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Assessment of the Comprehensive Competence of Graduates from a Comprehensive Course Program

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Abstract

This study examines the comprehensive competence of graduates from a professional course program in oral and maxillofacial surgery, with a focus on aligning their skills with employer expectations. The research aims to evaluate graduates' ability to meet market demands, identify gaps in training programs, and propose strategies for improvement. The study addresses a critical global concern regarding the professional skills of oral and maxillofacial surgeons, emphasizing the need to enhance their clinical expertise, knowledge base, attitudes, and capacity for independent professional development. The analysis of current training programs highlights the necessity of aligning educational outcomes with the evolving needs of the healthcare industry. In the context of modern labor market demands, employers prioritize highly qualified surgeons, underscoring the importance of continuous improvement in professional education and training methodologies.

Keywords: Oral and maxillofacial surgeons; Employer evaluation; Graduate competence; Training assessment; Methodology; Skill enhancement.

1. Introduction

A curriculum is a structured framework that outlines the knowledge, skills, and attitudes that an educational institution aims to impart to its students, as well as the strategies for achieving these objectives.

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It encompasses educational goals, content, teaching methodologies, assessment mechanisms, and implementation strategies.

2. Training core components

A training program includes the following components:

1. Goals and Objectives: These define the specific knowledge, skills, and values that students are expected to develop throughout their educational journey.
2. Content: This comprises the courses, topics of study, practical activities, and areas of research integrated into the program.
3. Methodology: This refers to the teaching approaches, instructional materials, and learning environments designed to facilitate knowledge transfer and skill acquisition.
4. Assessment System: A structured method to evaluate and measure students' knowledge, skills, and overall competence.
5. Training Plan: This includes the schedule of classes, seminars, internships, time allocations, and the overall program timeline.

The curriculum serves as the foundational guideline for ensuring the quality of education, defining both the content and structure of the course to meet desired educational outcomes. It bridges theoretical concepts with practical application to produce competent professionals.

2.1. Curriculum theories and Methodological approaches

There are various curriculum theories and methodological approaches that underpin the design and implementation of educational programs in a systematic and evidence-based manner [2, 5].

Table 1: Curriculum theories and Methodological approaches

Theories	The key point	Keywords	The key researchers
Theory of Knowledge	Focuses on core industry vales	Systematization and content foundation	Ralph Tyler (1949)
Outcome-based Theory	Aims for measurable learning outcomes	Results and clear goals	Spencer, Tyler
Learner-centered Theory	Centered on learner needs/interests	Individual and needs	John Dewey (1938)
Socially-based Theory	Addresses societal needs and duties	Social responsibility and problem solving	Paulo Freire (1970)
Theorized Theory	Encourages creative knowledge application	Challenges and creativity	Hilda Tabb (1971)
Developmental Theory	Matches students' developmental stages	Developmental and age-related characteristics	Jerome Bruner (1960s)
Holistic Theory	Supports overall mental, physical health	Comprehensive development, personality	Martin Habermas

These theories present various approaches to curriculum development, each offering distinct advantages depending on the specific goals of the program, the learning environment, and the characteristics of the learners.

Table 2: Stages of Curriculum Development

Stage	Features	Key activities
1. Planning phase	This is the stage where educational content is initially planned by identifying learning goals and needs, posing problems, and making recommendations.	- To do research - To set up aims - To identify social and learner needs
2. Organizational stage	The period of developing teaching content and methodology, creating lesson sequences, plans, and learning materials.	- To select contents - To organize the lesson/content structure - Teacher training
3. Implementation phase	Use the curriculum in real-world training and deliver it to learners.	- To teach lessons - Practical implementation - To support students
4. Evaluation phase	Evaluate the results and effectiveness of the training program and make adjustments.	- Student evaluation - Teacher evaluation - To evaluate the results of the program
5. Improvement phase	Improve and reform the program's shortcomings.	- To evaluate the results of the assessment - To update the program - To change the environment

Detailed explanation:

1. Planning: This critical phase involves identifying societal needs, establishing learning objectives, and understanding learner characteristics. Research and analysis are fundamental components of this stage, ensuring the curriculum is aligned with both academic and social demands.
2. Organization: During this phase, the curriculum content is structured, and lesson plans, along with appropriate teaching methodologies, are developed. This stage ensures that the learning experience is coherent and well-organized.
3. Implementation: The program is put into action through practical experiments, engaging both teachers and students in real-world application of the curriculum. This phase focuses on active learning and hands-on experience.
4. Evaluation: This phase assesses the outcomes of the program, measuring its effectiveness and identifying any areas for improvement. It serves as a reflective stage to determine whether the learning goals have been met.
5. Improvement: A continuous process of refining and enhancing the quality of teaching, this phase ensures the curriculum remains relevant and effective over time.

These stages operate as a cycle, fostering ongoing development and improvement within the curriculum.

The comparison and analysis of methodologies employed in the development of medical curricula are essential for advancing the quality and efficacy of training programs.

Table 3: Comparison of commonly used methods in curriculum development

Methodologies	Features	Strengths	Weaknesses
Systematic methodology	Developing a curriculum in stages, based on specific goals and outcomes	Clear structure Goal-oriented Measurable outcomes	Inflexible Likely to limit creative initiative
Learner-centered methodology	Developing a curriculum based on the needs and interests of the students	Encourage student engagement Consistent with personal development	May not meet common requirements More pressure on teachers
Integrated (integration) methodology	Developing a curriculum that integrates knowledge from many fields and can be applied to real life	Close to real life Developing problem-solving skills	Much time for developing a program Coordination required
Problem-Based Learning (PBL)	By working on specific problems and cases, students are given the opportunity to acquire knowledge on their own.	Developing self-reliance Improving teamwork skills	Requires additional learning materials and environment Teacher skills are very important
Results-based methodology	The knowledge, skills, and attitudes required of physicians are identified and incorporated into the program.	Clear outcome Easy to evaluate Meets professional standards	Students' creativity may be limited due to excessive results-oriented behavior
Holistic approach	Developing a curriculum by taking into account intellectual, psychological, and social development in a holistic manner	Improving students' personality Suitable for clinical psychology	Difficult to implement Costs are likely to be high

Highlights of the comparisons above are:

1. Systematic Methods: While systematic approaches are stable and effective, they lack flexibility, limiting their adaptability to diverse learning needs.
2. Learner-Centered Approaches: These approaches are highly responsive to the needs of individual learners, but they present challenges in standardization and consistency.
3. Problem-Based Learning (PBL): PBL is particularly effective in simulating real-world clinical environments, fostering critical thinking and problem-solving skills; however, it demands significant resources.
4. Outcome-Based Approaches: These methods are particularly suited for developing practical skills, though their impact on fostering creativity may be limited.
5. Holistic Approaches: A holistic approach promotes comprehensive student development, yet it can be time-intensive and costly to implement effectively.

The integration of these methods can enhance the effectiveness and efficiency of medical education programs [1]. Specifically, incorporating outcome-based assessment methods into competency-based education (CBE)

programs can significantly improve educational quality and help achieve desired learning outcomes [6]. This is further elaborated below.

2.3. Features of Competency-Based Learning (CBLC)

The Competency-Based Learning Curriculum (CBLC) emphasizes the development of students' ability to apply professional skills, knowledge, and attitudes in practical scenarios [7]. The program is characterized by:

- The development of tangible, real-world skills.
- Alignment with student needs and learning goals.
- A flexible and open organizational structure to support personalized learning paths.

2.4. Results-Based Assessment

Outcome-based assessment focuses on evaluating whether students have met specific learning objectives through measurable, real-world evidence of their competencies [8]. Key features include:

- Assessment of students' knowledge, skills, and attitudes based on actual performance outcomes.
- Action-based or performance testing that simulates real-life scenarios.
- Evaluation of whether the defined competency criteria are met.

Table 4: Strategies for improving competency-based programs

Improvements	The impact of outcome-based assessment
Developing real skills	Providing opportunity to assess and improve students' theoretical knowledge and practical skills
Creating responsible learners	Students will take responsibility and be motivated to develop themselves
Defining affordable goals	Defining consistent aim, competency level and assessment design
Ensuring quality of training	Creating conditions for monitoring and improving the quality of training
Developing teachers' skills	Teachers will improve their methodology and assessment skills by using new assessment techniques.

2.5. Implementation Phase of Results-Based Evaluation

1. Defining Competency Criteria: Clearly outline the specific knowledge, skills, and attitudes that learners are expected to acquire.
2. Developing Assessment Methods and Criteria: Employ a variety of assessment methods, including problem-solving cases, real-life tests, and aptitude assessments, to evaluate student performance.
3. Assessment: Continuously monitor and assess the learner's actions and outcomes, providing targeted evaluations based on performance.

4. Feedback Integration: Provide detailed feedback to students, explaining assessment results and identifying areas for improvement and further development.

2.6. Examples in the Medical Field

When assessing competencies such as clinical skills and ethical behavior in medical students, various methods can be used [3]:

- Case Study: Evaluating patient communication skills and decision-making in treatment planning.
- Simulation Exercise: Assessing clinical skills using authentic medical equipment in controlled environments.
- Competency Test: Evaluating the ability to perform emergency care procedures effectively.

Outcome-based assessment is the most effective strategy for improving the actual outcomes of competency-based curricula [4]. It enhances the quality of teaching and ensures that learners are better equipped with the necessary skills to be competent and professionally prepared.

2.7. Global Review of Research on the Comprehensive Competencies of Graduates from Blended Learning Programs

A Blended Learning Program (BLC) combines both theoretical and practical knowledge to prepare students for real-world professional challenges [8]. An international review assessing the comprehensive competencies of BLC graduates revealed the following key insights:

2.8. Features and Implementation of the National Standards for Higher Education (NSH)

The National Standards Curriculum (NSC) integrates learning content across multiple subjects and focuses on solving real-world problems. The methodology is categorized as follows:

- Cross-Disciplinary Integration: Each subject is taught independently, but similar topics are covered across all disciplines.
- Interdisciplinary Approach: A single problem or topic is explored from multiple perspectives, linking various disciplines.
- Fully Integrated Model: Real-life problems are introduced to spark student interest, with solutions explored from a multi-perspective approach. Research has shown that this model effectively develops critical thinking, teamwork, and problem-solving skills.

2.9. Comprehensive Competency Assessment Methodology

The NSC employs specific tools to evaluate the competencies of its graduates, such as:

- Student Course Experience Questionnaire (SCEQ): A tool that assesses course quality from the student's perspective.

- GEKo Tool: A comprehensive competency assessment tool that measures knowledge, skills, and attitudes.

While these tools are instrumental in evaluating graduate competencies, they may sometimes fall short in accurately comparing program outcomes.

2.10. Global Impact of the NSC

Professional Skills: International research indicates that the NSC equips students with flexible, market-relevant skills [7]. For instance, in the medical field, the integration of theoretical knowledge with clinical training has led to better-prepared doctors.

- European Bologna Process: Standardized frameworks have been developed across Europe to ensure graduate competencies are aligned with labor market needs.

2.11. Recommendations for Implementing the NSC

- Adapt training content and assessment tools to reflect real-life applications.
- Localize internationally recognized assessment systems and leverage technological advancements.
- Implement continuous evaluation mechanisms to refine and enhance program outcomes.

Based on program research, the NSC is confirmed as an effective model for preparing students to become competent professionals.

3. The research purpose

The research purpose is to assess the comprehensive competencies of oral and maxillofacial surgeons, specifically focusing on:

- Self-assessment of the comprehensive competencies of oral and maxillofacial surgeons; and
- Employer assessment of the comprehensive competencies of oral and maxillofacial surgeons.

4. Methodology

The study involved oral and maxillofacial surgeons with 1-5 years of post-graduation experience from the University of Georgia's Bachelor of Oral and Maxillofacial Surgery program. The CDIO cross-sectional assessment method was employed. Self-assessment and employer assessments were based on a set of 43 standard questionnaires designed to evaluate competencies using the Competency Inventory Scale (Core Competency) developed by Hsiu-Chin and Huan-Sheng Lo. Program evaluation was conducted by measuring mean scores, importance levels, and relevance on a scale from "7 = strongly agree" to "1 = strongly disagree." Data were processed using descriptive statistics, the Spearman correlation, ANOVA tests, and SPSS 25 software.

5. The research findings

Data were collected from 179 oral and maxillofacial surgeons employed in both public and private medical institutions, all of whom had graduated from oral and maxillofacial surgery programs. Additionally, 27 employers participated in the study, providing information regarding their years of service, professional degrees, and positions.

Among the 179 participating oral and maxillofacial surgeons, 95 (52.5%) were female, with 1-5 years of professional experience. Furthermore, 172 participants (95%) were identified as female. Descriptive and correlation analyses of demographic characteristics revealed a strong correlation between years of experience in the private sector and years of service within the same organization. This suggests a high level of stability among the oral and maxillofacial surgeons in the study, who tended to remain in the same organization over time.

Table 5: The demographics of the survey participants

Variable	Frequency N = 179	Percentage 100%
Age (years)		
Up to 20	32	17.7
21-24	43	23.8
25-29	65	35.9
Over 30	41	22.7
Gender		
Male	7	3.9
Woman	174	96.1
Position		
Oral and maxillofacial surgeon	168	92.8
Other	13	7.2
Education		
Bachelor	181	100
Master	0	0.0
Employment		
1-5 years	156	86.2
6-10 years	25	13.8
Professional degree		
Senior	0	0.0
Unqualified	181	100
Relevant office		
State institution	53	29.3
Private institution	125	69.1
Others	1	1.2

In the study, 125 participants (69.1%) were oral and maxillofacial surgeons, and 156 (86.2%) of the participants had been practicing for 1-5 years in private institutions or private practice settings, providing primary, intermediate, and advanced oral care.

Table 6: The demographics of the employers

Variable	Frequency n=27	Percentage 100%
Position		
Medical Director	8	29.6
X/U-EEO	19	70.4
Years of service		
1 - 5 years	1	3.7
6 - 10 years	2	7.4
11 - 15 years	1	3.7
16 - 20 years	6	22.2
21 - 25 years	4	14.8
26 - years and up	13	48.2
Subordinate department/unit		
State Hospital	8	29.6
Private hospital	14	51.9
Others	3	16.5

In the assessment of the comprehensive competencies of oral and maxillofacial surgeons by their employers, 13 employers (48.2%) were managers with more than 26 years of work experience. Additionally, 14 employers (51.9%) were affiliated with private dental clinics that provide continuous care, and 19 employers (70.4%) were deputy heads and methodologists responsible for overseeing treatment in both private and public oral and maxillofacial hospitals.

Table 7: Assessment of sub-groups of comprehensive competencies of oral and maxillofacial surgeons

#	Indicators	N = 179	Low value	Great value	Average	Standard deviation (±)
1	Comprehensive competence, ethics and responsibility	179	33.00	77.00	64.46	±9.09
2	Clinical skills	179	10.00	49.00	34.98	±7.43
3	Clinical knowledge, biomedicine	179	12.00	35.00	24.67	±5.46
4	Clinical skills	179	18.00	42.00	35.39	±4.82
5	Critical thinking skills	179	10.00	28.00	22.32	±3.71

The subgroup for evaluating the comprehensive competencies of oral and maxillofacial surgeons had a mean score of 77.0±9.09. Specific subgroups included the following:

- The mean score for clinical skills was 49.2±7.43.
- The mean score for clinical knowledge and biomedical science factors was 35.5±5.46.
- The mean score for clinical practice was 42.0±4.82.
- The mean score for critical thinking ability was 28.0±3.71.

Table 8: The employers' assessment of comprehensive competencies

#	Indicators	N = 27	Low value	Great value	Average	Standard deviation (±)
1	Comprehensive competence, ethics and responsibility	27	48.00	73.00	60.29	±6.64
2	Clinical skills	27	22.00	43.00	33.37	±5.05
3	Clinical knowledge, biomedicine	27	14.00	28.00	22.62	±3.92
4	Clinical skills	27	26.00	37.00	32.25	±2.65
5	Critical thinking skills	27	15.00	27.00	21.55	±3.38

In the employer ratings, the subgroup means for comprehensive competence were as follows:

- The mean for ethics and responsibility was 73.0±6.64.
- The mean for clinical skills was 43.0±5.05.
- The mean for clinical knowledge and biomedical science factors was 28.0±3.92.
- The mean for clinical practice was 37.0±2.65.
- The mean for critical thinking skills was 27.0±3.38.

Table 9: The evaluation by both oral and employers

#	Employment	Average	Standard deviation	Standard error	Confidence min 95%	Interval t max	df	Yes.
Pair 1	Oral and maxillofacial surgeons	28.0740	39.73075	7.64619	12.35711	43.79104 3.672	26	.001

p = 0.01< **a =0.05*

A significant difference was found between the assessments of oral and maxillofacial surgeons and employers at the 0.05 level of significance (Table 9).

Table 10: Analysis of variance

Segments	Total	df	Average	F	Yes.
Within the group	17332.502	4	4333.126	3.794	.006
Intergroup	200990.824	176	1141.993		
Total	218323.326	181			

The table above shows that the results of the factors assigned to the subgroups of comprehensive competence of oral and maxillofacial surgeons significantly differ, with F(4, 17) = 3.79, P = .006. The correlation between theoretical knowledge and professional competence was found to be low (r = 0.42), suggesting that a specialist's comprehensive competence is more closely linked to manual skills than theoretical knowledge.

6. Conclusion

The self-assessment of the comprehensive competence of oral and maxillofacial surgeons was found to be at an average level. However, the average assessment of the comprehensive competence of these surgeons by their employers was lower than their self-assessment. Factor analysis revealed significant differences in the subgroups of comprehensive competencies of oral and maxillofacial surgeons, with F(4, 17) = 3.79, P = .006.

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