



Doi: 10.21608/jhpei.2024.285780.1024

## ORIGINAL ARTICLE

## Open Access

# Perception of Faculty and Postgraduate Students on Mini-CEX as an Assessment Tool in Prosthodontics

Medha V. Bhuskute<sup>1</sup>, Smita R. Athavale<sup>2</sup>, Suhasini J. Nagda<sup>3</sup>

<sup>1</sup> Consultant Prosthodontist at Aarogynilayam, Timarni, Ex-Professor Bhabha College Of Dental Sciences, Bhopal, Madhya Pradesh, India

<sup>2</sup> Consultant Prosthodontist, Deenanath Mangeshkar Hospital & Research Center, Pune, India

<sup>3</sup> Course director, IPS-CCHPE, Director & Educational Consultant, CU Shah Medical College, Surendranagar, formerly Director, Medical Education & Major Hospitals, MCGM, Ex Dean, Nair Hospital Dental College, Mumbai, India

## Abstract

### Background:

In an attempt to make post graduate training competency based, there is a need to introduce formative assessment methods as a part of the post graduate program. Mini-CEX is a valid formative assessment tool that fills the lacunae of traditional assessment methods to a certain extent. This study aimed to raise awareness among faculty and postgraduate students about Mini-CEX. It also aimed to analyse the perception of faculty members and students about the use of Mini-CEX as an assessment tool in Prosthodontics.

### Method:

Six postgraduate students pursuing MDS in Prosthodontics underwent six Mini-Clinical encounters after being sensitized towards Mini-CEX. Four teaching faculty members performed the roles of assessors. Assessors rated the performance by directly observing the students on parameters mentioned in a modified assessment form developed for this study. A systematic feedback session immediately followed each Mini-CEX encounter. Faculty members and student's perception was recorded on a 5-point Likert scale.

### Results:

All the assessors [100%] agree that direct observation during clinical examination is helpful and immediate feedback provided motivates students for further learning. All the assessors perceive that Mini-CEX will help to improve performance in university exams and that they will use the tool in the future. All the students [100%] agree that Mini-CEX helps to improve communication skills and helps in a better understanding of patient management.

### Conclusion:

Mini-CEX can be used as a formative assessment tool that can motivate students to further learning based on the feedback received.

### Keywords:

Assessment, Dental Education, Mini-CEX, Feedback

Received: 28-04-2024 Accepted: 27-08-2024

Published Online: October 2024

## How to cite this article

Bhuskute M, Athavale S, Nagda S. "Perception of Faculty and Postgraduate Students on Mini-CEX as an Assessment Tool in Prosthodontics." J Health Prof Edu Innov, Vol. 1, No. 3, Oct. 2024, pp 15-26.

Doi: 10.21608/jhpei.2024.285780.1024

## Address for Correspondence

Medha V Bhuskute,  
Gadhi, Gandhi Chowk, Timarni, District Harda, Madhya Pradesh  
Pincode :461228  
Mobile No.+91 9926669955  
E-mail: medhabhuskute@gmail.com



## Background:

The National Education Policy [NEP] 2020 and its implementation in the curriculum of the undergraduate and postgraduate programs of Indian Dental Colleges is set to bring about significant changes to dental education [1]. One of the key aspects of this all-inclusive policy is the adoption of Competency-Based Dental Education [CBDE], which will further include Workplace-Based Assessments [WPBAs] as a crucial tool for formative assessments [1, 2, 3]. WPBAs are formative assessments conducted by trainees in a workplace setting that provides feedback to help trainees improve. These assessments once done, will help the trainees to identify their shortcomings and help them further in refining their professional skills [4,5,6]. WPBAs can be broadly categorized into three types out of which Mini-Clinical Evaluation Exercises [Mini-CEX] are the ones that involve direct observation of students' clinical skills during authentic patient encounters, providing real-time feedback for continuous improvement [2]. This feedback will play an important role in the process of improving clinical skills, as it is described as a core component of formative assessment [2, 3, 4]. Mini-CEX is a valid and reliable tool to assess the "DOES" level of the Miller's pyramid [5-9].

Over the last few decades, too much emphasis was laid on assessing the student's performance with respect to how well the student is able to recall during a pen and paper test. The judgement would oscillate between 'Pass' or 'Fail' depending upon the individual's capacity to retain from his memory. Rote learning was highly appreciated. Insufficient emphasis was given to whether the student can perform in the role expected of them as dental practitioner [10]. Conventional assessment methods have several shortcomings such as assessments based on stereotypical and predictable cases, evaluation carried out by a fixed number of examiners, and a student is tested for a set of homogenized competencies [4, 10]. Mini-CEX has the potential to bridge the gaps and strengthen the framework of conventional assessment methods [7]. The rationale behind exploring Mini-CEX lies in the need for assessments that align with the practical and dynamic nature of Prosthodontic practice [2]. Prosthodontic clinical examination encompasses specific aptitudes, and proficiencies such as communication skills, professionalism, clinical

evaluation/judgement, counselling and overall competence, which is rarely assessed through conventional assessment methods. Hence, a gap was identified in the process of "assessment of learning," and "assessment for learning," carried out during the summative and formative assessments respectively [9]. Moreover, not much research has been accomplished on the use of Mini-CEX as an assessment tool in dental education, particularly in Prosthodontics [4, 11-13].

Since Mini-CEX is an assessment for learning, it can help provide feedback to both learners and faculty members regarding the learner's progress towards achieving pre-determined goals [14, 15]. This feedback is to be used by faculty members to revise and develop robust assessments. Feedback is used to actively improve student learning, may be informative and supportive, and help facilitate a positive attitude towards future learning [16, 17]. Hence it is important to consider the perceptions of all stakeholders, including faculty members and students, while developing effective assessment methods [18]. The most effective way to evaluate the pitfalls of the assessment held is to gather students' perceptions through feedback. Additionally, feedback from faculty members is crucial for a comprehensive evaluation of the teaching and learning process [19, 20].

After developing a specific Mini-CEX rating form, the present study aimed to create awareness among postgraduate students and faculty members of Prosthodontics regarding Mini-CEX. The study also aimed to analyze the perception of post graduate students and faculty members about the use of Mini-CEX as an assessment tool in Prosthodontics. This academic exercise shall attempt to gain valuable insights in refining assessment practices in Prosthodontics, thereby fostering a holistic environment that aligns with the contemporary dental education standards.

## Methodology:

### Study Design:

A quasi-experimental study was conducted at the Department of Prosthodontics, Bhabha College of Dental Sciences, Bhopal.

**Context:**

The study was held during May 2022 to August 2022 at the above mentioned institution. An awareness session on the use of Mini-CEX was conducted for the faculty members as well as students of the Department of Prosthodontics.

A pre-test was conducted before the awareness session. A detailed power point presentation highlighting Mini-CEX, and its application was demonstrated. The domains of scoring in Mini-CEX were defined. The benefits of incorporating Mini-CEX during formative assessment in the clinical settings were emphasized through the presentation. Discussions were held on the various methods of giving constructive feedback to students. A role play was enacted to facilitate the learners. The researcher performed the entire Mini clinical evaluation exercise on an actual patient in an authentic clinical setting. As a part of the role play, the use of checklist was demonstrated. The faculty too was oriented on the use of modified assessment form to grade the student and the method of providing immediate feedback. A feedback session was also carried out as a part of the role play. Doubt clearing session was also held to address the queries and concerns of the participants. A post test was conducted at the end of the session. The pre and post test data was analyzed to ascertain the validity of the tests conducted and the result produced.

**Sample Size and Type:**

Six postgraduate students and four senior faculty members participated voluntarily in the study. Informed consent was collected from all participants. The students were pursuing MDS in Prosthodontics, and the faculty members acted as assessors during the study. All the six students underwent six Mini-Clinical encounters after the awareness session was conducted.

**Data Collection Tool:**

A modified Mini-CEX checklist was developed for the study, which was used by the faculty to evaluate the students' performance. The assessment form tailored for this study is based on the generic template available at <http://www.abim.org/pdf/paper-tools/Minicex.pdf>.

**Data Collection Timing:**

The study spanned from May 2022 to August 2022. Pre-test and post-test assessments were conducted. The students were assigned the task to initiate the assessment. All Mini-CEX encounters were carried out on a real patient in real clinical setting. Each student was rated on his ability to take patient history, clinical judgement of evaluating the ridge & choice of pontic and his organizing efficiency in a fixed dental prosthesis case. Each session lasted for 10-15 minutes.

All Mini-CEX encounters were followed by a systematic feedback session. Feedback session lasted for about 5 minutes and started with appreciation of what went well during the Mini CEX encounter thus providing a positive feedback to the students. This was followed by targeting the areas which needed improvement. On completion of six Mini-CEX encounters for each student, faculty and student's perception was recorded on ten different parameters on a 5-point Likert scale. This helped the faculty and students to express their perception about Mini-CEX as an assessment tool in Prosthodontics.

**Data Analysis:**

Data collected from the pre and post-tests, as well as feedback sessions, was analyzed to assess the students' performance and the perception of faculty and students regarding Mini-CEX as an assessment tool in Prosthodontics.

**Ethical Approval:**

An approval was taken from the Ethics Committee of Bhabha College of Dental Sciences, Bhopal [BU 2022/ACGd/200]. Informed consent was collected from all participants involved in the study.

**Statistical analysis:**

Data was entered in Microsoft Excel spreadsheet and descriptive data was analyzed using statistical package of social sciences 25.0 software [SPSS Inc., Chicago, USA]. The mean values and standard deviations were calculated in each analysis. Results were statistically analyzed by using student's t- test and one way ANOVA test. For all statistical purposes, a p-value of  $\leq 0.05$  was considered significant.



**Results:**

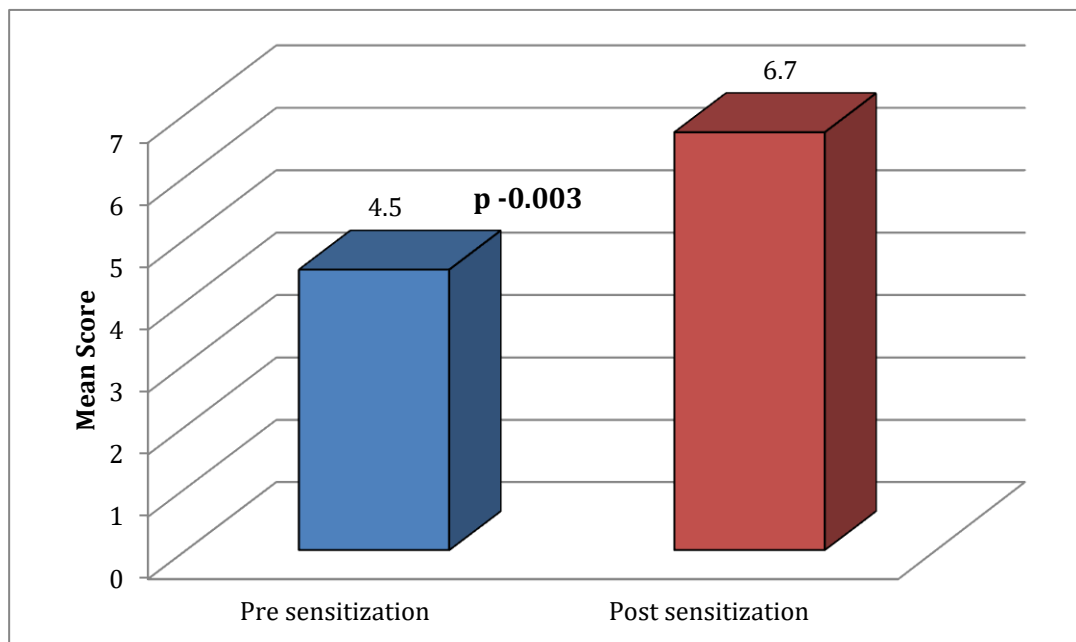
As seen in table 1 and figure 1 , the knowledge of faculty and PG Students [Pre and Post sensitization] towards Mini Clinical Evaluation Exercise was found to be 4.5[Pre-test] and 6.7[post-test] respectively. The P

value of the pre-test and post-test was found to be 0.003 which was statistically significant. This indicates that sensitization session helped in better understanding of the use of assessment tool prior to its implementation.

**Table 1- Mean Knowledge of Faculty and PG Students [Pre and Post sensitization] towards Mini Clinical Evaluation Exercise**

Sensitization	Mean Score	SD	t- value	p value
Pre sensitization	4.500	1.58	-3.359	0.003*
Post sensitization	6.700	1.33		

\*Statistically significant, SD- Standard Deviation



**Fig.1- Mean Knowledge of Faculty and PG Students [Pre and Post sensitization] towards Mini Clinical Evaluation Exercise**



Table 2 represents mean scores of four different assessors over 36 encounters of six post- graduate students.

**Table 2- Mean scores of 4 different assessors over 36 encounters of 6 students**

Number of encounters	Mean $\pm$ SD	95% Confidence Interval for Mean		f- value	p value
		Lower	Upper		
1 <sup>st</sup> encounter	15.00 $\pm$ 1.54	13.37	16.62	19.134	0.00*
2 <sup>nd</sup> encounter	16.00 $\pm$ 2.36	13.51	18.48		
3 <sup>rd</sup> encounter	20.00 $\pm$ 0.89	19.06	20.93		
4 <sup>th</sup> encounter	19.33 $\pm$ 1.36	17.89	20.76		
5 <sup>th</sup> encounter	19.66 $\pm$ .516	19.12	20.20		
6 <sup>th</sup> encounter	21.00 $\pm$ 0.00	21.00	21.00		

\*Statistically significant, SD- Standard Deviation

Table 3 shows mean observing time and feedback time of four different assessors over 36 encounters of six students. The mean observation time was found to be

7.55 min with a standard deviation of +3.84 min .The mean feedback time was found to be 5.55 min with a standard deviation of +3.15 min.

**Table 3- Mean observing and feedback time of 4 different assessors over 36 encounters of 6 students**

Number of encounters	Observing time[minute]		Feedback time[minute]		
	Mean $\pm$ SD		Mean $\pm$ SD		
1 <sup>st</sup> encounter	7.33 $\pm$ 4.92		4.66 $\pm$ 1.86		
2 <sup>nd</sup> encounter	8.33 $\pm$ 3.72		5.33 $\pm$ 3.61		
3 <sup>rd</sup> encounter	6.66 $\pm$ 3.72		4.00 $\pm$ 1.54		
4 <sup>th</sup> encounter	7.66 $\pm$ 4.03		5.33 $\pm$ 3.61		
5 <sup>th</sup> encounter	8.66 $\pm$ 4.58		6.33 $\pm$ 3.14		
6 <sup>th</sup> encounter	6.66 $\pm$ 3.14		7.66 $\pm$ 4.22		
Total	7.55 $\pm$ 3.84		5.55 $\pm$ 3.15		
Lower	Upper	6.25	8.85	4.48	6.62
Minimum	Maximum	2.00	13.00	2.00	13.00
f- value		0.253		1.009	
p value		<b>0.935</b>		<b>0.430</b>	

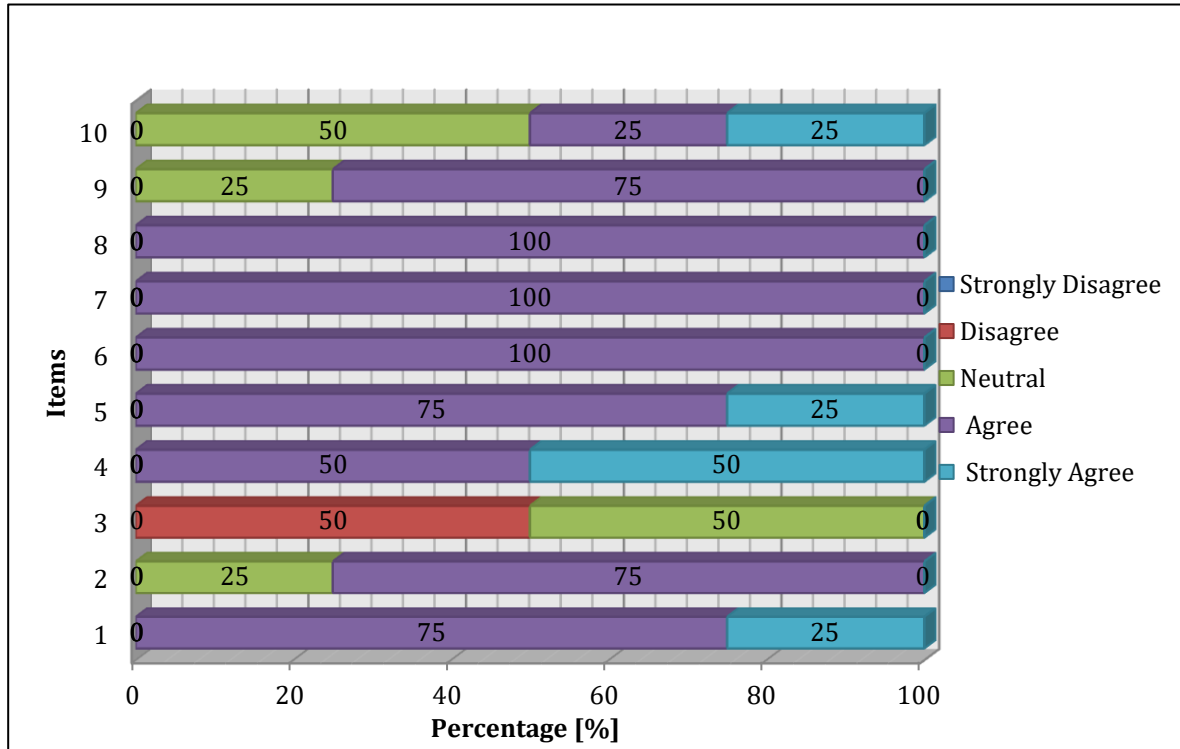
SD- Standard Deviation

These figures are suggestive of a significant reduction in the time taken for observation based on the immediate

feedback students received after each encounter and more time was dedicated for the feedback session.

**Faculty Perception**

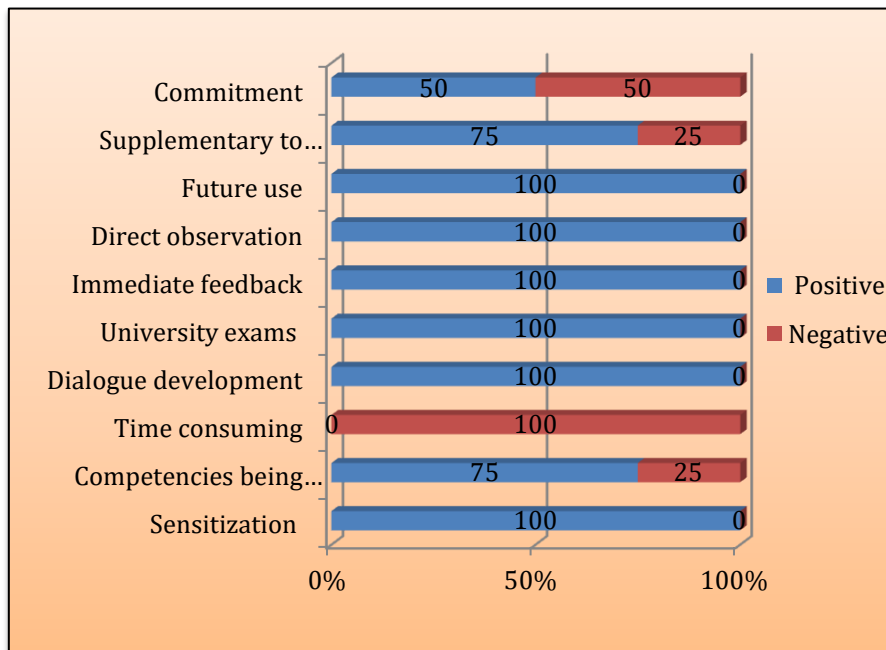
Figure 2 shows the perception of faculty towards Mini Clinical Evaluation Exercise on a 5 point Likert scale.



**Fig. 2 - Perception of Faculty to Mini Clinical Evaluation Exercise**

Figure 3 represents the graphical representation of the response of faculty members and students[in

percentage] on Mini Clinical Evaluation Exercise as an assessment tool in Prosthodontics.



**Fig. 3 - Faculty response in percentage**



All the four assessors [100%] agree that sensitization of faculty and students were done prior to the commencement of the study. Mini-CEX helped to develop a dialogue between trainee and evaluator. All the four assessors[100%] agree that the immediate feedback offered after each Mini- CEX encounter motivates students for further learning .All of them[100%] are of the perception that Mini CEX will help to improve performance in university exams. Presence of assessor and direct observation during

clinical examination was also found to be helpful by all the four assessors. All the four assessors displayed their readiness to use this tool for formative assessment in the near future. All the four assessors found Mini-CEX to be time consuming.50% of the assessors agree that more commitment is required to conduct Mini-CEX than the conventional assessment methods. Three out of four assessors [75%] responded that they were aware of the competencies being assessed and Mini-CEX can supplement conventional assessment tools.

**Student Perception**

Figure 4 shows the perception of faculty towards Mini Clinical Evaluation Exercise on a 5 point Likert scale.

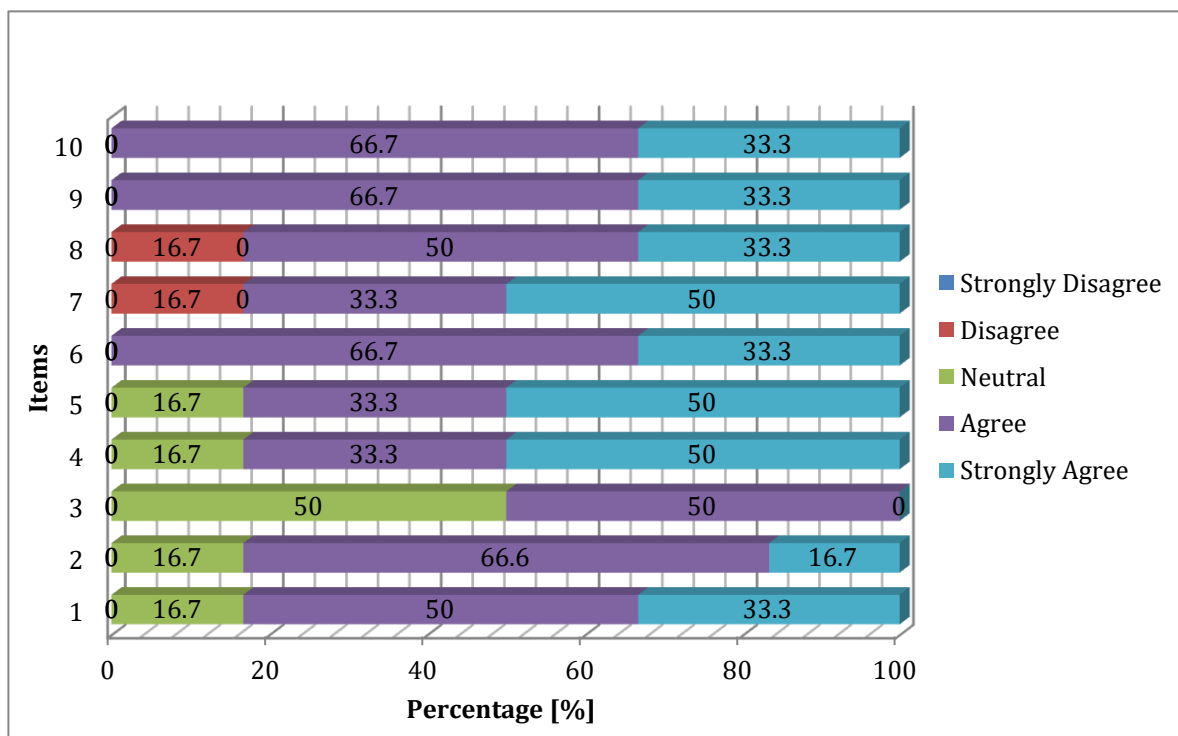


Fig. 4- Perception of Students to Mini Clinical Evaluation Exercise



Figure 5 represents the graphical representation of the response of students [in percentage] on Mini Clinical

Evaluation Exercise as an assessment tool in Prosthodontics.

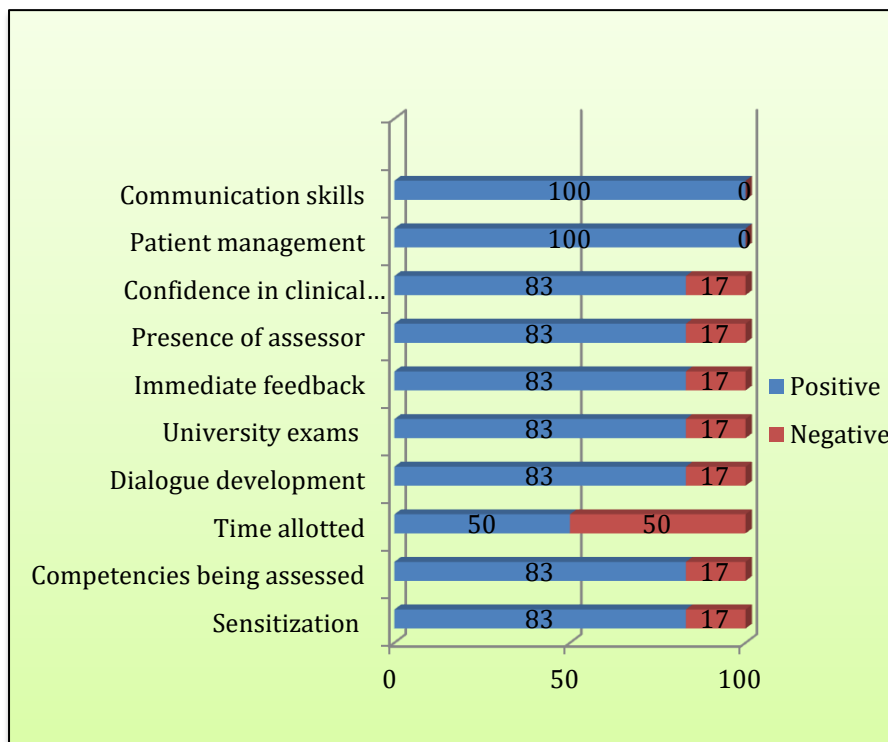


Fig. 5- Student response in percentage.

All the students [100%] agree that Mini-CEX helps to improve communication skills and helps in better understanding of patient management.

83% students agreed that Mini-CEX helps to develop a dialogue between trainee and evaluator. Majority of the students [83%] agreed that Mini-CEX will certainly improve their performance in university exams, and also opined that the feedback which is provided immediately motivated them for further learning. The presence of assessor was also found to be helpful by 83% students and they were confident in conducting clinical examination in a FDP [Fixed denture prosthesis] case.

50% students confirmed that the time allotted for the assessment was adequate. 83% agreed that sensitization was done prior to the commencement of study and that they were aware of the competencies being assessed.

Figure 6 shows frequency of responses [pre and post sensitization] about how Mini-CEX will help improve individual performance in final exams. Pre sensitization response from the participants showed that only 50% of them believed that Mini-CEX will help improve performance in final exams. Post sensitization data shows 90% faculty and students perceive that Mini-CEX will help improve the performance in final exams.



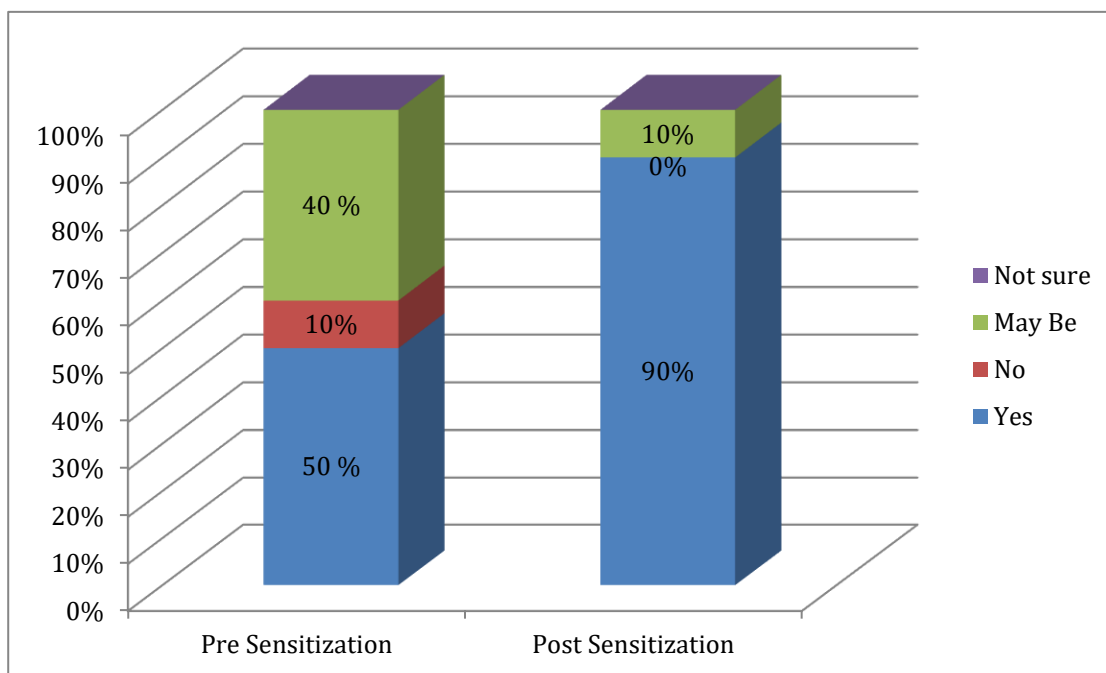


Fig.6- Frequency of responses [pre and post sensitization] about Mini CEX will help to improve performance in final exams

**Discussion:**

The common practice at our dental institutes is that whenever a trainee or postgraduate student examines a clinical case, it is not directly observed by faculty members. Secondly, conventional assessments have no provision for feedback, and even if feedback is provided, they are not based on direct observation. On the other hand, high-stakes assessments are conducted at the end of three years in an artificial setting and do not provide a true picture of students' competence in dealing with patients. Mini-CEX was developed by the American Board of Internal Medicine to assess medical residents in real-life settings. Mini-CEX is a 15-minute snapshot of doctor-patient interaction, designed to assess the clinical skills, attitudes, and behaviour essential to the provision of high-quality care. The assessment involves observing the trainee interacting with the patient in a clinical encounter [4, 5]. The core strength of the Mini-CEX as an assessment tool lies in its provision of immediate feedback related to the competencies being assessed by a knowledgeable assessor. Structured feedback makes this even more effective. Hattie stated that feedback has the single most important influence on learning [6, 7]. Providing feedback is not a common practice in dental education. Feedback is most effective when given to specific tasks. Eighty percent of trainees were never observed during their actual work, even during medical education [7]. A systematic literature review on assessment, feedback,

and physicians' clinical performance concluded that feedback can change physicians' clinical performance when provided systematically over multiple years by an authoritative, credible source [21]. We seem to be missing an important tool to improve the quality of learning, especially of clinical skills that are important from a future perspective. Routinely, the assessment is conducted at the end of a term or year in an artificial setting. The student is not observed during the process of history taking or physical examination, and the examiner is more concerned about the student's presentation than his/her clinical skills. Mini-CEX assesses the student while performing the clinical examination, thus conforming to the highest level, Does level [level 4] of Miller's pyramid. The implementation of workplace-based assessments is crucial because Competency-Based Dental Education is poised to bring about a paradigm shift in dental education in India. Mini-CEX is a reliable tool, and 6-8 encounters of Mini-CEX have shown to have a reliability of 0.83 or higher, which is greater than that of a long case or OSCE of the same duration [6, 7]. The General Dental Council, UK, recommends five Mini-CEX encounters per year to be satisfactory for prosthodontic specialty training [2]. In our study, we conducted six Mini-CEX encounters with all postgraduate students, thus making the observations reliable. Both the faculty members and students agreed that Mini-CEX helped initiate dialogue between the



trainee and the assessor. This reduces anxiety and ensures preparedness for the final examinations. The Mini-CEX format may produce less anxiety than conventional formats because the assessment is less formal and less dependent on a single, high-stakes encounter with one faculty member and patient. This will help students improve their performance during the final exams [5]. The increased percentage of perceived responses [from 50% prior to sensitization to 90% after completion of the study] confirms the findings of various previous studies. The assessor's evaluation was recorded on a structured checklist that enabled the provision of developmental verbal feedback to the trainee immediately. The use of this checklist reduces bias, identifies developmental points, and helps in commenting on specific behaviour [2]. As the interaction is of short duration, each trainee can be evaluated on several occasions compared to conventional examinations. Mini-CEX assesses trainees in diverse clinical situations, has better reproducibility, and offers trainees greater opportunities for instruction and feedback from different faculty members and with a variety of patients. The added advantages of Mini-CEX as an assessment tool are that it can be used in various clinical settings and a variety of clinical cases can be examined. Mini-CEX provides a practical solution within the workplace; no separate arrangements are needed. It is a low-expertise, low-resource-intensive method that does not require any special preparation<sup>7</sup>. However, the Mini-CEX may be more difficult to administer because multiple encounters must be scheduled for each trainee. All faculty members agreed that they required more commitment than conventional assessment methods. A study conducted by Batra et al. in the past also reported that 60% of faculty members felt that Mini-CEX required more effort than conventional methods [22]. Recent bibliometric analysis results reveal that, despite the implementation of Mini-CEX over two decades, evidence remains limited. The analysis showed that Mini-CEX was utilized in various settings in 38% of past studies, with a single setting of 16%. These findings highlight the necessity of applying Mini-CEX across multiple disciplines in dentistry [23].

## Conclusion

During post-graduation, the main challenge is to obtain a valid instrument to assess the "Does" level. Mini-CEX assesses the students during actual clinical encounter, at the "Does" level of Miller's pyramid. Mini-CEX gives better reflection of clinical competence than assessment done during a conventional examination setting. Effective use of feedback is not commonly seen in

dental education. Feedback given during the Mini-CEX also motivates students for further learning and can thus be used as an adjunct tool for formative assessment in Prosthodontics. Mini-CEX fills the lacunae of conventional assessment to a certain extent. Combined use of various Workplace Based Assessment methods can help in evaluating various competencies and prove beneficial for overall judgment of trainees. All assessors who participated in our study agreed that immediate feedback motivates students and improves their performance during the final examination. Direct observation while conducting clinical examinations also brought in a positive response. However, assessors opined that the process is time-consuming and required more commitment than the conventional methods. Despite these challenges, most assessors believe that Mini-CEX can effectively supplement conventional assessments. The Mini-Clinical Evaluation Exercise [Mini-CEX] has proven to be an effective tool in dental education, with all students reporting improvements in their communication skills and understanding of patient management. Most students found that Mini-CEX fostered dialogue with evaluators, enhanced exam performativity, and motivated further learning through immediate feedback. The presence of an assessor is widely regarded as beneficial, instilling confidence in students during clinical examinations. Initial apprehension about the Mini-CEX's effect during exam performativity was significantly reduced after the awareness session, with nearly all participants recognizing its benefits. Within the limitations of this study [including a small sample size and focus on a single discipline from one institute], we can conclude that immediate feedback following a Mini-clinical encounter effectively motivates learning. However, further studies in diverse settings are needed before the acceptability can be generalized.

## Mini –CEX and its applications in Dentistry.

The first step in arriving at a correct diagnosis and formulating a treatment plan is to record a proper case history and perform a thorough clinical examination. Most of the time, this important step is never observed by an assessor during a trainee's postgraduate tenure. Eventually, the result of a summative assessment bears a conventional tag of 'Pass' or 'Fail'. This kind of assessment ceases to give a true picture of the competence of students dealing with patients. Mini-CEX is a tool that involves direct observation while conducting oral examinations followed by a structured feedback, and has widespread application in dentistry, similar to medical sciences. In Prosthodontics, there is a



wide range of permutations and combinations across all specialties that can be assessed using Mini-CEX. Mini CEX can be conducted for patient who has edentulous arches or partially edentulous arch. Thorough examination of arch size, shape, occlusion, lateral throat form, palatal arch form, posterior palatal seal area, frenal attachments, type of mucosa, compressibility of mucosa, and evaluation of stress-bearing and stress-relieving areas can help students deliver optimum care for edentulous patients. In our study, as we included Siebert's classification of ridge defects and its relation to pontic design, all assessors agreed that student`s were quite confident at the end of the six encounters and that they were well versed with the classification of ridge defects. Selection of the abutment tooth can also be assessed with Mini-CEX. Attachment level, gingival architecture, tooth mobility, probing pocket depth, crown root ratio, and Ante's law are vital components in the selection of abutment teeth for FDP. A checklist can be made to assess these competencies and a Mini-CEX encounter can provide valuable learning experiences for students. The assessment of a failing tooth can be performed based on the guidelines of Kois[2004] on factors such as tooth position, gingival form, biotype, tooth shape, and position of the osseous crest. Assessment of an endodontic ally treated tooth can be done on amount of remaining tooth structure, ferrule, mobility, soft free gingival margin location, etc. Thus, Mini-CEX can assess a wide range of clinical scenarios in real clinical settings and can be extremely beneficial for students to gain expertise in carrying out clinical examinations in Prosthodontics.

#### Educational Impact:

- 1] Initial fear and apprehension about being observed by the faculty while conducting clinical examinations reduced gradually.
- 2] It is done during an actual patient encounter, and hence prepares the students to deal with patients in the future.
- 3] The faculty appreciated that Mini-CEX encounters provided a suitable platform for interaction with students.
- 4] Faculty members believe that Mini-CEX can be used for formative assessment in a variety of other clinical settings.
- 5] A change in attitudes toward learning was found.
- 6] Longitudinal view of progress of the trainee can be viewed /assessed.

#### Acknowledgement

We remain deeply indebted to Dr.Ashwini Karve ,Dr.Medha Joshi, Dr.Chinmay Shah for their valuable mentorship throughout the educational project.We also express heartfelt gratitude towards, Dr. Manoj Mittal,Principal, Bhabha College of Dental Sciences, Bhopal, Dr. Gourav Beohar, HOD [Prosthodontics] ,all the staff members and postgraduate students of the Department of Prosthodontics, Bhabha College of Dental Sciences, Bhopal for their unconditional support and cooperation throughout the conduct of this educational project .We also thank Dr.Mohammad Shammass for his valuable inputs in shaping the manuscript of this study and Dr.Vijayta Sharva for carrying out the Statistical Analysis. Additionally, we would like to thank Mrs. Smita Kalikar, Assistant Professor, SFS College, Nagpur, for her assistance with the manuscript's expert proofreading.

#### Conflict of Interest

None

#### References:

- 1.Pradnya K, Shivasakthy M. National Education Policy 2020 Compliant Multidisciplinary Education and Research Universities for Dental Education in India - A Road map. J Med Evid. 2022;3:10.4103/JME.JME\_107\_21.
- 2.Kalsi HK, Kalsi JS, Fisher NL. An explanation of workplace-based assessments in postgraduate dental training and a review of the current literature. Br Dent J. 2013;215[10]:519-524.  
<https://doi.org/10.1038/sj.bdj.2013.1098>.
- 3.Grieveson B, Kirton J, Palmer N, et al. Evaluation of workplace based assessment tools in dental foundation training. Br Dent J. 2011;211:E8.  
<https://doi.org/10.1038/sj.bdj.2011.681>.
- 4.Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. Med Teach. 2007;29[9-10]:855-871. doi:10.1080/01421590701775453.
- 5.Liu C. An introduction to workplace-based assessments. Gastroenterol Hepatol Bed Bench. 2012 Winter;5[1]:24-28.
- 6.Singh T, Modi JN. Workplace based assessment: a step to promote competency based postgraduate training. Indian Pediatr. 2013;50[6]:553-559. doi:10.1007/s13312-013-0164-3. PMID:23942397.
- 7.Singh T, Sharma M. Mini-clinical examination [CEX] as a tool for formative assessment. Natl Med J India. 2010;23:100-102.
- 8.Bock A, Peters F, Elvers D, et al. Introduction of Mini-clinical evaluation exercise in teaching dental radiology - A pilot study. Eur J Dent Educ. 2020 Nov;24[4]:695-705. doi:10.1111/eje.12558.



9. Holmboe ES, Huot S, Chung J, et al. Construct validity of the Mini-clinical evaluation exercise [MiniCEX]. *Acad Med.* 2003;78:826-830.
10. Chawla Jamenis S, Pharande S, Potnis S, Kapoor P. Use of Mini Clinical Evaluation Exercise as a Tool to Assess the Orthodontic Postgraduate Students. *J Indian Orthod Soc.* 2020;54:0301574219888041.
11. Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. *Med Teach.* 2007;29[9-10]:855-871. doi:10.1080/01421590701775453.
12. El-Kishawi M, Khalaf K, Al-Najjar D, Seraj Z, Al Kawas S. Rethinking Assessment Concepts in Dental Education. *Int J Dent.* 2020;2020:8672303. doi:10.1155/2020/8672303.
13. Behere R. Introduction of Mini-CEX in undergraduate dental education in India. *Educ Health.* 2014;27[3]:262-268. doi:10.4103/1357-6283.
14. Al-Jewair T, Kumar S. Review and application of the Mini-clinical evaluation exercise [Mini-CEX] in advanced orthodontic education: a pilot study. *J Dent Educ.* 2019;83[11]:1332-1338.
15. Rathod SR, Kolte A, Shori T, Kher V. Assessment of postgraduate dental students using Mini-clinical examination tool in periodontology and implantology. *J Indian Soc Periodontol.* 2017 Sep-Oct;21[5]:366-370. doi:10.4103/jisp.jisp\_293\_16.
16. Shepard LA. The role of assessment in a learning culture. *Educ Res.* 2000;29[7]:4-14. doi:10.3102/0013189X029007004.
17. Rafique S, Rafique H. Students' feedback on teaching and assessment at Nishtar Medical College, Multan. *J Pak Med Assoc.* 2013;63[9]:1205-1209.
18. Kearney S. Improving engagement: the use of "Authentic self-and peer-assessment for learning" to enhance the student learning experience. *Assess Eval High Educ.* 2013;38[7]:875-891. doi:10.1080/02602938.2012.751963.
19. Rezigalla AA, Eleragi AME, Elkhalfifa MI, Mohammed AMA. Comparison of student perception and exam validity, reliability and items difficulty: cross-sectional study. *Sudan J Med Sci.* 2020;15[2]:114-123.
20. Shammam M, Nagda S, Shah C, et al. An assessment of preclinical removable prosthodontics based on multiple-choice questions: Stakeholders' perceptions. *J Dent Educ.* 2024;1-11. <https://doi.org/10.1002/jdd.13462>.
21. Preston R, Gratani M, Owens K, Roche P, Zimanyi M, MalauAduli B. Exploring the impact of assessment on medical students' learning. *Assess Eval High Educ.* 2020;45[1]:109-124.
22. Batra P, Batra R, Verma N, Bokariya P, Garg S, Yadav S. Mini clinical evaluation exercise [Mini-CEX]: A tool for assessment of residents in department of surgery. *J Educ Health Promot.* 2022 Aug 25;11:253. doi:10.4103/jehp.jehp\_1600\_21.
23. Sharma R, Gupta T, Haidery TH, Sinha S, Kumar A. Current Trends in Mini-Clinical Evaluation Exercise in Medical Education: A Bibliometric Analysis. *Cureus.* 2022 Dec 30;14[12]:e33121. doi:10.7759/cureus.33121. PMID:36721606; PMCID:PMC9884390.