

Teaching, learning and evaluation of professionalism in dental education: A narrative review

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ABSTRACT

Background. Professionalism is an essential competence needed in the practice of dentistry. Teaching–learning and assessment of this competency is a part of the dental curriculum. We reviewed evidence in the literature regarding methods used for teaching, learning, evaluation and assessment of professional competency in undergraduate dental education.

Methods. Three different databases were searched for peer-reviewed full-text articles of studies relating to teaching–learning or evaluation of professionalism among dental undergraduate students. The evidence was then screened and the quality of the evidence was analysed by two different reviewers.

Results. A total of 573 articles were found relating to the topic and after removal of duplicates and initial title and abstract based screening using inclusion and exclusion criteria, 29 articles were shortlisted. Four more were excluded as the full-text of the articles could not be obtained. After full-text screening, 4 more articles were excluded due to variations in the abstract and methodologies in the full-text. Twenty-one articles were finally divided into 12 articles regarding teaching–learning and 9 articles regarding assessment methodologies and subjected to quality analysis.

Conclusion. Eleven methods for teaching and 8 methods for evaluation of professional competencies were found. The available literature on teaching, learning and assessing professionalism for dental undergraduate education is of moderate to low quality. Various authors have evaluated different methods but there is scope for improving the study designs to be more robust and the tools for assessment need to be refined.

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INTRODUCTION

Oral healthcare providers receive a structured education and training followed by licensing to practice dentistry. Every dentist needs to maintain high professional and ethical standards for which, ‘professionalism’ is an essential competence needed in the practice of dentistry. Teaching–learning and assessment of this competency are a part of the dental curriculum, and various attempts have been made using different techniques for attainment of professionalism. With rapidly changing education technologies, dental education is also changing from a more subject centred to a learner centred curriculum. Similar changes in the teaching and evaluation of professionalism competency in dental undergraduate curriculum need to be established. We reviewed the evidence in the literature regarding various methods for teaching, learning, evaluation and assessment of professionalism competency in undergraduate dental education.

METHODS

The methodological framework of this study is adapted from Nguyen *et al.* 2017.¹ We used the PubMed, Google Scholar and Wiley library databases in the literature search for studies related to teaching, learning and evaluation of professionalism in dental undergraduate course. Table 1 lists the exclusion and inclusion criteria.

Our literature search strategy was: (((*professionalism*[Title/Abstract]) AND (*dental education*[Title/Abstract]))) OR (((*professionalism*[Title/Abstract]) AND (*dental*[Title/Abstract]))) AND (*education*[Title/Abstract])) OR (*professionalism in dental education*[Title/Abstract]). The search was done on 21 July 2021 and yielded 573 articles (303 Google Scholar, 122 PubMed and 148 Wiley library). Based on the exclusion and inclusion criteria, the following were excluded: Duplicates (129), books (28), conference proceedings (3), reports (2), non-English article (6) and other (186) articles such as reviews and editorials. Title-based screening of 229 articles yielded 47 results. Further abstract-based screening resulted in 29 articles being shortlisted. Four more

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articles were excluded as we could not obtain the full-text and after full-text screening another 4 were excluded as these were overview or review type of articles. Finally, 21 articles were included of which 12 articles were regarding teaching and learning of professionalism and 9 articles were regarding methods of assessment of professionalism in undergraduate dental education. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the process is shown in Fig 1. The segregation of the teaching–learning papers from evaluation and assessment papers was done for ease of discussion.

For quality appraisal, the selected articles were critically assessed based on the critical appraisal skill programme checklist for qualitative research.² Studies on evaluation or assessment of professionalism were also assessed for whether internal reliability and validity of the method were measured. The papers were evaluated for strength of evidence and educational outcome levels on a scale of 1–5 for the strengths of the findings³ and the educational outcomes were based on Kirkpatrick hierarchy, adapted by Steinert *et al.*⁴

RESULTS

The included studies were divided in two themes: teaching and learning (12 studies) and assessment (9 studies). The educational outcomes and level of evidence are provided in Table 2 and the quality appraisal of the studies is shown in Tables 3 and 4.

Teaching–learning professionalism

Level 1: Reaction. Nayar *et al.*, in 2014, showed the effectiveness of community-based dental education programme as a successful and effective method in developing all the competencies outlined by American Dental Education Association (ADEA).⁵ Brondani, in 2012, collected and analysed reflections from DMD students of all 4 years and three categories of the framework: (i) Contribution to the classroom and community; (ii) value of diversity in the community and (iii) exercise of responsibilities and reported the professionalism and community service programme to be effective in fostering the understanding of all 3 issues (directly or indirectly) among the students.⁶ Marei

et al., in 2018, studied the usefulness of virtual patient scenarios for teaching professionalism and found it to be beneficial, and also pointed out that high fidelity cases must be incorporated in the programme rather than low fidelity cases.⁷

Level 2a: Learning. Kardos *et al.*, in 2009, used an E-portfolio system to advance the academic and professional development among bachelor of oral health students and proved it to be an effective tool with 75%–85% of the trailing rate of the system.⁸ Røding, in 1999, conducted a series of 5 seminars on inter-cultural communication, communication with patients and other healthcare providers, essentials of ethical practice, group dynamics, empathy, professional demeanour and professional competence and this series was effective in developing cultural and professional competence in freshmen.⁹ Schwartz and Bohay, in 2012, used recorded patient videos

TABLE 1. Inclusion and exclusion criteria

Criteria	Included	Excluded
Study design	All interventional study designs like prospective or retrospective cohort, cross-sectional, mixed methods, etc.,	Systematic reviews, scoping reviews, narrative reviews, opinions, overviews, experience, policies, or any other type of literature review
Language	English	Non-English
Availability	Full-text	Only abstract or full text not available or retrievable
Population studied	Undergraduate students of dentistry or dental hygiene	Postgraduate or postdoctoral students, junior or senior residents, medical, nursing, physiotherapy or any other branch of medicine
Intervention	Educational models or techniques for teaching–learning of professionalism beyond the core curriculum; methods for assessment of professionalism	Studies evaluating or assessing the effects of the existing curriculum on the attainment of professionalism
Outcome	Professionalism competence measured by any qualitative or quantitative method	Studies evaluating only student feedback of experience of the module

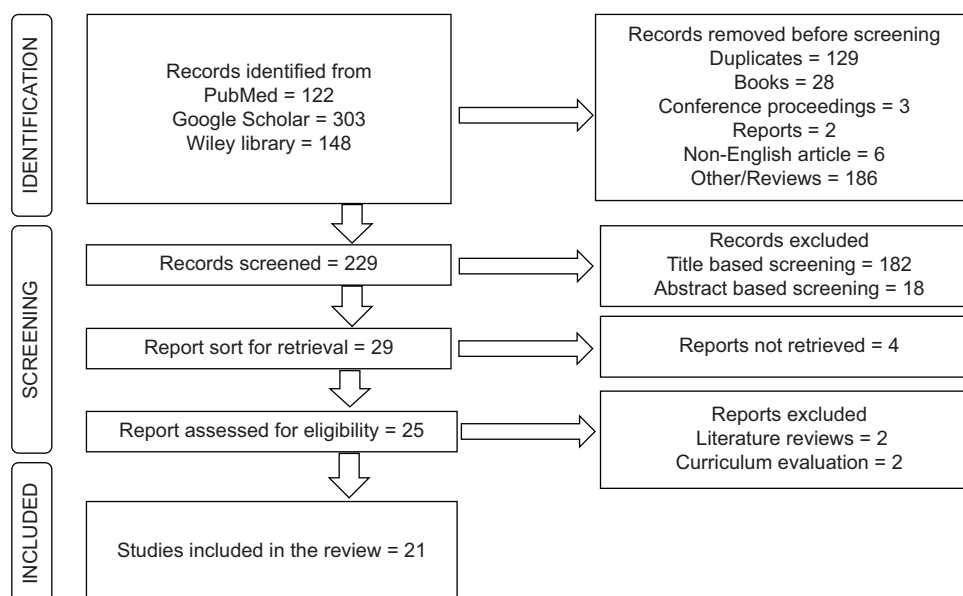


FIG 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow chart

TABLE 2. Categorization of the reports based on education outcomes and level of evidence

Educational outcome	Level of evidence				
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Level 1: Reaction	Nayar <i>et al.</i> ⁵ Brondani ⁶ Behere ¹⁷				Marie <i>et al.</i> ⁷
Level 2a: Learning		Kardos <i>et al.</i> ⁸ Roding ⁹	Schwartz <i>et al.</i> ¹⁰ Quick <i>et al.</i> ¹⁵		
Level 2b: Learning			McFarland <i>et al.</i> ¹¹ Setyonugroho ¹⁹	Ahmed <i>et al.</i> ¹² Al-Khalifa <i>et al.</i> ¹³	
Level 3: Behaviour		Taylor <i>et al.</i> ²⁰	Kanji <i>et al.</i> ¹⁴ Duff <i>et al.</i> ²¹	Quick ¹⁸ Langille <i>et al.</i> ²²	
Level 4a: Results				Farah-Franco <i>et al.</i> ²³	Ramaswamy ²⁴
Level 4b: Results				Roberts <i>et al.</i> ¹⁶	Zijlstra-Shaw <i>et al.</i> ²⁵

for teaching empathy as well as professionalism to dental undergraduates and noticed that students were more receptive to patient's words and remembered these better, in turn helping to teach professionalism and empathy to dental students. They also found that implementing such methods in final preclinical years is more beneficial.¹⁰

Level 2b: Learning. McFarland *et al.*, in 2016, evaluated self-rated competence in ADEA competencies with a survey of dentists who studied in a dental programme involving community service. The survey revealed that community-based dental education (CBDE) programme was effective in improving the competence of students in all 6 domains with the highest increase in critical thinking.¹¹ Ahmad *et al.*, in 2020, included a specially designed programme involving blind patients to teach professionalism. The programme had a positive impact on students in developing professionalism in patient care, and also trained the students in management of patients with special needs.¹² Al-Khalifa and Nazir, in 2020, used a project of preparing role play videos to teach professionalism and communication to dental students and noticed that students perceived the project as highly effective in developing professionalism and found that regular incorporation of such courses can help to improve the professional behaviour of students with patients and colleagues.¹³

Level 3: Behaviour. Kanji *et al.*, in 2020, conducted a pre- and post-test on dental hygiene students and reported a positive change in behaviour of students towards professionalism after exposure to an interprofessional education module, making them more receptive to working in collaboration with other disciplines for problem-solving.¹⁴ Quick and Blue, in 2019, studied the effects of an 'IGNITE' project-based learning including creation, presentation, discussion and reflection on topics related to academic integrity and professionalism through four dental school scandals and three topics of conflicts of interest. The project advanced the understanding and desire to learn further among the students.¹⁵

Level 4a: Results. No articles were found at this level.

Level 4b: Results. Roberts *et al.*, in 2018, studied the perceptions of participants on effect of peer-assisted learning (PAL) general practice module and found PAL to be a useful tool to teach professionalism skills and transfer the same in practice.¹⁵

Assessment of professionalism

Level 1: Reaction. Behere, in 2014, piloted a mini-clinical evaluation exercise in the oral medicine department and

found it to be a useful tool for assessment of students' clinical skills and identified the benefits of the same for assessment of communication and professionalism competence of the students.¹⁷

Level 2a: Learning. Quick, in 2016, used objectively structured clinical examination involving standardized patients and included self and peer assessment in the crossover method for 5 overall performance themes and 3 student learning themes. They found peer assessment to be higher than self-assessment and the exercise inculcated a deeper understanding of professionalism and ethical competencies as students observed the peers.¹⁸

Level 2b: Learning. Setyonugroho and Kennedy used MAAS global tool for calibrating the assessment of communication skills during OSCE. The study also found OSCE to be a reliable method for assessment of communication skills.¹⁹

Level 3: Behaviour. Taylor and Grey, in 2015, used critical incidence reporting forms (IRFs) to identify professional behaviours in clinical and non-clinical environments and found the system to be useful in assessing the aspects not possible by conventional methods.²⁰ Duff *et al.*, in 2020, tried to predict the non-cognitive traits using multiple mini-interviews in the domain of professional behaviour during patient care and found it to be both reliable and valid to predict key behavioural traits associated with professionalism in dental students.²¹ Langille *et al.*, in 2010, designed and validated a dental value scale and piloted the same on dental students and practitioners. They found professionalism to be higher in early stages of professional life and decreased with time.²²

Level 4a: Results. Farah-Franco *et al.*, in 2017, evaluated the relation of emotional quotient index (EQ-i) and professionalism mini-evaluation exercise and found positive correlation in EQ-i and professionalism. They suggested multiple triangulated efforts to teach professionalism in dental education.²³ Ramaswamy, in 2019, devised patient management and professionalism scale (PMPS) to measure professional conduct of students during patient care. PMPS showed good reliability and validity.²⁴

Level 4b: Results. Zijlstra-Shaw *et al.*, in 2017, designed and piloted 'Assessment of Dental Students Professionalism System' (ADSPS). The tool showed good internal reliability and validity. They suggested that the ADSPS assessment system was a valuable approach for evaluation of professionalism within dental education.²⁵

DISCUSSION

Finally, 11 methods for teaching and learning and 8 methods of assessment were identified (Table 5).

TABLE 4. Quality appraisal of reports related to evaluation methodologies of professionalism in dental education

Author	Tool used	Study design	CASPQRS									
			Are the results valid?					What are the results?				
Was there a clear statement of the aims of the research?	Is a qualitative methodology appropriate?	Was the research design appropriate to the aims of the research?	Was the recruitment strategy appropriate to the research?	Was the data collected in a way that addressed the research issue?	Has the relationship between the researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	Will the results help locally?	How valuable is the research?	Internal validity measured for the assessment methodology	
Zijlstra-Shaw <i>et al.</i> ²⁵	ADSPS	Qualitative panel testing before piloting, qualitative evaluation of ADSPS during piloting, and quantitative evaluation by analysis of students' marks during piloting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Taylor <i>et al.</i> ²⁰	Critical incident reporting form	Observational cohort study with incident reporting cards	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	No
Ramaswamy ²⁴	Patient management and professionalism scale (PMPS)	Qualtrics survey using PMPS by clinical director and patient care coordinator for all students	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quick ¹⁶	Objective structured clinical examination (OSCE) using standardized patient with self and peer assessment for evaluation as clinician and observer with a self and peer assessment	OSCE using standardized patient examination with self and peer assessment for evaluation as clinician and observer with a self and peer assessment	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No
Langille <i>et al.</i> ²²	Dental value scale	Factor analysis of framed indicators of values in dentistry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Farah-Franco <i>et al.</i> ²³	P-MEX AND EQ-1	Correlational cohort study	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No
Duff <i>et al.</i> ²¹	Multiple mini-interview	Reliability and validity, also a correlation with patient management grade	Yes	Can't tell	Yes	Yes	Yes	No	Yes	Yes	No	No
Setyugroho ¹⁹	OSCE (MAAS global tool)	Cohort	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Behere ¹⁷	ADSPS assessment of dental students' professionalism system	Cohort	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No
		MAAS maasricht history-taking and advice scoring list CEX clinical evaluation exercise	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No

E-portfolio

Kardos *et al.*, in 2009, designed a 3-stage E-portfolio, consisting of data storage, segregation, filtering and publishing of records, empowering students to self-evaluate their experience, anticipating greater understanding of the importance of their academic and professional education and learning. The bachelor of oral health (BOH) e-Portfolio was designed in accordance with the Dental Council of New Zealand certification requirements.⁸

Ignite project

Quick and Blue, in 2019, used a session of about 5 weeks for a small group of students in which they were made to examine problems in their educational environment, prepare a presentation and later discuss the same. The method exposed students to newer ways of thinking, improved collaboration and peer interactions in the learning process. Students developed professional qualities of collaboration, critical thinking and team working.¹⁵

Role-play videos

Al-Khalifa and Nazir, in 2020,¹³ studied the perception of students in with regard to preparation of role-play videos, benefits of the activity and skills developed during the same. Students were provided knowledge regarding the role-play videos by showing the role-play videos of a previous batch and then were divided into small groups to make and present similar videos on 2 topics (1: communication with patients and 2: communication with colleagues). Such project-based learning exercises were shown to develop deeper understanding and improvement in the professional behaviour of students towards patients and members of the dental team.¹³

Recorded videos of patients

Before interaction with actual patients, students' need to learn many clinical and soft skills in the preclinical years. Schwartz and Bohay, in 2012, evaluated the effect of video recorded experiences of patients in their own voice. The stages in the study were: (i) pre-test for frame background knowledge; (ii) recorded videos of patient reflections; and (iii) reflections of students after a month, including Jefferson's empathy scale.

The students revealed that listening to patients' reflections improved their understanding of empathy in clinical encounters. This method of using patients' recorded videos in teaching professionalism and empathy is well accepted and beneficial for students.¹⁰

Virtual patient scenarios

Five virtual patient (VP) scenarios were used by Marei *et al.* for a collaborative small group learning experience in dental students. The virtual scenarios involved 4 high fidelity cases on topics of privacy, confidentiality, excellence and honesty and 1 low fidelity case on confidentiality. Student reflections and questionnaires showed that high fidelity cases were more beneficial for the students. Such exercises helped students experience real-life situations and think like actual dentists. Moreover, the group activity was beneficial for developing more professional skills. Students suggested inclusion of such methods in a movie format in future sessions. VPs should be dramatic and have multiple plausible endings.⁷

Specially designed programmes involving people with disability

Ahmad *et al.*, in 2020, evaluated the effect of an extramural programme involving people with disabilities (PwD; blindness) for learning professional behaviour and experience in managing PwD. The students worked with community dentists to develop a tool kit and educational material to be used in the 2-day programme. With one-to-one interaction, students had to perform dental health check-up of PwDs, communicate with the patients and provide education to them regarding oral hygiene measures as well as guide them for healthy diet and cessation of smoking. The programme was successful in improving the knowledge, skills, attitude and values among the students and they also supported future programmes.¹²

Professionalism and community dental service module

Brondani evaluated students' reflection on professionalism and community service (PACS) programme which included the following activities: community service projects in schools or community organizations, interaction with members of the community with experience of addiction, interaction with the local gay community, exposure to an unethical simulated environment by trained actors, providing services at long-term care facilities as well as to children below 3 years age. They also needed to interact with human immunodeficiency virus positive patients for non-profit organizations. Although the results were inconclusive, the reflections of the students were positive.⁶

Community-based dental education

Nayar *et al.*, in 2014, and McFarland *et al.*, in 2016, evaluated the students' and supervising dentists' perspectives regarding a CBDE module. Both identified the benefits of the extensive programme in inculcating professional competence among the participants in all the domains of ADEA competency, with maximum benefit in domains of interpersonal skills and critical thinking. Dental students generally spend several weeks in off-site dental clinics and private dental offices with oversight provided by supervising dentists.^{5,11}

Seminar/lecture series

Röding, in 1999, conducted a 5 lecture/seminar series on 'Man and Society' including topics such as intercultural communication, communication with patients and other healthcare providers, ethics, empathy, professional conduct and demeanour as well as group dynamics. The group discussion and student reflections after the seminars showed improved understanding of the intercultural communication, empathy and professional skills in students. And theme 'man and society' was deemed beneficial by both participants and authors.⁹

Peer-assisted learning (PAL)

In PAL, 3rd and 4th year students pair as an operator and assistant to practice four handed dentistry and quadrant dentistry. They practice clinic protocols, documentation, appointments and non-technical aspects. Participants reported that this method developed and transferred professionalism to practice of dentistry making them lifelong learners, teachers and community leaders.¹⁸

Interprofessional education module

Kanji *et al.*, in 2020, evaluated the effect of an interprofessional education (IPE) module on 2nd year dental hygiene students

TABLE 5. Methods for teaching, learning, and evaluation of professionalism in dental education

Teaching and learning professionalism	Evaluation/assessment of professionalism
Project-based learning	Assessment of dental students' professionalism system (ADSPS)
E-portfolio	Critical incident reporting form (IRF)
Ignite project-based learning	Patient management and professionalism scale (PMPS)
Roleplay video	Objectively structured clinical examination (OSCE)
Structured situational learning	Dental value scale (DVS)
Recorded videos of patients	
Virtual patient scenario	
Specially designed programme involving people with disability	
Community-based learning	
Professionalism and community service dental module (PACS)	Professionalism-mini evaluation exercise (P-MEX)
Community-based dental education (CBDE)	
Conventional and revised methodologies	Multiple mini interview (MMI)
Lecture series	
Peer assisted learning (PAL)	Mini clinical evaluation exercise (M-CEX)
Inter-professional education (IPE)	

and found that students had greater clarity regarding their roles and became more receptive to learning clinical problem-solving skills with other disciplines. The IPE module had sessions on professionalism, ethical practice, indigenous cultural safety and resilience.¹⁴

ADSPS

Zijlstra *et al.*, formulated a 3-step questionnaire to evaluate the attainment of professional competence among dental undergraduate students attending an offsite outreach programme in private practice including self-assessment of students, practitioners' assessment of students and factors agreed by both students and practitioners. Assessment, feedback and reflections were the three components of the system. The format of assessment had good internal reliability and validity with further scope to frame assessments around it.²⁵

Critical IRF

Taylor and Grey, in 2015, evaluated the utility of a critical incident reporting system for professionalism. They devised a red card for serious and yellow card for mildly unprofessional behaviour and green card for good professional conduct. Students' details and event details were also recorded in the card which could be allotted by any staff member for any single event. This method was useful to record and assess professional behaviour of students as well as to serve as a self-evaluation tool for students.²⁰

PMPS

Ramaswamy adapted a 10-item professionalism index to design a PMPS tool including the following domains: extraversion (extroverted/reserved), agreeableness (critical/sympathetic), conscientiousness (dependable/disorganized), emotional stability (anxious/calm) and openness to experience (open to new experience/conventional). The PMPS demonstrated very good reliability and validity in this study and positive correlation with academic performance and patient management in the doctor of dental surgery (DDS) programme. PMPS was found to be a

versatile and flexible tool to assess professionalism.²⁴

Objectively structured clinical examination (OSCE)

Both Setyonugroho and Quick demonstrated the utility of OSCE as a useful tool to assess professionalism in dental undergraduate education.^{18,19} Setyonugroho used the MAAS global tool to calibrate the grading in a communication checklist during OSCE with 17 items in three sections. Section 1 had introduction, follow-up consultation, a request for help, physical examination, diagnosis, management and evaluation of the consultation. Section 2 focused on exploration, emotions, information giving, summarisations, structuring and empathy. Section 3 was intended to examine the mastery of history taking, physical examination, diagnosis and management which represent phases of the consultation. They quickly evaluated the effect of self and peer assessment during OSCE using standardized patients and noted that the addition of peers in the observers' role improves the understanding of the domains of concern and that peer rating is mostly higher than self-rating.

Dental value scale

Langille *et al.*, in 2010, derived a dental value scale (DVS) using focus group discussion and literature search. Items of their new dental value scale (DVS) and Schwartz's values scale, a generic values scale, were combined and piloted on practitioners and students. The initial 99-item scale was reduced to 27 items by factor analysis and later fit into a 5 factor structure that was confirmed by confirmatory factor analysis. The 5 factors were altruism, personal satisfaction, conscientiousness, quality of life and professional status. Both internal reliability and validity were satisfactory.²²

Professionalism-mini evaluation exercise (P-MEX)

Farah-Franco *et al.*, in 2017, found a positive correlation between emotional quotient and professionalism among students. They utilized the EQ-i and P-MEX tools. The P-MEX, developed at McGill University, is an objective assessment tool for professional behaviour in clinical encounters, small group sessions and sign-out rounds. The 21 P-MEX items are in four domains: doctor-patient relationship skills, reflective skills, time management skills and interprofessional skills. The reliability and validity of the P-MEX have been confirmed in medical education.²³

Multiple mini-interview (MMI)

Duff *et al.* found multiple mini-interviews to be a reliable and valid tool for predicting non-cognitive traits associated with professional behaviour. Two traditional interview-type questions and eight MMI stations addressing various personal skill domains, dental grade point average (GPA) and patient management scores were used. Five non-cognitive traits were measured using PMPS: extraversion, agreeableness, conscientiousness, emotional stability and openness.²¹

Mini-clinical evaluation exercise

Behere piloted the use of a mini-clinical evaluation tool in dental undergraduate education and found it to be useful for measuring clinical as well as non-cognitive parameters of dental undergraduate training. The parameters were rated by trained staff on 3-point scale (unsatisfactory, satisfactory and superior). Seven parameters were rated: medical interviewing skill, physical examination skill, humanistic qualities/professionalism, clinical judgement, counselling

skill, organising efficiency and overall clinical competence. They reported that the students' attitude and communication skills can be assessed and improved by focused feedback.¹⁷

We identified only a few methods for teaching-learning and evaluation of professionalism in dental undergraduate students, many more methods exist in medical education which are yet to be implemented and documented for their utility in dental undergraduate training.

In the context of the methods identified, we suggest the use of conventional and project-based learning (Ignite process, E-portfolio and Role-plays) in the early years of undergraduate training to sensitise the students regarding professionalism competency. The structured/simulated (virtual patients, recorded video and customised group of special groups of patients) learning models can be used in the later years of clinical training. The community-based learning models are more suitable for teaching-learning and assessment in graduating years or internship programmes.

The ADSPS, PMPS, DVS and OSCE methods of the evaluation of professional competence can be used in summative evaluation of professional competency in the final or graduating years. The other methods (Table 5) can be more useful in formative assessment during the early years of dental undergraduate and clinical training.

We need to improvise or combine more than one method of teaching-learning and evaluation as no single method for teaching-learning and evaluation of professional competence is sufficient. Based on the infrastructure, available resources and schedule of training, we need to include various methods in the undergraduate curriculum. Moreover, proper documentation of the methodology is needed to create strong evidence for further research in the field.

Limitations

The search was limited to only 3 databases; expanding the search to other resources may provide more studies relevant to our discussion. The search included only 'professionalism' term and variations were not used. More researchers should be involved in the team to make the quality analysis more rigorous. Curriculum design was not considered in this study; only the methods used and documented in dental stream were considered.

Conclusion

We identified 12 methods of promoting professionalism and 8 methods of assessment/evaluation of professionalism among dental students. Most of the papers were of moderate to low level of evidence and had methodological flaws. Further research for defining, promoting and evaluating professionalism among dental students with high level of evidence is needed. With advances in artificial intelligence, robotics and machine learning technology, the cognitive and psychomotor part of healthcare services will start being replaced but the affective or cognitive domain should not get compromised as it is the soul of healthcare services; hence, quality research and strong evidence is needed in this field.

Conflicts of interest. None declared

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