



ORIGINAL ARTICLE

# The Level of Program Learning Outcomes (PLOs) achievements among the Interns and Fresh graduates of the BDS program



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## KEYWORDS

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**Abstract** *Objectives:* Success of Dental Program depends on the students' performance measured in terms of Program Learning Outcomes (PLOs) achievement. The present study was carried out to evaluate the level of achievement of the PLOs among dental interns and fresh graduates as a direct measure for the success of the BDS program of the College of Dentistry, King Saud University.

*Methods:* An online survey instrument was used to seek the opinion of male and female dental interns and fresh graduates about the attainment of the PLOs distributed over 6 domains: patients' care, communication & interpersonal skills, professionalism, practice management, information management & critical thinking, and health promotion domains on a five-point Likert scale. The data were analyzed using Minitab Statistical Software version 15.1.31.0. Descriptive as well as Chi-Square statistics were calculated to determine the significance of the responses to the levels of PLOs achievement at 0.05 level of significance.

*Results:* Levels of achievement of PLOs under the 6 domains indicated a good standard of planning, delivery, and evaluation of the BDS program. On an overall average score basis, the achievement of PLOs under the Communication-Interpersonal Skills domain ranked as highest with a score of  $4.22 \pm 0.88$  followed by Professionalism ( $4.18 \pm 0.85$ ), Practice Management ( $4.03 \pm 0.93$ ), Patient care ( $3.94 \pm 0.84$ ) and Information Management-Critical Thinking domain with a score of  $3.68 \pm 0.96$ . The lowest score was achieved under Health promotion domain with a score

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of  $3.60 \pm 0.93$ . Statistically, no significant differences were found based on the graduation years and gender of the respondents.

*Conclusion:* The study revealed significant achievement of PLOs under all learning domains of the BDS curriculum taught at the College of Dentistry, King Saud University. However, achievement scores for Information Management, Critical Thinking, and Health Promotion domains require further improvement through reinforcement of the curriculum, updating of content, and teaching strategies.

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## 1. Introduction

The success of professionals in any field depends on the ability and competence of the learners after graduation. The competency measures the ability of graduates to perform the relevant procedures successfully, safely and independently without supervision (Gaunkar et al., 2016; Monrouxe et al., 2017). The academic institutions and programs, therefore, develop institutional and Programs' Learning Outcomes (PLOs), aiming to produce professionals who possess the required skills and professional competencies demanded in the job market. Keeping in view the prime importance of humans and their safety, these PLOs are considered more seriously in medicine, dentistry and other health-related programs. The curricula of health-related specialties provide detailed information about the learning outcomes, teaching strategies and assessment methods of the programs; as well as about the courses to achieve those learning outcomes. Hence, these curricula serve as the building blocks for the educational programs (Harden, 2001; Mazurat and Schönwetter, 2008). Although the evaluation of courses directly measures the achievement of CLOs, which ultimately leads to an assessment of the PLOs, yet it is challenging to validate the competence of a graduate to practice general dentistry simply through his/her achievement in the courses. Because the attributes such as the presence of a culture of inquiry and respect essential for much of learning may not be apparent from a student's performance in any course (Johnsen, 2013). A course-based evaluation of the curriculum also lacks a cohesive way to bring together and balance outcomes regarding practical knowledge, technical proficiency, critical thinking, ethics, social responsibility, etc (Harden, 2001; Mazurat and Schönwetter, 2008; Johnsen et al., 2011) since training and assessment in those areas across disciplines and academic years can appear to be fragmented throughout the curriculum (Johnsen, 2012). In these circumstances, the overall evaluation of the PLOs through seeking the opinion of the fresh graduates may prove one of the best tools to evaluate the performance of a dental program as well as the level of achievement of its intended learning outcomes. Use of other direct assessments methods such as students' performance in licensing exam, employers' feedback, results of the comprehensive dentistry course may be helpful in concrete validation of the program learning outcomes achievement.

Unlike social sciences, oral health care programs involve numerous clinical and non-clinical students' learning outcomes, which are required by dental practitioners in their practice (Licari and Evans, 2014). For a successful dentist, PLOs and competencies refer to the possession of adequate knowledge, cognitive skills, psychomotor skills, professionalism,

ethical values and technical skills required to perform dental procedures independently and successfully (Rafeek et al., 2004). The PLOs alternatively known as Students Learning Outcomes (SLOs), if successfully achieved, help the young dentists in joining the work market as competent general dentists (Licari and Evans, 2014; Gaunkar et al., 2016). Under the circumstances, the success of graduates and the dental programs directly depends on the well-defined PLOs translated into a comprehensive curriculum that meets the demand of the job market. Review of literature revealed that the dental programs throughout the world have adopted dental competencies and PLOs to train the young dentists. These PLOs and competencies have been opted by American, European and Australian dental schools mainly relating to undergraduate curricula (CED, 1999; ECACTDP, 1997; Mossey and Stirrups, 1997). Most recently, work on developing students' learning outcomes for the postgraduate programs has started in America and Europe (Mossey and Stirrups, 1997; Anne et al., 2005, ACTDP, 1999). A study conducted at the School of Dental Sciences, Newcastle University, UK, concluded that well-constructed and well-designed PLOs help in achieving the mission of the program, enhance quality and validate the success of the program (Bateman et al., 2017). The PLOs can be applied in dental education, especially in the areas of students' enrolment, curriculum development, students' learning, teaching and assessment (Clark et al., 2004). That is why, the dental schools, as well as policymakers, have attributed significant importance to the PLOs as these guide the programs in the right direction and help in achieving the vision and mission and objectives set for the programs as well as institutions. The PLOs documents are used as a guideline for the delivery of the program, whereas the results are used as evidence of achievement during the accreditation process (Whitney et al., 2015). Both schools, as well as accreditation bodies, are interested in tangible achievements of the PLOs using numerous direct and indirect methods.

Validation of PLOs reflects a critical component of successful education in the skills, knowledge, affective processes, and professional values that define the competent practice (Albino et al., 2008). King Saud University (KSU), College of Dentistry has also defined PLOs for its dental program (VDAA, 2013). To achieve these PLOs, the college has developed a curriculum that comprises of 65 courses to train the undergraduate students to meet the PLOs prescribed for the program. Unfortunately, no study so far has been conducted to evaluate the performance and feedback of the KSU interns and fresh graduates to determine the level of PLOs they acquire while studying at the college. The present research, therefore, planned to seek the perception of the interns and the fresh

graduates about the level of achievement of the PLOs required to be a successful general dentist.

## 2. Materials & methods

A formal approval to conduct this study was granted by the Research Centre of the College of dentistry, King Saud University with registration no. E-17-2707. This cross-sectional study targeted all dental interns and freshly graduated dentists from the College of Dentistry, King Saud University during the last three academic years (2015/16, 2016/17 and 2017/18). Based on the year-wise passing rate of around 70 males and 50 females, the total population came to be around 360 subjects including 210 males and 150 females. A 23-item online pilot-tested questionnaire was used to assess the levels of achievements of PLOs of the Bachelor of Dental Surgery program. The questionnaire was sent to all male and female interns and fresh graduates of the BDS program of year 2015/16 to 2017/18. The study was conducted from July 27, 2017, to May 8, 2018. The PLOs were distributed over 6 major learning domains: Patients' Care, Communication and Interpersonal Skills, Professionalism, Practice Management, Information Management, and Critical Thinking and Health Promotion domains. Feedback was collected on a five-point Likert scale (where 5 points were attributed to strongly agree, 4 to agree, 3 to fair, 2 to disagree, and 1 to strongly disagree).

Prior to distribution, a pilot study was conducted among 20 participants who were asked to validate questionnaire and give their opinion about the length of the questionnaire, clarity, and relevance of the questions and any additional information needed to be added to measure PLOs achievement. Based on the pilot study findings, rephrasing of some questions was made to enhance the wording and clarity.

After pilot testing, invitations to participate in the study were sent using an online mobile-friendly survey link using SurveyGizmo application through emails and some social media outlets such as WhatsApp. The original estimated time to respond to the survey was fixed as 2 weeks, but it was extended to four weeks because of pilot testing and updating the survey instrument.

### 2.1. Statistical analysis

The data collected were subjected to descriptive statistics as well as Analysis of Variance using Minitab Statistical Software version 15.1.31. (Minitab, 2004). The Chi-square tests were also carried out to determine the level of significance among the responses of male and female interns and fresh graduates at the  $P < 0.05$  level.

## 3. Results

Out of 360 invited interns and fresh graduates, 130 males and 129 females responded with a percentage of 62 and 86%, respectively. Among the intern respondents of 2017–2018, 48 were male and 46 were female interns with a response rate of 77.4 and 90.2%, respectively. Out of fresh graduates of 2016–2017, 42 were male and 46 female graduates with a percentage of 55.63 and 85.2%, respectively. Lastly, the fresh-graduate respondents of 2015/16 included 40 males and 37 females with a percentage of 52.63 and 75.5%, respectively.

The response rate was higher in the case of female interns and fresh graduates as compared to their male counterparts. The statistical analysis revealed that there was no significant effect of Graduation years ( $F = 2, 259 = 0.158, p = 0.85$ ), gender ( $F = 1, 259 = 1.34, p = 0.25$ ) and their interaction ( $F = 2, 259 = 0.071, p = 0.93$ ) on level of the PLOs achievement at 0.05% level of probability. Keeping in view the non-significant effect of graduation years and gender, no post hoc tests were performed.

The results of the present investigations presented in Tables 1–3 have revealed that both male and female respondents perceived promising levels of PLOs achievement in respect of all learning domains. The highest level of perception towards PLOs achievement was observed in case of Communication-Interpersonal Skills with an overall average score of  $4.22 \pm 0.88$ , followed by Professionalism, Practice Management, Patients' Care, Information Management-Critical thinking and Health Promotion domains with overall average scores of  $4.18 \pm 0.85$ ,  $4.03 \pm 0.93$ ,  $3.94 \pm 0.85$ ,  $3.68 \pm 0.84$  and  $3.60 \pm 0.85$ , respectively on a five-point Likert scale. The chi-square test did not reveal any significant difference between the responses of male and female interns and fresh graduates.

As far Patients' Care domain is concerned, the overall assessment score for the PLOs under this domain was  $3.94 \pm 0.84$ . Whereas the average scores marked by male and female respondents were  $4.08 \pm 0.78$  and  $3.89 \pm 0.87$ , respectively (Table 1). Both male and female respondents pronounced that they could demonstrate sufficient manual dexterity and tactile sensation to perform clinical and adjunctive dental procedures as is evident from the result of PLO 1.7 with a score of  $4.10 \pm 0.89$ . Whereas the lowest achievement score ( $3.59 \pm 0.83$ ) was recorded in the case of PLO 1.2 that measures the respondents' knowledge about the response of human organisms to diseases. The results pertaining to the Practice Management domain exhibited an achievement score of  $4.03 \pm 0.93$  on an overall assessment basis. The highest achievement score was observed in the case of PLO-2.4 where male and female students affirmed that they could demonstrate eye-hand coordination to perform safe dental procedures, as is depicted by the corresponding scores of  $4.38 \pm 0.73$  and  $4.22 \pm 0.94$ , respectively. Detailed analyses showed that in case of all PLOs under these domains, the scores reported by male respondents were slightly higher as compared to their female counterparts; however, the differences were not statistically significant (Table 1).

The results pertaining to the Communication - Interpersonal Skills and Professional domains (Table 2), revealed that the respondents affirmed high scores in the case of all concerned PLOs under these domains as is depicted with an overall assessment score of  $4.22 \pm 0.88$  for communication-interpersonal domain and  $4.18 \pm 0.85$  for professionalism domains, respectively. A detailed analysis showed that the highest achievement score was observed in the case of PLO 3.2 ( $4.37 \pm 0.82$ ), wherein the participants affirmed that they could interact professionally and effectively with patients, colleagues, and members of the healthcare team. This was followed by PLO no. 3.3, 3.4, and 3.1 with corresponding scores of  $4.20 \pm 0.88$ ,  $4.19 \pm 0.88$ , and  $4.15 \pm 0.94$ , respectively. A comparison of male and female respondents' scores enunciated that females were having a higher score of  $4.17 \pm 0.95$  and  $4.21 \pm 0.86$  in the case of PLO no. 3.1 and 3.3 corresponding to their knowledge of behavioral sciences

**Table 1** Achievement of program learning outcomes in case of patients' care and practice management domains.

Mean Score showing Achievement of PLOs on a 5-Point Likert Scale along with Standard Deviation

PLO No.	Domain-1 Patients' Care	Males n = 130	SD	Females n = 129	SD	Total N = 259	SD	Chi-square P-value
1.1	Through the BDS program, I acquired a sound knowledge of the structure and function of the human body.	4.24	0.87	3.90	0.81	3.98	0.84	> <b>0.05</b>
1.2	I can demonstrate sound knowledge of the response of human organism to disease;	3.83	0.89	3.53	0.98	3.59	0.83	
1.3	I possess sound knowledge of basic principles and theories associated with oral and para-oral diseases and common therapeutics used in the dental practice.	4.24	0.58	3.77	0.89	3.88	0.85	
1.4	I have an understanding of basic dental material science as well as clinical and laboratory procedures related to the practice of dentistry.	4.14	0.74	4.01	0.93	4.04	0.89	
1.5	I can use knowledge and understanding of relevant principles and theories to identify and investigate oral and para-oral diseases.	3.93	0.70	3.86	0.80	3.88	0.77	
1.6	I can utilize problem-solving, critical thinking and decision-making skills for the diagnosis of oral diseases and treatment planning.	4.10	0.72	4.09	0.80	4.09	0.78	
1.7	I can demonstrate sufficient manual dexterity and tactile sensation to perform clinical and adjunctive procedures related to the practice of dentistry with precision	4.07	0.96	4.11	0.87	4.10	0.89	
<b>Overall Average</b>		<b>4.08</b>	<b>0.78</b>	<b>3.89</b>	<b>0.87</b>	<b>3.94</b>	<b>0.84</b>	
	Domain 2. Practice Management							> <b>0.05</b>
2.1	I have an understanding of the oral health care system in Saudi Arabia and ethical and professional behavior.	4.07	0.88	4.01	0.97	4.02	0.95	
2.2	I am aware of the principles of sound practice management and appropriate response to possibly encountered emergencies in the dental practice.	4.07	0.65	4.05	0.83	4.05	0.79	
2.3	I can Identify and effectively utilize reliable IT resources and e-health practice system and tools	4.07	0.65	3.68	1.07	3.77	1.00	
2.4	I can demonstrate eye-hand coordination to perform safe dental practice;	4.38	0.73	4.22	0.94	4.26	0.90	
2.5	I have learned to operate in three dimensions and perform dental procedures using mirror.	4.34	0.72	3.97	1.05	4.05	1.00	
<b>Overall Average</b>		<b>4.19</b>	<b>0.73</b>	<b>3.99</b>	<b>0.97</b>	<b>4.03</b>	<b>0.93</b>	

and cooperating with their colleagues in managing joint projects. In the case of Professionalism domain, [Table 2](#) further reveals that all respondents demonstrated a higher level of achievement with an overall achievement score of  $4.18 \pm 0.85$  for this domain. Comparison of the achievement scores for male and female respondents expressed that on the overall average basis the male interns and fresh graduates scored better as compared to their female counterparts as is obvious with corresponding scores of  $4.28 \pm 0.64$  and  $4.15 \pm 0.90$ , respectively.

The results pertaining to the level of PLOs achievement under the Information Management and Critical Thinking domain revealed an overall achievement score of  $3.68 \pm 0.96$ . Although the achievement score in case of male respondents was on the higher side as compared to the females as is evident with overall scores of  $3.86 \pm 0.88$  and  $3.63 \pm 0.98$ , respectively, yet the differences were statistically non-significant. Out of the two PLOs under this domain, PLO 5.1 depicted the higher level of achievement wherein respondents acknowledged that they could apply evidence-based reasoning and practices to provide comprehensive dental care to patients as is evident from a score of  $4.02 \pm 0.81$  ([Table 3](#)). In the case of the Health promotion domain, all respondents on average exhibited a satisfactory score of

$3.6 \pm 0.93$ . The average achievement score for PLO no. 6.2 showed that all respondents were more satisfied with the achievement of the PLO pertaining to determining of community oral health needs using a range of methodologies to develop creative solutions to address them ( $3.84 \pm 0.85$ ). Whereas they were found less satisfied with the achievement of PLO 6.1 that corresponds to having sound knowledge of scientific research and the latest developments in the field of dentistry ( $3.35 \pm 1.02$ ).

#### 4. Discussion

The present investigations focused on the levels of achievement of the PLOs of the Bachelor of Dentistry program offered by the College of Dentistry at KSU. As mentioned in the result section, both interns and fresh graduates reported good achievements of the PLOs under all 6 domains of the program including patients' care, Communication and Interpersonal Skills, Professionalism, Practice Management, Information Management and Critical Thinking, and Health Promotion ([Tables 1–3](#)). This is worth mentioning that the present study is the first study of its kind and there was no previous investigation of this kind has been ever conducted within the kingdom or in the gulf region. The investigations are of prime

**Table 2** Achievement of program learning outcomes in case of communication -interpersonal skills and professionalism domains.

Mean Score showing Achievement of PLOs on a 5-Point Likert Scale along with Standard Deviation								
PLO No.	Domain 3. Communication and Interpersonal Skills	Males n = 130	SD	Females n = 129	SD	Total N = 259	SD	Chi-square P-value
3.1	Through the BDS program, I have acquired a sound knowledge of behavioral sciences and the principles of effective communication.	4.07	0.92	4.17	0.95	4.15	0.94	> <b>0.05</b>
3.2	I can interact professionally and effectively with patients, colleagues, and members of the healthcare team.	4.38	0.68	4.36	0.86	4.37	0.82	
3.3	I have learned how to cooperate with others in building and managing joint projects and work productively within a team environment;	4.14	0.95	4.21	0.86	4.20	0.88	
3.4	I can communicate effectively with patients, health care providers and other society members using appropriate communication media.	4.24	0.69	4.17	0.93	4.19	0.88	
<b>Overall Average</b>		<b>4.21</b>	<b>0.81</b>	<b>4.23</b>	<b>0.90</b>	<b>4.22</b>	<b>0.88</b>	
<b>Domain 4. Professionalism Domain</b>								<b>&gt; 0.05</b>
4.1	I can practice dentistry in the best interest of patients observing professional standards.	4.41	0.63	4.24	0.88	4.28	0.83	
4.2	I can demonstrate effective self-management, motivation and planning.	4.21	0.68	4.26	0.88	4.25	0.83	
4.3	I have learned to undertake continuing professional self-development and value the process of life-long learning.	4.21	0.62	3.94	0.96	4.00	0.90	
<b>Overall Average</b>		<b>4.28</b>	<b>0.64</b>	<b>4.15</b>	<b>0.90</b>	<b>4.18</b>	<b>0.85</b>	

**Table 3** Achievement of program learning outcomes in the case of information management and critical thinking domains.

Mean Score showing Achievement of PLOs on a 5-Point Likert Scale along with Standard Deviation								
PLO No.	Domain 5. Information Management and Critical Thinking	Males n = 130	SD	Females n = 129	SD	Total N = 259	SD	Chi-square P-value
5.1	I can apply evidence-based reasoning and practices to provide comprehensive dental care to patients.	4.07	0.75	4.00	0.83	4.02	0.81	> <b>0.05</b>
5.2	I can utilize basic statistical methods for data analysis and use audio-visual communication technology effectively to present data and reports.	3.66	1.01	3.25	1.13	3.34	1.11	
<b>Overall Average</b>		<b>3.86</b>	<b>0.88</b>	<b>3.63</b>	<b>0.98</b>	<b>3.68</b>	<b>0.96</b>	
<b>Domain 6. Health Promotion</b>								<b>&gt; 0.05</b>
6.1	I have acquired a sound knowledge of scientific research and the latest developments in the field of dentistry.	3.55	0.78	3.29	1.08	3.35	1.02	
6.2	I can determine community oral health needs using a range of methodologies and develop creative solutions to address them.	4.07	0.59	3.78	0.90	3.84	0.85	
<b>Overall Average</b>		<b>3.81</b>	<b>0.69</b>	<b>3.54</b>	<b>0.99</b>	<b>3.60</b>	<b>0.93</b>	

importance as the PLOs achievement measures the level of knowledge, skills, and competence of the graduates who pass out a program. The level of achievement of the learning outcomes demonstrates that fresh graduates can practice safely, effectively and professionally (GDC, 2012). The results of the present investigations have revealed that the participant reported a higher degree of competence for having sufficient manual dexterity and tactile sensation to perform clinical and adjunctive procedures related to the practice of dentistry with precision. The findings are in agreement with those of Lugassy et al. (2018), who reported that students' manual grades obtained at the beginning of the phantom course, their

performance on the Purdue test using both hands, and their performance on the O'Connor test under indirect vision predicted phantom course success in 80% of cases (Lugassy et al., 2018). Likewise, the respondents' depicted high scores for attaining problem-solving, critical thinking and decision-making skills for diagnosis of oral diseases and treatment planning. These skills help the young dentists towards better treatment planning of the patients. The findings are in agreement with those of Deshpande et al., who stated that an improvement in professional ability to plan the treatment efficiently, is required for a successful clinical practice (Deshpande et al., 2015). Findings on communication and interpersonal

skills showed that study participants observed a higher score for having sound knowledge of behavioral sciences, interacting professionally with patients, colleagues, and the members of the healthcare team. The studies have revealed that effective communication with patients is key to the success of medical professionals (Yuan et al., 2018). Competency in communication skills is essential for medical and dental students and practitioners alike. Proper communication of the physician with his patient will increase a patient's satisfaction and also compliance with the treatment (Stewart et al., 1999). Some studies have shown that patient's satisfaction can be improved if the doctor has undergone training to obtain good communication skills (Shendurnikar and Thakkar, 2013). In a similar study, it was revealed that a total of 96.43% of the students agreed that the course had improved their communication skills with the patients. Similar findings were observed by several other studies (Jagzape et al., 2015; Towle and Hoffman, 2002; Wagner et al., 2002). Jagzape et al., in their observational study found 78.46% improvement in communication skills experienced by the students (Jagzape et al., 2015).

The achievement of PLOs concerning professionalism also revealed a higher score for both the male and female fresh graduates and interns. The respondents reported their competence for observing professional standards, effective self-management, motivation and planning and the urge for life-long learning for their professional growth. In dental education, professionalism has been viewed as a requirement in order to achieve and maintain competence in the practice of dentistry (Farah-Franco et al., 2017). The results of the present finding are in line with those of Zijlstra-Shaw et al., who stated that the dental professionalism is an essential requirement to practice dentistry that covers both abilities and personal qualities. Therefore, a program of assessment that promotes personal and professional development throughout the undergraduate dental education course is needed (Zijlstra-Shaw et al., 2017).

Results on the achievement of PLOs relating to practice management also revealed high scores. The practice management is a very vital skill required by dental students especially at such a specific time where chances to establish and manage their own practice are highly available to secure employment. Mollica et al., while studying assessments of dental students' entrepreneurial self-efficacy to aid practice management, found that the students had statistically significant high scores of 3.95 (79%), consistent with the implementation of practice management courses in the curriculum (Mollica et al., 2017).

When it comes to Information Management & Critical Thinking, and Health Promotion, the results of the present investigations draw our attention towards further improvement pertaining to these two domains. Besides, the findings indicate the need to update the current dental curriculum, which is treatment-oriented while it should be prevention-oriented. This needs collaborative work across different disciplines within the College of Dentistry.

Findings of this study can be considered to help in better planning of dental education in Saudi Arabia as it is the first study that aimed at assessing levels of achievement of the PLOs of the Bachelor of Dentistry program offered by the College of Dentistry at KSU. However, there is a need that the study may be conducted at the country level to include feedback of the interns and graduates of the other 27 dental colleges of Saudi Arabia.

## 5. Conclusion

The results of the present investigations revealed good achievement of all PLOs under all domains of the BDS curriculum of the College of Dentistry at KSU by the dental interns and the fresh graduates. The achievement scores for PLOs pertaining to Patient care, Communication and Interpersonal Skills, Professionalism and Practice Management domains were on the higher side. Whereas scores for Information Management & Critical Thinking and Health Promotion domains were found comparatively on the lower side which necessitates reinforcement of the curriculum, updating of content and teaching strategies to improve the level of achievement of PLOs under these domains.

## 6. Limitation of the study

The present investigations based on the interns and fresh graduates' perceptions about the level of achievement of the BDS Program Learning Outcomes. Inclusion of other direct and indirect assessment methods of measuring respondents' performance such as their GPA, results of Capstone courses and Comprehensive Dentistry Courses, Health Specialties Licensing Examinations and employers' surveys could give a concrete evidence of achievement of the Program Learning Outcomes.

## References

- Advisory Committee on the Training of Dental Practitioners (ACTDP). Postgraduate Competence, 1999.
- Albino, J.E., Young, S.K., Neumann, L.M., Kramer, G.A., Andrieu, S.C., Henson, L., Horn, B., Hendricson, W.D., 2008. Assessing dental students' competence: best practice recommendations in the performance assessment literature and investigation of current practices in predoctoral dental education. *J. Dent. Educ.* 72, 1405–1435.
- Anne, H., Ian, H., Neil, J., 2005. Postgraduate Medical Education and Training: A Guide for Primary and Secondary Care. 190 pp.
- Bateman, H., Ellis, J., Stewart, J., McCracken, G., 2017. Using learning outcomes in dental education. *Br. Dent. J.* 223, 854–857. <https://doi.org/10.1038/sj.bdj.2017.993>.
- Clark, J.D., Robertson, L.J., Harden, R.M., 2004. Applying learning outcomes to dental education. *Br. Dent. J.* 196, 357–359.
- Council of European Dentist (CED), 1999. Competences Required for the Practice of Dentistry in the European Union. Advisory Committee on the Training of Dental Practitioners. pp. 1–4.
- Deshpande, S., Lambade, D., Chahande, J., 2015. Development and evaluation of learning module on clinical decision-making in Prosthodontics. *J. Indian Prosthodont. Soc.* 15, 158–161.
- European Commission Advisory Committee on the Training of Dental Practitioners (ECACTDP) Report and Recommendations on Core Knowledge and Understanding- Pre-requisite to achieving clinical proficiencies (Competencies). XV/8011/3/97-EN Brussels European Commission.
- Farah-Franco, S., Singer-Chang, G., Deoghare, H., 2017. Advancing the measurement of dental students' professionalism. *J. Dent. Educ.* 81, 1338–1344.
- Gaunkar, R.B., Basavarajappa, P., Raheel, S.A., Kujan, O.B., 2016. Perception of dental public health competency among recent graduates. *J. Int. Soc. Prevent. Communit. Dent.* 6, S137–S142.
- GDC, 2012. Preparing for practice Dental team learning outcomes for registration. pp 104. [https://www.gdc-uk.org/api/files/Preparing%20for%20Practice%20\(2012%20v1\).pdf](https://www.gdc-uk.org/api/files/Preparing%20for%20Practice%20(2012%20v1).pdf).

- Harden, R.M., 2001. AMEE guide no. 21: curriculum mapping—a tool for transparent and authentic teaching and learning. *Med. Teach.* 23, 123–137.
- Jagzape, T.B., Jagzape, A.T., Vagha, J.D., Chalak, A., Meshram, R.J., 2015. Perception of medical students about Communication Skills Laboratory (CSL) in a rural medical college of central India. *J. Clin. Diagn. Res.* 9, JC01-JC04.
- Johnsen, D.C., 2013. Student learning: improving practice. In: *Critical thinking: focal point for a culture of inquiry*. Hauppauge, NY: Nova Science, 2013.
- Johnsen, D.C., Lipp, M.J., Finkelstein, M.W., Cunningham-Ford, M. A., 2012. Guiding dental student learning and assessing performance in critical thinking with analysis of emerging strategies. *J. Dent. Educ.* 76, 1548–1558.
- Johnsen, D.C., Marshall, T.A., Finkelstein, M.W., et al, 2011. A model for overview of student learning: a matrix of educational outcomes versus methodologies. *J. Dent. Educ.* 75, 160–168.
- Licari, F.W., Evans, C.A., 2014. Recommended standards for dental therapy education programs in the United States: a summary of critical issues. *J. Publ. Health Dent.* 74, 257–260.
- Lugassy, D., Levanon, Y., Pilo, R., Shelly, A., Rosen, G., Meiorowitz, A., et al, 2018. Predicting the clinical performance of dental students with a manual dexterity test. *PLOs ONE* 13, e0193980. <https://doi.org/10.1371/journal.pone.0193980>.
- Mazurat, R., Schönwetter, D.J., 2008. Electronic curriculum mapping: supporting competency-based dental education. *J. Can. Dent. Assoc.* 74, 886–889.
- Minitab. Minitab Statistical Software. 15.1.31.0. 2004 Quality Plaza, 1829 Pine Hall Rd, State College PA 16801-3008, USA.
- Mollica, A.G., Cain, K., Callan, R.S., 2017. Using assessments of dental students' entrepreneurial self-efficacy to aid practice management education. *J. Dent. Educ.* 81, 726–731.
- Monrouxe, L.V., Grundy, L., Mann, M., John, Z., Panagoulas, E., Bullock, A., Mattick, K., 2017. How prepared are UK medical graduates for practice? A rapid review of the literature 2009–2014. *BMJ Open* 7 (1), e013656.
- Mossey, P., Stirrups, D.R., 1997. *Clinical Competencies in Dentistry — Exploring the Issues*.
- Rafeek, R.N., Marchan, S.M., Naidu, R.S., Carrotte, P.V., 2004. Perceived competency at graduation among dental alumni of the University of the West Indies. *J. Dent. Educ.* 68, 81–888.
- Shendurnikar, N., Thakkar, P.A., 2013. Communication skills to ensure patient satisfaction. *Indian J. Pediatr.* 80, 938–943.
- Stewart, M., Brown, J.B., Boon, H., Galajda, J., Meredith, L., Sangster, M., 1999. Evidence on patient-doctor communication. *Cancer Prev. Control.* 3, 25–30.
- Towle, A., Hoffman, J., 2002. An advanced communication skills course for fourth-year, post-clerkship students. *Acad. Med.* 77, 1165–1166.
- Vice Deanship of Academic Affairs (VDAA). 2013. *The competencies and Students' Learning Outcomes of the BDS program of the King Saud University, College of Dentistry*.
- Wagner, P.J., Lentz, L., Heslop, S.D., 2002. Teaching communication skills: a skills-based approach. *Acad. Med.* 77, 1164.
- Whitney, E.M., Walton, J.N., Aleksejuniene, J., Schonwetter, D.J., 2015. Graduating dental students' views of competency statements: importance, confidence, and time trends from 2008 to 2012. *J. Dent. Educ.* 79, 322–330.
- Yuan, S., Humphris, G., Ross, A., MacPherson, L., Zhou, Y., Freeman, R., 2018. A mixed-methods feasibility study protocol to assess the communication behaviours within the dental health professional-parent-child triad in a general dental practice setting. *Pilot Feasibility Stud.* 4, 136.
- Zijlstra-Shaw, S., Roberts, T., Robinson, P.G., 2017. Evaluation of an assessment system for professionalism amongst dental students. *Eur. J. Dent. Educ.* 21, e89–e100.