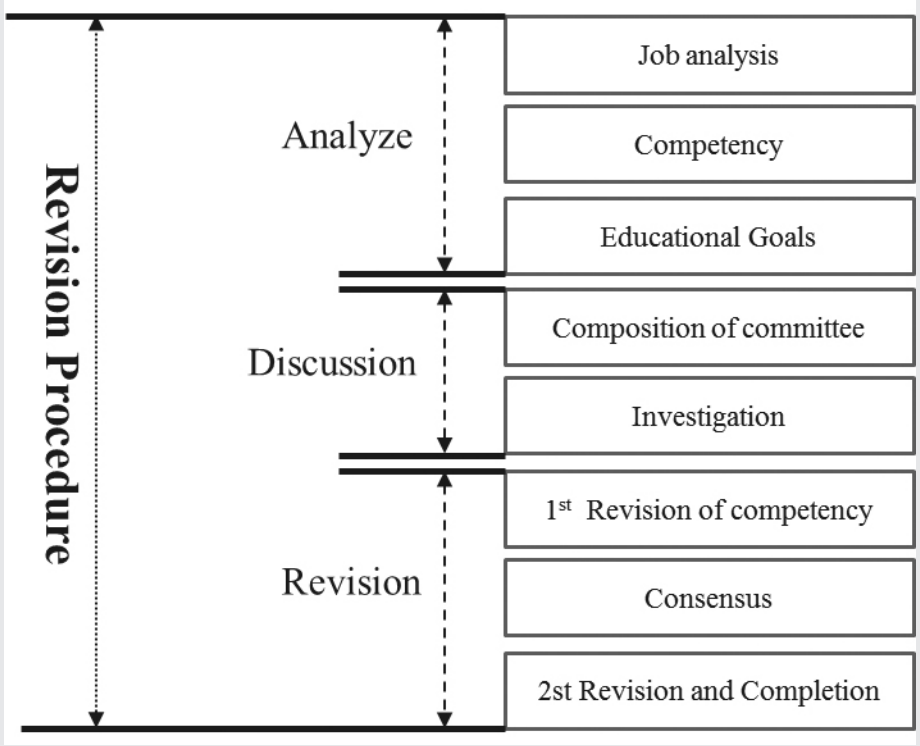

Fig. 3. Competency revision stage (Step 2)

Thinking, Clinical Information-Gathering, Diagnosis and Treatment Planning, Establishing and Maintaining Oral Health, and Health Promotion; in contrast, the revised domains are Professionalism, Communication Skills, Knowledge Base/Critical Thinking, Examination/Diagnosis/Treatment Planning, Clinical Competencies, and Management/Administration.

Step 3: Development of Outcome Levels and Evaluation Standards

Step 3 is the process of setting the levels according to which competencies are measured and establishing evaluation criteria; on this basis, competency descriptions can be produced. The competency description is describing the rubric, which is an objective evaluation criterion reflecting each of the 45 revised competencies. Performance criteria were set based on the Dreyfus model, employed as a procedure for clinical problem-solving. The Dreyfus model involves observing the performance of experts within a certain field facing various problems, such as pilots and dancers, whom it categorizes into five stages. Stage 1 is the Novice stage, where one is able to perform related functions only when the rules are provided and learned. Stage 2 is an Advanced Beginner stage, in which students begin to experience

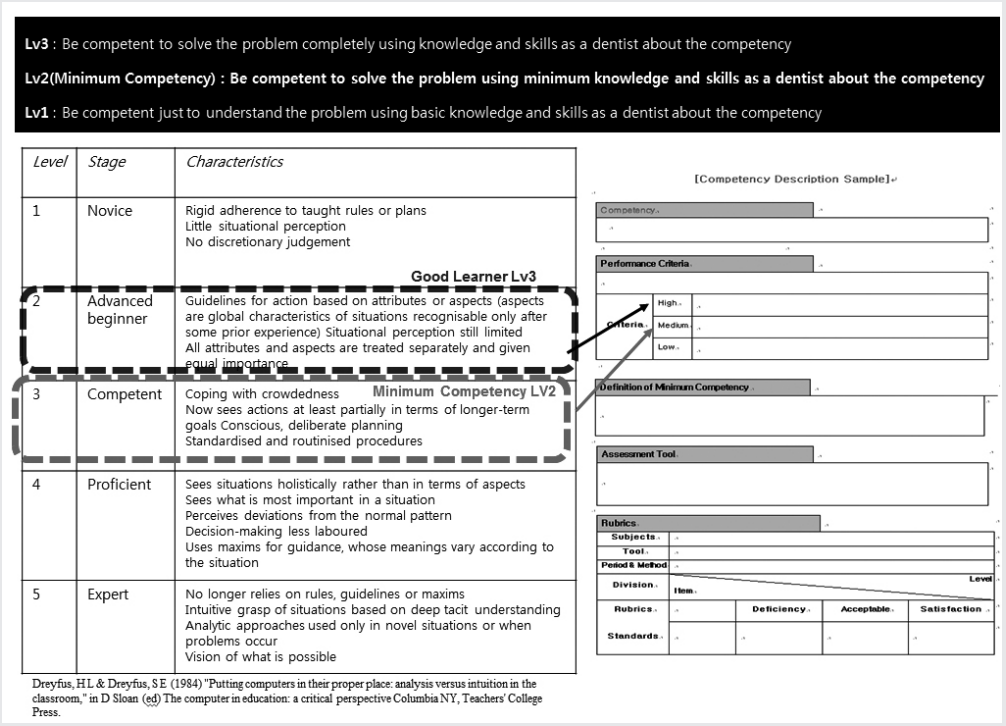

Fig. 4. Setting competency criteria and developing descriptions

real-world situations as presented by instructors. Stage 3 is the Competence stage, where potential functions are overwhelmingly increased through more experience. At this stage, learners will understand how to master their skills. Stage 4 is the Proficiency stage, in which proficiency at tasks comes naturally and learners can solve contextual problems themselves and achieve appropriate outcomes. Stage 5 is the Expertise stage, where professionals can make immediate decisions about what to do to achieve their goals as well as what goals need achieving. At this point, the specialist can distinguish specifically what they need from each situation and can make tactical decisions. The Competence stage reflects minimum competency for a professional dentist, and the Proficiency stage reflects the level of a good learner. Therefore, an evaluation of graduation-competency was incorporated in the program, reflecting Stage 3 of the Dreyfus model.17 Its overall development is summarized in the following Fig. 4.

Step 4: Development of Milestones for Curriculum/ Instructional Strategy

After the decision to apply the revision competency (Step 2) to the subject is made, in Step 3, the existing problems are analyzed. The curriculum should be developed according to the procedure described in Table 1.

Through this process, the Seoul National University School of Dentistry analyzed the problems with the existing curriculum and suggested improvements.

Step 5: Evaluating Outcomes

In the final stage, an outcome evaluation is done; this means developing a procedure for the overall evaluation of the school's outcomes rather than a course-by-course evaluation as described in the previously developed competency descriptors. In this study, to assess the most important evaluation area in the outcome-based curriculum of Seoul National University School of Dentistry, an outcome evaluation for undergraduates was conducted based on two types of competencies: basic knowledge and clinical skills.

In order to design for outcome evaluation at this stage, the study adopts the procedure seen in Fig. 5. The model was designed so that students could achieve Level 2 of the Dreyfus system, which was determined to be the minimum competency as per the evaluation rubrics.

Table 1. Curriculum development milestone procedures

no	Contents	Methods
1.	Subject analysis committee	Consists of faculty and students who completed the curriculum for analysis real contents were instructed
2.	Syllabus review and lecture notes collection	Syllabus composition and content review Acquisition of lecture by subject
3.	Analysis of the content of each subject	Analysis of the coherence of the planning, execution, and evaluation of actual education
4.	Discussing the problem and deciding whether to reflect it	Review of the first results report of the subject analysis committeeDisclosure and review of analysis results for all faculty
5.	Milestone development	Curriculum milestone development in accordance with analysis outcomes

Feedback was gathered and retraining conducted where students were deficient based on evaluation results for basic science knowledge and clinical skills, and then a second competency evaluation was conducted.

Ⅳ. DISCUSSION

The purpose of this study was to provide basic data and a toolkit to help improve the curriculum of Korean dental schools. To this end, the procedure developed for the implementation of outcome-based curriculum at Seoul National University School of Dentistry is presented in five stages.

The entire model development process took about two years. The curriculum was based on the ADDIE model, but the detailed processes and procedures were developed to suit the purpose and direction of OBE. Competency-based curriculum should be reorganized as a comprehensive form of curriculum able to transmit essential knowledge, skills, and attitudes as well as changing content.

As noted by Spady (1988), developing an outcome-based curriculum involves developing curriculum and designing lessons based on helping students achieve the best possible outcomes.[18] Although the reorganized

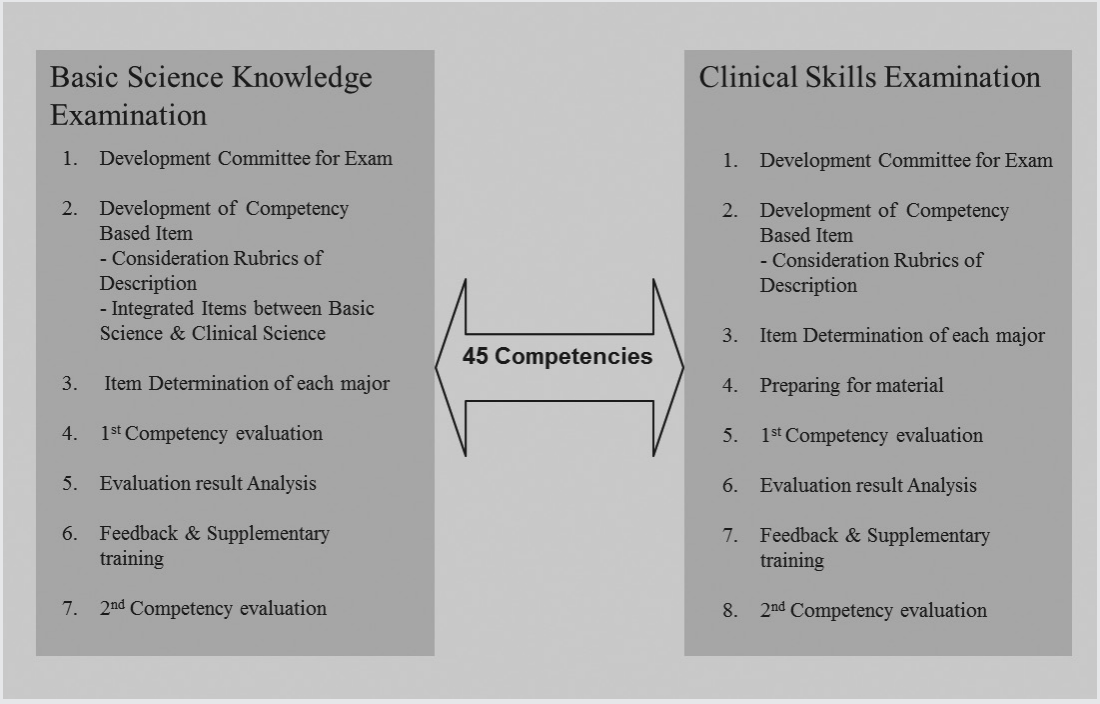

Fig. 5. Outcome evaluation design and implementation procedure

outcome-based curriculum is based on general dental competencies, it also needs to clearly reflect students' needs. Therefore, in the first stage, a demand analysis was conducted among alumni and current students, including an education satisfaction and awareness survey.

Harden (2002) suggested that development of new learning outcomes has significant implications for changes in medical education,[19] but requires clearly defining and disclosing outcomes as education goals, designing evaluation processes, and performing evaluation. Therefore, in order to establish the outcome-based education model at this dental school, faculty members and educational researchers tried to revise existing competencies and develop competency desc riptions based on outcome evaluation, to establish a more concrete direction of education.

After developing competencies, instructors determined the minimum level of each competency to achieve the determined outcome. In this study, the Dreyfus model was used to develop competency descriptions, and the competencies were described as a behavior indication that students should achieve. In order to express an outcome, it is desirable to present it as a concrete behavior indicator.[20] Therefore, in the competency description model used here, a detailed evaluation method was developed along with criteria for each course to determine the final outcome of every competency.

The competency descriptions developed in this way are used in basic science knowledge examinations and clinical skill examinations for graduation. The competency descriptions are also used to develop appropriate items for minimum competency evaluation and provide retraining for students who have not reached the minimum standard. In the outcome evaluation, the evaluation scale should ultimately reflect the learning outcomes.[21]

Howe suggested that one of the most urgent requirements in modern medical education is to develop a framework for theory and practice with solid professional competencies for lifetime practice.[22] Most efforts to implement competency-based education focus on defining competencies.[23] The 2010 International Competency-Based Medical Education (ICBME) also states that there is no evidence that changes to competency-based medical education will foster good doctors.[24] Therefore, in order to reflect and practice competency-based medical education properly, schools should not base education only on the final examination at the time of graduation.

V. CONCLUSION

According to Grant (1979), a competency-based curriculum should be designed through analysis of the predicted or actual role of modern society, and students' achievements evaluated based on their role.[25] To do so, it is important to conduct a clear analysis of the actual role of the dentist and to set a minimum competence level on that basis. To describe competencies according to discrete achievement levels, a clear understanding and application of the vision, goals, and purpose of each school's education is required and in-depth discussion by faculty members is needed to create outcome standards and criteria.

Knowledge-centered education, which has accounted for most dental education in the past, has been accompanied by internship programs that link theory

and practice through competency-based curriculum, problem-based learning, project-based learning, group discussion, case studies and so on.[26] Since then, the awareness of the importance of competencies has expanded, and many dental schools are making efforts to implement a competency-based curriculum reflecting the needs of the professional field.

As a result, learning outcomes have already spread to the international level, in many fields. To date, studies on competency models and outcome evaluation have asserted and reinforced the learning goals of dental or medical schools in relation to competency-based education,[27] investigated the development of an outcome-based education model in individual dental or medical schools,[28] and considered the implications and criticisms of the results of outcome-based curriculum studies in medical education.

In the dental field, there have also been studies on the development of competencies for general dentists or dentist graduates,[29] competency-based education,[12] and evaluation of outcomes.[30] However, there are limits to the present understanding of how best to practically and concretely ensure these educational practices develop. The purpose of this study was to introduce other dental schools to the experiences of the program investigated here in order to present an educational model for outcome-based education that those schools can use.

However, limiting the scope to one system at one dental school also leads to limitations. First, as no feasibility study was conducted to judge the appropriateness of the procedure, this remains outstanding. Basically, competency development is not a one-time or short-term process, but is ongoing and continually under revision and validation. Second, it is necessary to evaluate the curriculum model based on outcome evaluation results provided by students, who are the intended beneficiaries of the model and who can best identify areas for improvement. Since this model is at an early stage and it has not yet been possible to determine its actual educational outcomes, it will likely be necessary to add further processes to evaluate the outcomes clearly in the future. Actually the ADDIE model relies on each stage being done in the given order but with a focus on reflection and iteration. The model gives you a streamlined, focused approach that provides feedback for continuous improvement. However our model have some limitation about feedback cycle based on results. Therefore we have to confirm the result and reflection of this model and submit the cyclic result of feedback in the further research.

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