BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 12

DOI:10.58240/1829006X-2026.21.12-358

ORIGINAL RESEARCH

BRIDGING THEORY AND PRACTICE: KEY CONCEPTS IN WORKPLACE-BASED ASSESSMENT FOR DENTAL EDUCATION

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Received: *Jul 26. 2025;* ***Accepted:*** *Dec 18, 2025;* ***Published:*** *Dec. 30, 2025*

Abstract

Assessment is considered the most valuable tool in evaluating performance in healthcare educational training programs. End-of-year assessments often present challenges for trainees. To address this, workplace-based assessments (WPBAs) have been introduced during the clinical years, allowing students to engage with real patients and thereby build their clinical skills and confidence. Although awareness of these techniques is growing, only a limited number of dental schools have implemented these WPBAs. The strategic implementation of these WPBAs over the clinical years can aid in keeping track of the progress of the students and filling the gaps in their knowledge to have a positive educational impact on their lifelong learning. This paper will explore the key concepts of the use of WPBAs within undergraduate dental education to enhance students' practical competencies.

Keywords: Dental Education/Education, Workplace-based assessments, Feedback.

1. INTRODUCTION

The purpose of the BDS course is to produce knowledgeable clinicians who can practice clinical skills independently and who can efficiently work as a team in providing oral health care to the community. However, there has always been a gap between knowledge and behavioral skills when it comes to clinical training. [1]

Recently, there has been a paradigm shift in assessment tools in clinical education from assessing only theoretical aspects of learning to performance and competency-based assessment. [2] Therefore, it becomes necessary to use an assessment tool that can comprehensively and progressively evaluate trainees as they work in the workplace, allowing for constructive feedback to be given to them. [1]

Workplace-based assessment (WPBA) involves evaluating students in clinical settings with actual patients. It serves as a valuable tool for assessing various competencies, including cognitive abilities, psychomotor skills, communication, clinical management, and professionalism.[3] When implemented, these assessments enable trainees to recognize their weaknesses and contribute to the enhancement of their professional competencies. WPBAs have a promising role in bringing a holistic approach to the assessment in dental education.[4]

1.1. Rationale:

Recently, quality assurance testing was conducted with our university alumni about the curriculum and

their practical skills, and it was underlined that 33% lacked in communicating and conducting patient-specific procedures, independently. They indicated that it would be easier if the feedback were given regularly in the clinics, rather than at the end of the semester, to demonstrate their shortcomings during the clinical postings. It was felt that this could be because the process of evaluating the students' clinical work and providing feedback in the current clinical setting is not streamlined. Many trainees from other dental schools have also reported on having difficulties in conducting the independent practice. [5] This paper primarily aims to highlight the key theoretical and practical concepts regarding the use of WPBAs and their educational impact on the practice of dental trainees. The secondary aim is to explore the practical challenges and opportunities in implementing WPBAs in the dental clinical environments and to suggest recommendations to bridge the gap between theory and clinical assessment to improve the quality of dental education.

2. Theoretical Foundations of WPBAs:

Miller's Pyramid, proposed by George E. Miller in 1990, is a widely used framework in medical and dental education to conceptualize clinical competence. It illustrates a hierarchical model of assessing learners, progressing from knowledge acquisition to real-world performance. The four levels of domains, like knowledge (knows), competence (knows how), performance (shows how), and does (Action in practice) in Miller's pyramid, are used for assessing competence.[6] So, how the candidate performs and acts in real-life situations (does) is assessed by the Workplace Based Assessments (WPBAs).[7] (Figure 1)

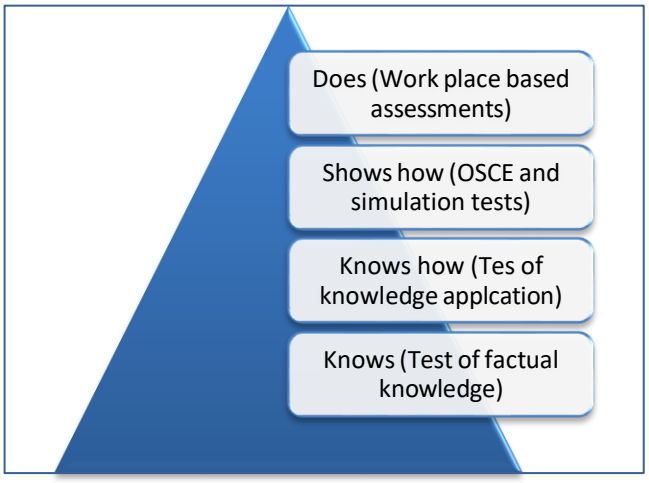


Figure 1. Workplace Based Assessments (WPBAs)

WPBAs fulfill the three basic assessment criteria that can facilitate learning in clinical education. Constructive alignment between the content, competency, and desired learning outcomes of the course, provision to give feedback to the trainees, and to guide the trainee learning towards the desired outcomes.[7]

WPBAs can regularly keep track of the progress of the learners, integrating their knowledge with clinical skills and effective decision-making in the clinical environment. This assessment also aids in assessing the behavioral modifications while interacting with the patients and other healthcare professionals.[8] Through this, there is also a provision to give feedback to the trainees about their everyday performance in clinical settings.[9]

Extensive research also supports the use of multiple assessment points across a student's educational journey, rather than relying solely on a single high-stakes, final evaluation. This approach helps ensure that learners progressively develop and demonstrate the minimum required levels of knowledge and performance.[10]

2.1. Principles of Assessment:

There are ongoing concerns about the validity, reliability, and fairness of these assessment methods in clinical education.[11]

Validity assesses whether a test accurately measures what it is intended to measure.[12] To ensure this principle, these WPBAs must be aligned with the curriculum outline and map with the learning outcomes of the program. The clinical procedures on the real-life patients have been directly observed by the assessor (DOPS) using the checklist to ensure all the procedures are being followed [13]

Reliability is the degree to which assessment results remain consistent and can be reproduced over time. It ensures that evaluations are standardized among different assessors, leading to stable and dependable results. These assessments also support the training of assessors to interpret results consistently and uniformly using the clear and detailed rubrics for assessing the procedures. [14]

Fairness is the unbiased opinions of the assessors towards the trainees, irrespective of race, gender, or ethnicity. This can be ensured by having more than 1 assessor for the same procedure with the trainee.[15, 16]

3. Key concepts in WPBAs

3.1. Authenticity in Assessment

WPBAs encompass the various assessment strategies to evaluate the trainee's encounter with

patients in the clinical settings and provide contextual feedback. The psychomotor and behavioral skills are assessed along with the cognitive domain through these assessments.[17] The "Does" level of Miller's Pyramid assesses students during real patient encounters, emphasizing clinical skills, attitudes, and behaviors essential for quality care. It involves direct observation and one-on-one, structured feedback from faculty members.[3] Strong evidence supports using multiple assessments across a student's learning journey, rather than relying on a single high-stakes exam, to ensure gradual development of essential knowledge and performance levels.[18]

3.2. Feedback and Reflective Practice

Feedback is crucial and is an integral part of this formative assessment. It promotes the students' learning by notifying them about their strengths and weaknesses and motivating them to engage in appropriate learning activities. [7] This kind of assessment falls under learning-oriented assessment (LOA) that is based on certain principles like relating assessment with course learning outcomes, involving students in active learning, and providing timely feedback to the students for supporting future learning.[19] Feedback is a major component of the adult learning theory, where it can reinforce the learner's existing knowledge and promote self-motivation. [19]

The rubric-based criteria help guide the student's reflection on their work and promote the setting of learning goals for a specific performance appraisal. This also allows the assessor to deliver honest feedback and the trainee to reflect positively.[20]

3.3. Entrustable Professional Activities

The shift toward competency-based education in the health education system has prompted the adoption of entrustable professional activities (EPAs). These were first developed by ten Cate in 2005 as a method to assess the competency of the postgraduate medical students. These were later introduced to the undergraduate medical education program in 2013. [21] EPAs function as assessment tools where multiple competencies can be assessed by the entrustable clinician to check the readiness of trainees to perform the procedures independently. [22] They provide a structured approach for task-specific assessment and play a critical role in the advancement of professional competence. These activities assess the highest level of Miller's pyramid, enabling the trainee to make competency-based judgments on clinical procedures in supervised settings.[23] Once trainees have demonstrated the competence to perform them independently, EPAs—practical, real-world tasks—can be entrusted to them.[22] According to a recent literature review, both dental trainees and their supervisors have responded positively to the early use of entrustable professional activities (EPAs) in undergraduate dental programs.[24]

4. Assessment tools in WPBAs:

Various assessment tools have been employed over past 2 decades to assess the competencies of the trainees in real-life situations through EPAs. [23] They also focus on multidisciplinary integration and feedback-based reflection for the clinical procedures. [24] The table 1 summarizes the common WPBA tools that have been used in health education to assess the clinical competencies of the trainees by the supervisors. [13]

- Group III (ES group): Teeth undergo root canal obturation using EndoSeal MTA sealer without any additional intervention.

Table 1. Assessment tools suitable as sources of information in the workplace to inform EPA entrustment decisions.[13]

Approaches	Methods	Tools
Watching	Brief and focused observation	Mini Clinical Examination exercise (mini-CEX); Direct observation of procedural skills (DOPS) (with or without video recording); in some cases *insitu* simulation (Patterson et al. 2013) or audio-based evaluation (Sanatani et al. 2020)
	Longitudinal observation	Multisource feedback (MSF) or 360^0 Evaluation
Talking	Brief conversations	Case-based discussions, Chart-Stimulated Recall, One-minute Preceptor, SNAPPS, Entrustment-based discussions
Reviewing results	Product evaluation	Entries in Electronic Health Record; Discharge letters; QI reports; Resident-Sensitive Quality Measures (RSQM)(Schumacher et al. 2018)

Mini-CEX (Mini Clinical Evaluation Exercise)

The Mini Clinical Evaluation Exercise (Mini-CEX) involves observing a trainee's direct interaction with a patient in a clinical setting. Originally introduced by Norcini et al. in medical education, it aims to assess a

trainee's competence in managing patients independently and confidently. [14] This assessment method effectively assesses the trainee's communication and empathetic skills with the patient and his team.[14] This tool includes the provision of immediate feedback, helping trainees identify their mistakes and make continuous improvements in their clinical skills. The areas of assessed competencies include history taking, physical examination, communication, decision-making skills and professionalism.[25] Mini-CEX has been proven to be a valid and reliable assessment tool. [26] Research on the use of Mini-CEX in dental education is limited, with only a few studies emphasizing its significance in disciplines such as oral radiology, oral medicine, prosthodontics, and orthodontics.[27] Table 2 outlines the steps of Mini-CEX to assess history taking, diagnosis, and treatment planning in dentistry.

Table 2. Mini-CEX process for assessing clinical skills in history taking, examination, and diagnosis.

Step	Description
1. Preparation	- Select a patient case relevant to history taking, clinical examination, or diagnosis.
	- Prepare the Mini-CEX assessment form/checklist.
2. Observation	- **History Taking:** Student gathers medical/dental history from the patient.
	- **Clinical Examination:** Student performs physical/oral examination on the patient.
	- **Diagnosis:** Student formulates diagnosis based on history and examination findings.
3. Assessment	- Examiner observes and assesses student's skills: communication, clinical, professionalism, decision-making.
4. Feedback	- Examiner provides immediate, constructive feedback including strengths, areas for improvement, and suggestions.
5. Documentation	- Examiner records scores and comments on the Mini-CEX form.
	- Student reflects on feedback and plans for improvement.
6. Follow-up	- Repeat Mini-CEX in future sessions to monitor student progress.

4.2. DOPS (Direct Observation of Procedural Skills)

Developed by the Royal College of Physicians, the Direct Observation of Procedural Skills (DOPS) is now widely incorporated into workplace-based assessments for trainees in health education across the globe.[14] Typically centered around a single procedural task, DOPS evaluates a trainee's performance during one clinical encounter. DOPS functions both as a tool for evaluation and as a method for experiential learning through direct observation in the clinical setting. An assessor and trainee may engage in several clinical sessions, each focusing on different procedures.[28] There is a paucity of research on the use of DOPS as an assessment tool in the dental education system.

An Indian study concluded that DOPS can be effectively integrated into dental student training sessions with a high rate of acceptance. However, training faculty in observation techniques and providing feedback can enhance its effectiveness. [28] Table 3 outlines the sequential workflow of the Direct Observation of Procedural Skills (DOPS) process in dental training. Each step describes key activities from selecting the procedure through to follow-up assessments, emphasizing both evaluation and learning aspects within clinical practice.

Table 3. Steps involved in the DOPS process for assessing and improving dental procedural skills.

	Steps	Description
1.	Identification of Procedure	Trainer and trainee select a specific dental procedure to be assessed (e.g., cavity preparation).
2.	Preparation	Trainee reviews procedure steps and guidelines to ensure readiness.
3.	Direct Observation	Trainer observes trainee performing the procedure on a patient during clinical practice.
4.	Assessment and Feedback	Trainer assesses performance using a structured form and provides immediate constructive feedback.
5.	Documentation	Assessment results and feedback are recorded in the trainee's portfolio or logbook.
6.	Follow-up	Additional sessions scheduled if needed to improve skills and monitor progress.

4.3. Multi-Source Feedback (MSF)

Researchers have demonstrated that feedback provided to trainees during patient encounters plays a vital role in the learning process. By encouraging reflection and self-awareness, effective feedback helps students identify their strengths and areas for improvement, thereby serving as a constant source of motivation.[29]

The primary source of immediate feedback is typically supervisors; however, feedback is also reported to come from peers, self-evaluation, and even patients. These diverse perspectives contribute significantly to the development of trainees' clinical skills—a process known as 360-degree feedback or multisource feedback (MSF).[29]

Furthermore, there have been ongoing debates regarding how trainees perceive feedback from peers and patients, and whether such feedback effectively contributes to the improvement of their clinical decision-making skills.[30] Some suggest that peer evaluation can have a positive impact on identifying weaknesses and strengths during clinical procedures.[31] On the contrary, the peer evaluation can be influenced by personal relationships, confidentiality issues, or a lack of expertise in the specific clinical procedures.[31]

Self-evaluation can initiate the self-directed learning process by helping students identify gaps in their clinical knowledge and skills during patient interactions. However, some students may undervalue their abilities and struggle to accurately assess their own clinical performance.[32]

Patients rarely offer their feedback to trainees about their subjective experiences regarding the students' ability to communicate effectively and demonstrate patient-centered care. This lack of feedback limits students' understanding of how well they engage with patients, hindering their growth in crucial areas of clinical practice such as empathy, communication, and the application of patient-focused approaches.[32]

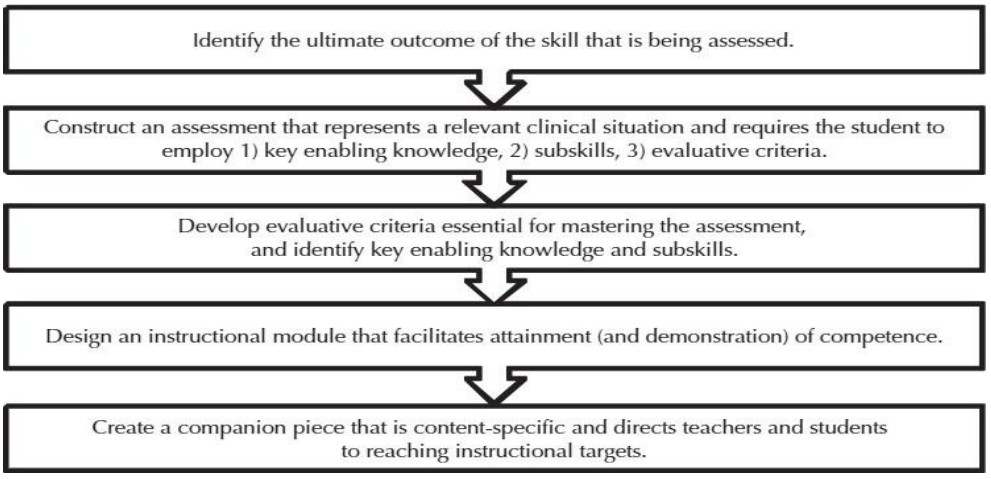
But if strategically implemented with written, customized questionnaires, MSF in a collaborative learning environment can help provide students with valuable feedback, overall enhancing the learning process.[33]

Feedback within dental education remains an underexplored area, highlighting the need to enhance the feedback process in clinical training to support the effective development of future dental practitioners.[34,35]

5. Developing Clinical Competency Assessments

Assessment of students, particularly in the healthcare education system, consists of two main domains: one focuses on evaluating the trainees' foundational knowledge and skills necessary to perform clinical procedures, while the other involves demonstrating these skills in real-life patient scenarios.[3] The development of these assessments (WPBAs) must be carefully aligned with the learning outcomes associated with the procedure, ensuring that they accurately reflect and assess the skills required in real-world clinical situations. This alignment is essential for ensuring that the assessments are both meaningful and relevant to the specific clinical scenario trainees are likely to encounter.[36] This concept has been implemented in the development of competency-based assessments within the Predoctoral Orthodontic Education Program at NYUCD, with continuous modifications and improvements since 2001.[36] Table 3 outlines the Steps for developing clinical competency assessments.

Table 3. Steps of designing the Competency based assessments



6. Supporting evidence (Global perspective on WPBAs and dental education)

An international joint meeting held in London in 2017 highlighted issues related to assessment strategies in dental education and concluded that DOPS has been the most widely accepted assessment method among various dental schools.[37] A recent study conducted at a dental school in Saudi Arabia emphasized the importance of feedback in enhancing clinical skills. DOPS was also reported to be widely used and well-accepted by trainees in dental schools. They have advised on the implementation of a tailor-made, well-designed faculty development program focused on various student assessment methods.[38] A high degree of satisfaction with the feedback provided during formative assessments has been observed among both trainees and trainers in the UK dental schools. [39] In an Indian study, Mini-CEX has been found to be a valid tool as formative assessment in improving the communication skills in orthodontic training.[40] It has been concluded by some authors that when a workplace-based assessment (WPBA) is conducted across various clinical settings, on multiple occasions, and by different assessors, it enhances both the reliability and validity of the assessment process.[28]

7. Challenges and Suggestions:

Several challenges exist in implementing Workplace-Based Assessments (WPBAs) within dental education, including insufficient faculty training, limited time availability, variability in assessor judgments, student apprehension towards the assessment process, administrative complexities, inconsistent quality of feedback, and difficulties in effectively integrating WPBAs into the existing curriculum framework. [41]

Before implementing this tool, it is essential to carefully consider and weigh the potential benefits and drawbacks for assessors, trainees, and administrative staff. Establishing best practices from the outset is crucial to avoid wasting valuable resources and to prevent the development of ambivalent attitudes toward this assessment method.[41, 42]

It is essential to provide comprehensive training in assessment for both trainers and trainees to ensure a thorough understanding of the assessment system, its methods, purposes, and applications. Such training promotes a shared understanding and consistency in the implementation of WPBAs, as well as in the application of established standards.[16]

8. CONCLUSION

WPBAs may not be appropriate for the high-stake conducts, but they can identify and remediate suboptimal performance by the clinicians during their training course. Workplace-based assessments (WPBAs) serve as a vital component in the overall evaluation of trainees, effectively supplementing more traditional assessment methods such as written or oral examinations. These assessments are specifically designed to support the development of essential clinical and professional competencies within a supervised and structured learning environment. One of the most significant advantages of WPBAs is their unique ability to capture a trainee's actual performance in real-life settings, thereby providing a direct reflection of their ability to apply knowledge in practice. When WPBAs gain popularity, there is an increasing need for continued development of the faculty and greater evidence regarding the validity and reliability of these tools, which will allow the academy to integrate this strategy into the current curricula. Nevertheless, more interventional and experimental evidence-based models are needed to determine its major educational effect on clinical education.

DECLARATIONS

Funding

This research received no funding.

Acknowledgment

None

Conflict of Interest

The authors declared no conflict of interest.

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