

Unveiling Potential: Using A Mixed-Methods Approach To Explore The Influence Of Mini-CEX-Associated Feedback On Students' OSCE Performance

Mahrukh Durrani¹, Riffat Shafi², Hareem Fatima³, Shazia Irum⁴, Muneeza Aamir Sami⁵

1. Associate Director PGME & CME, Shifa College of Medicine 2. Head of Department, Physiology, Shifa College of Medicine. 3. Senior Lecturer, Shifa College of Medicine. 4. Assistant Professor, Shifa College of Medicine. 5. Assistant Professor, Shifa College of Medicine.

Corresponding author: Dr Mahrukh Durrani, Mahrukh.md@gmail.com

Abstract

Objective: Objective Structured Clinical Examination (OSCE) and Mini-Clinical Evaluation Exercise (Mini-CEX) on a continuum allow for appropriate assessment of clinical skills. At Shifa College of Medicine (SCM) both assessment strategies are implemented. Mini-CEX-associated feedback is intended to help learners perform well during summative OSCE. This study was conducted to determine the interplay between mini-CEX and end-of-clerkship OSCE performance of fourth-year undergraduate medical students and to understand their perspectives regarding the effectiveness of feedback provided following mini-CEX encounters.

Methods: This cross-sectional study employed a Mixed-Methods approach. One Hundred fourth-year students, rotating through different clinical clerkships, were invited to participate. Survey responses and students' OSCE and mini-CEX were quantitatively analyzed using descriptive statistics and Pearson's coefficient. Thematic analysis of the comments on the survey and focus group discussions provided an in-depth understanding of the process.

Results: Survey analysis showed that respondents agreed with current practices of mini-CEX assessments and associated feedback and considered them suitable for appropriate learning and assessment. Statistical analysis revealed a significant positive correlation between two sets of scores. ($r = 0.692$). Thematic analysis of Focus group discussions provided insight into the process and external factors, i.e., resources, exam setting, duration, scheduling, scoring schemes, and preceptors, and their influence on the quality of the assessment activity, associated feedback, and its effectiveness on our learners' performances.

Conclusion: From this study, we gathered that mini-CEX has been an invaluable learning opportunity for our students. Its associated feedback positively impacted their academic performance. Moreover, it was concluded that the overall impact can be improved by training the faculty and students alike to provide and optimally utilize feedback.

Keywords: Feedback; Education, Medical, Undergraduate; Clinical Skills; Academic Performance; Cognitive abilities; Assessment, Educational Assessment, Examination

Introduction

Modern medical education, guided by fundamental educational theories, aims to produce lifelong, self-directed, empathetic professionals. To achieve their goals, all healthcare professionals require comprehensive knowledge, evidence-based training, sound research embedded in reflective practice, and social accountability to ensure the highest standards of healthcare services.¹ This study, conducted at Shifa College of Medicine (SCM), examined the evolving landscape of undergraduate medical education (UGME) in our local context. It focused on performance assessment strategies to holistically evaluate learners' knowledge, skills, and attitudes, ultimately shaping well-rounded healthcare practitioners.

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The CanMEDS framework, developed by the Royal College of Physicians and Surgeons of Canada, identifies seven essential roles for healthcare professionals: Medical Expert, Communicator, Collaborator, Manager, Health Advocate, Scholar, and Professional.² Recognized as a global standard, it provides a foundation for medical educators and decision-makers to design educational programs that train healthcare professionals with the skills needed to thrive in demanding environments. This includes training them to demonstrate swift clinical responses, master essential practical skills, and provide empathetic care to their patients.

In a dynamic hospital environment, learners encounter complex challenges as they balance the demands of providing high-quality patient care while fulfilling their administrative responsibilities simultaneously. To perform these diverse tasks effectively without compromising patient safety, learners must receive training tailored to such multifaceted demands. Performance assessments conducted in authentic work environments eliminate the artificiality of simulated tasks, enabling objective evaluations of both cognitive abilities and practical/clinical skills. These workplace-based assessments provide an opportunity to assess students, followed by feedback that aids in training them for the complexities of professional practice, thus equipping them to respond effectively to unexpected and emergent situations.³

Miller's pyramid proposed by George Miller,⁴ Forms the basis of modern medical education offering the opportunity to effectively incorporate various assessment tools according to the level of the learners. Medical examinations are traditionally knowledge-based tests. However, performance assessments provide a more holistic picture of students' learning as they focus on practical skills based on basic concepts. The World Federation of Medical Education (WFME) also recently revised a standards document that guides regulatory bodies to ensure uniform practices. They emphasized that all assessment practices must be well-designed to allow for formative and summative evaluations of students in all three domains i.e., Knowledge, skills, and attitude.⁵ Assessment tools like Objective Structured Clinical Examination (OSCE) and Workplace-Based assessments (WBAs) offer the opportunity for a well-rounded evaluation of students' learning and performance. OSCE is conducted to assess learners' clinical skills in a controlled environment with standardized or simulated patient interactions.⁶ The examination is designed across 14-18 observed, unobserved, technology-based, or linked stations to ensure optimal reliability.⁷ Mini-Clinical Evaluation Exercise (Mini-CEX) is part of WBAs, introduced by the American Board of Internal Medicine during which a trainee performs an assigned task under direct observation, followed by specific feedback and a future action plan. The specificity of feedback allows it to be used for formative purposes.^{8,9} The reliability and validity of this assessment strategy have been well-established⁹. Both OSCE and Mini-CEX can be used on a continuum to assess learners' attainment of clinical skills. This practice provides triangulated evidence that supports the final decision on students' progression to the next stage.¹⁰

OSCE is an appropriate assessment tool when the sole purpose is to assess the observable outcomes of performance skills. However, in clinical practice, the cognitive process that leads to these outcomes is as important, and thus assessment of competencies related to clinical reasoning, problem-solving, and information processing holds immense value in ensuring the training of competent professionals.¹¹ WBAs fulfil the requirement for improved training and assessments, as these are conducted in authentic, natural settings with an opportunity to provide immediate, specific feedback. This allows learners to focus on their weaknesses for improvements and hone their strengths.¹² WBAs, particularly mini-CEX, were initially developed for postgraduate education, but their utility in undergraduate education cannot be over-emphasized.¹³

A review conducted to evaluate the existing body of literature on the utilization, implementation, and implications of mini-CEX and OSCE as performance assessment tools revealed the widespread use of both assessment tools across different curricula. The literature review revealed research that probed into various aspects, including psychometric properties.^{14,15} Social and cultural influences,¹⁶ the impact of raters' training and various scoring methods e.g., checklists or subjective experience-based scoring systems,¹⁷ and feedback characteristics.^{18,19} Despite the widespread use of Mini-CEX and OSCE in local teaching hospitals, there is a lack of data exploring the relationship between these two assessment tools, particularly given their potential to be utilized on a continuum, where performance in one might be expected to influence the other. In Pakistan, this ongoing research has predominantly focused on acceptability and feasibility.^{20,21} Our primary aim was to understand students' perspectives on the interplay between OSCE and Mini-CEX while analyzing the influence of associated factors related to implementation and administrative strategies.

Limited data within Pakistan stresses the need for more research on the use of these assessment tools to foster innovations tailored to our local context for maximum benefits. After the introduction of Mini-CEX at SCM, a study,²⁰ Was conducted to analyze the impact of mini-CEX as a performance assessment tool. However, no study has since explored its role in enhancing students' clinical performance that is evaluated during end-of-clerkship summative OSCEs. With this study, we aimed to assess the value of this combined approach. Additionally, we sought to understand students' perceptions of the feedback provided after each Mini-CEX and their approach toward utilizing that feedback to improve clinical performance.

Materials And Methods

This study was conducted under ethical standards and principles. Institutional Review Board (IRB) and Ethics Committee approval was obtained prior to the commencement of the research (Reference number: IRB 0100-22). Informed consent was acquired from all participants involved in the study. The research was conducted with respect for participant privacy, confidentiality, and autonomy.

A cross-sectional study employing a Mixed-Methods approach was conducted at Shifa College of Medicine (SCM) during the academic year (May 22- November 22) after approval from the Institutional Review Board and Ethics Committee (Appendix A). Data were gathered through three sources employing non-probability convenience sampling. These included a survey administered to all participants, focus group discussions, and Students' scores (Mini-CEX and OSCE scores) obtained from the examination

department after due approvals (Appendix B). Written consent was obtained from all participants before survey administration and focus group discussions (Appendix C).

Survey Questionnaire

A 10-statement Likert-type survey was designed to align with study objectives and obtain students' perceptions of mini-CEX, its associated feedback practices, and its impact on learning (Appendix D). A peer review was carried out before the survey was piloted, and feedback was incorporated before final dissemination.

This survey focused on aspects including introduction and orientation to the assessment strategy and conduction process i.e., time allocation, duration, factors related to preceptors, and feedback characteristics. Responses were recorded on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree). The survey was administered to all students during orientation sessions for the study. Eighty-four completed forms were returned. Percentages of responses to each statement were calculated.

Focus Group Discussions:

The focus group discussions were semi-structured and guided by pertinent questions designed based on a comprehensive literature review and the study objectives (Appendix E). The focus group guide was developed according to AMEE guidelines²² To ensure clarity and alignment with the study aims. Three focus group sessions were conducted according to participants' availability, and all sessions were audio-recorded with prior consent. One observer took detailed notes in addition to the recordings to capture nuanced details during the discussions. These discussions provided a platform to explore the interplay between the two assessment strategies and the influence of external factors.

The primary investigator translated and transcribed the discussions verbatim. Data obtained through observers' notes, audio recordings, and transcriptions were triangulated to minimize researcher bias during thematic analysis. Codes were assigned to similar data units by the primary investigator and reviewed by a second researcher to ensure accuracy and consistency. These codes were subsequently grouped into categories to generate themes, ensuring that the analysis remained objective and reflective of the participants' perspectives.

Students' scores: Mini-CEX and OSCE:

Mini-CEX and OSCE scores of all students were obtained from the examination department of Shifa College of Medicine, after submission of a No Objection Certificate (NOC), (Appendix B).

Results:

All data was recorded and analyzed with SPSS version 26. Descriptive statistics were applied to survey responses and median, inter-quartile range, and percentages were calculated.

Data obtained during focus group discussions was transcribed and translated verbatim. Observers' notes were scrutinized to ensure credibility. Thematic analysis was conducted manually by first creating units from the transcription. Codes were generated and then clustered to create themes to understand the study results better.

Students' Scores data (mini-CEX and OSCE scores) were obtained from the examination department. The normality assumption of the data was fulfilled by using the one-sample Kolmogorov-Smirnov test. It was followed by determining the Pearson correlation (r) coefficient.

Survey Questionnaire

The calculated median and IQR was 4 (3-4). It was observed that most respondents agreed that current practices of mini-CEX assessments and associated feedback are suitable for appropriate learning and assessment. The observed percentile of responses falling within the "neutral" category in addition to "disagreements" was further explored via thematic analysis of FGDs.

Survey response percentages (Table 1) revealed that 60.71% (51/84) of respondents agreed the introduction of Mini-CEX assessments in the fourth year was adequate. However, satisfaction with resource allocation for Mini-CEX was lower, with only 51.19% (43/84) expressing agreement. Additionally, 59.52% (50/84) acknowledged that preceptors demonstrated encouraging and considerate behaviour during assessments.

Opinions on the effectiveness of feedback provided after Mini-CEX sessions were mixed. While 52.38% (44/84) agreed that feedback was effective and 70.24% (59/84) agreed that provided feedback helped clarify concepts, however, 25% (21/84) of respondents remained neutral, and 21.43% (18/84) disagreed. Despite this variability, 79.76% (67/84) recognized Mini-CEX as a valuable assessment tool in undergraduate medical education (UGME).

Notably, 76.19% (64/84) of respondents felt that Mini-CEX feedback enhanced their performance in summative OSCEs, and 67.06% (56/84) reported utilizing this feedback to improve future performances. These findings suggest a strong perceived connection between Mini-CEX feedback and overall academic development.

Students' scores: mini-CEX and OSCE:

To further refine our study findings and understand the impact of Mini-CEX assessments conducted during clerkships on end-of-clerkship OSCE performance, we analyzed the relationship between Mini-CEX and OSCE scores. For each student, the mean Mini-CEX and OSCE scores were calculated separately. Descriptive analysis showed a mean Mini-CEX score of 6.94 (SD 0.91) and a mean OSCE score of 48.12 (SD 5.77). Pearson's correlation coefficient ($r = 0.692$) revealed a significant positive correlation, indicating that strong performance in formative Mini-CEX assessments is associated with improved outcomes in subsequent summative OSCEs. This highlights the importance of purposefully designed assessments in enhancing students' overall performance. Figure 1 illustrates the clustering of students' Mini-CEX and OSCE scores, further demonstrating this association.

Table 1: Percentage of responses

Questions	Agreement %age	Neutral %age	Disagreement %age
Introduction to Mini-CEX provided at the beginning of 4th year MBBS is adequate	60.71	16.67	22.62
The number of mini-CEX encounters during 4th year of MBBS is sufficient	67.86	20.24	11.90
Duration of mini-CEX interactions is appropriate	71.43	14.29	14.29
Appropriate resources are available to conduct mini-CEX efficiently	51.19	23.81	22.62
Effective feedback is provided after every mini-CEX session	52.38	25.00	21.43
Mini-CEX is a useful assessment tool in UGME	79.76	10.71	8.33
The preceptors assigned are considerate and encouraging	59.52	27.38	13.10
Feedback provided helps to clarify concepts	70.24	21.43	7.14
Feedback provided during mini-CEX helps me perform better in summative OSCE	76.19	17.86	4.76
I have been able to utilize feedback to improve all my future performances	67.06	25.00	7.14

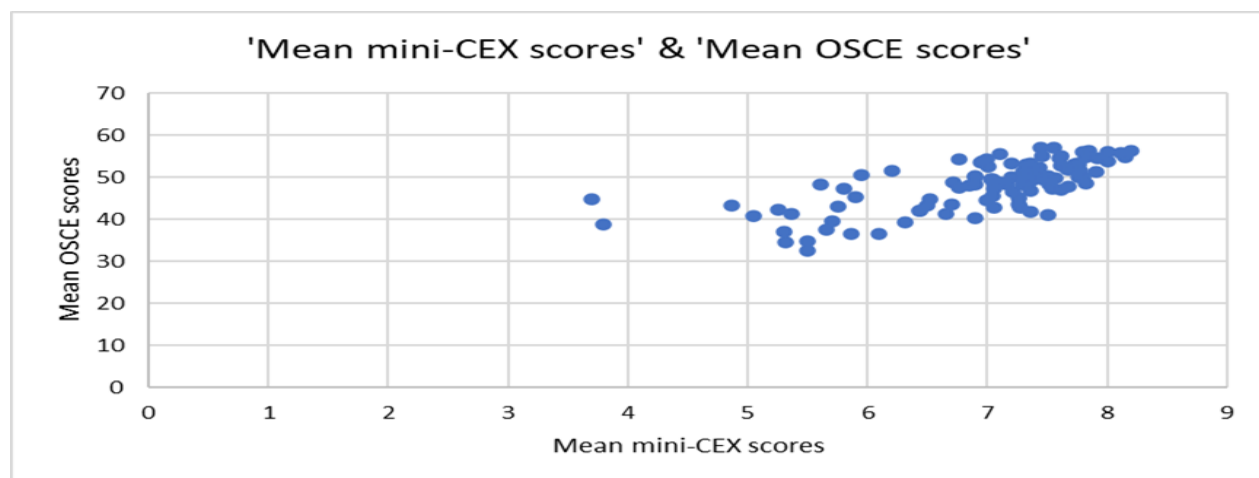


Figure 1: Scatter Plot showing clustering of data (Mini-CEX & OSCE scores)

Focus Group Discussions

Three focus group discussions were conducted to further explore the perceived relationship between Mini-CEX, OSCE and external factors. Tables 2a & b present four themes with codes and examples (Quotes).

The following themes were extracted:

1. Mini-CEX: Context Characteristics: This theme revolved around procedural aspects of Mini-CEX assessments, highlighting the importance of adaptability, relevance to clinical practice, and the impact of external factors on the quality of assessment activity.
2. Mini-CEX: Students' Perceptions: This theme reflected students' views on the effectiveness and challenges of Mini-CEX encounters, emphasizing its role in building confidence and fostering critical thinking. Students found mini-CEX-associated feedback helpful in identifying gaps in knowledge and skills.
3. Feedback: Context Characteristics: This theme focused on the nature and delivery of feedback in clinical settings, including its timing, specificity, action plan, and relevance, as well as direct observation by the preceptor. Students valued feedback that was immediate and actionable, linking it directly to their learning outcomes.
4. Feedback: Students' Perceptions: This theme highlighted how students interpret and utilize feedback to improve their performance. Comments revealed that constructive and detailed feedback enhanced their ability to apply theoretical knowledge in practical scenarios.

These themes show that students perceive Mini-CEX and feedback as integral tools for improving clinical competencies and adapting to real-life challenges. OSCE offers an opportunity to utilize the provided feedback, to improve and achieve required learning outcomes, thus strengthening the importance of implementing these performance assessment strategies on a continuum. Table 2a: Themes with codes and examples.

Table 2 a: Mini-CEX: Context Characteristics

Codes	Examples
Timings And Scheduling	“But even then, I think that the impact of feedback that comes a week before the exam lasts longer”. “So, in my opinion I would rather that if I start the rotation I do one mini-CEX at the first week and one mini-CEX in the last week or may be the second last week”
Duration	“For that they really need to give us 15 minutes”. “Because if you get such a small time slot, what can they even make you do in that duration”
Setting and Patient influx	“...it’s just too busy that quality can be assessed.” “Then over there a lot of things are happening at the same time.... so, I think we don’t get enough opportunity to learn there”.
Mapping of Learning objectives	“Then we should be given this option that whichever disease we have studied, our viva should be on it”. “This is one of the reasons for not studying, its excess... either the topic should be specified or the examination”
Level-appropriate case selection	“If you want me to perform a CVS examination on someone then pick someone who has TOF (tetralogy of Fallot) or something like that.” “Then a good preceptor should at least be able to know that this patient is at their level, at undergrad level”.
Mini-CEX: Students’ Perceptions	
Purpose of mini-CEX	“When we are halfway through our rotation, it’s a format to assess our learning so far.” “...to assess our ability of history taking and examination till then or how much we have learnt.”
Attitude of preceptors	“They are only interested in assessing our exams then moving on to either the next students or the next patient” “My preceptor really took the time And they gave very detailed feedback on history and examination also.”
Attitude of students	“I think at least for me I don’t even consider mini-CEX to be something very important.” “Particularly the best thing about it is that we get different kinds of examinations”
Interdepartmental variations	“There is lack of uniformity.” “But there are some departments who tell you the specifics.... on the rare occasion does happen but if it happened more frequently, as it should, then results ca be better.”
Inter-rater scoring differences	“...It will reduce overall impact of my examination on the examiner.” “Marking is an important part of our internal assessment.... If you are giving a mini-CEX and you are getting 2 or 3, that’s just unfair.”
Improvement suggestions	“There has to be some pool out of which they decide what questions to ask.” “I think, generally, all SRs teach us the examinations then they should take our mini-CEX as well.”

Medical education continues to evolve, particularly in teaching and assessment methodologies. The implementation of integrated curricula has bridged discipline-based boundaries, enhanced conceptual connections, and improved the retention and acquisition of clinical skills. Appropriate assessment strategies, such as knowledge and performance-based examinations including WBAs, play a crucial role in reinforcing these outcomes²³.

At SCM, Mini-CEX was introduced in 2009 as a clinical assessment tool for fourth- and final-year medical students during their clerkships. An observational and psychometric analysis conducted in 2011 demonstrated significant improvements in students’ performance during clinical rotations. Both faculty and students expressed satisfaction with this change at the time.²⁰ Building on this foundation, our study explored the interplay between Mini-CEX and OSCE assessments while also capturing students’ perceptions of the assessment strategy and the effectiveness of its associated feedback.

Mini-CEX: Context Characteristics

The data were analysed both quantitatively and qualitatively. Quantitative analysis of the survey revealed that more than sixty per cent of respondents agreed with the institutional practice of Mini-CEX assessments, indicating general satisfaction with its practice and implementation. However, discrepancies emerged regarding the duration of the assessments. While survey results showed a significant percentage of respondents were satisfied with the duration, interviews revealed dissatisfaction among participants. Students reported being asked to complete tasks within five minutes, contradicting the recommended 15-20 minutes

required for accurate assessment of competencies.²⁴ This insufficient duration limits the activity's effectiveness and fails to meet established guidelines.

Table 2b: Themes with codes and examples

Feedback: Context Characteristics	
Codes	Examples
Action plan	"...they don't go into specifics about what you should actually be doing." "If there is gap in knowledge then they tell you right away.... I mean they talk about the incorrect one, but they don't talk about the correct one." "In the past 3 mini-CEXs that I have given I never received specific feedback"
Identification of strengths and weaknesses	"I don't even know focusing on which areas exactly.... That's why I am unable to prioritize how I should improve my knowledge or skills." "But before that the only feedback I got was "very good job" "very good student" I don't know if they liked my history taking, or my examination"
Direct observation	"...I think as much as that one-on-one feedback that we should get, that is not so robust." "Then sometimes they make you do examination in front of them and other times you just tell what you examined"
Level of preceptor	"I will actually prefer all of our mini-CEXs with the consultants who don't teach us." "It makes a difference while giving it.... but I guess it doesn't make difference to feedback."
Inter-Preceptor differences	"The feedback that I got was so negative that it effected my mental health very negatively." "Either they tell us correct diagnosis right then or tell us correct management plan."
Feedback: Students' Perceptions	
Preceptors' expectations	"Expect that I will pick all the finding at the same time.... They expect so much from us." "But when consultant level or HOD level preceptors come, they expect more from us."
Required skills	"We have learnt region wise examination.... there and then I have to perform GPE, I have to do abdomen examination, I have to do chest auscultation at the same time." "When you have gone through that process of giving a mini-CEX or in some way, you have spent some time with them in an exam setting.... we understand that this is how they do it"
Impact on students' future academic/clinical performances	"...And we will take these habits with us when we become doctors." "That this station when I gave it during formative, I made these mistakes, and then in my summative OSCE, I knew that I shouldn't do this."
Students' approach towards preceptors and feedback	... you are very well tuned with all of your preceptors." "it's not just that how you should deal with the preceptor it's also that what you should be doing on that preceptor's station"
Impact of exam setting	"You are doing faster because you are in an exam setting, then you are going to miss out very important findings." "There is some simulation then overall stress level about OSCE, when you think about it, it decreases.... Either it diminishes or completely disappears"
Improvement suggestions	"Appreciation is important" "Basically, just focus more on the fact that they have to be taught they should learn it by the end"

Discussion

Participants also highlighted frequent misalignment between learning objectives and assigned tasks, which they felt hindered their performance and led to lower-than-expected scores. This observation aligns with a study from India that emphasized the importance of aligning assessment content with intended competencies to ensure adequate evaluations.²⁵ Misalignment between learning objectives and assessment activities may negatively influence outcomes.

Furthermore, participants noted that the complexity and relevance of selected cases were often linked to how well learning objectives were mapped. When preceptors selected cases according to learning objectives, students were exposed to diverse and complex presentations, including rare conditions, allowing them to identify positive findings thus enhancing their clinical skills. Conversely, when students selected their cases, they tended to choose familiar presentations, which limited their learning opportunities. This is consistent with findings from other studies, that suggested that preceptor-led case selection introduces diversity and varying levels of complexity, enriching the learning experience.^{16,26}

The qualitative analysis also revealed several external factors that influenced the effectiveness of Mini-CEX. Similar findings were reported in a study by Rogausch et al.,²⁷ Which identified that Mini-CEX assessment outcomes can be impacted by contextual factors in addition to students' skills. Despite these influences, our data showed a strong positive correlation ($r = 0.692$) between Mini-CEX and OSCE scores. This correlation may reflect the cumulative benefits of repeated exposure to assessments conducted

by different examiners. Such repetition allows students to practice and refine desired skills, while repeated, specific feedback from preceptors reinforces knowledge retention. These findings align with previous studies emphasizing the role of repetitive assessments and feedback in fostering skill mastery and improving outcomes in medical education.^{28,29}

Feedback: Context Characteristics

Feedback is a mandatory component of mini-CEX activity. We explored the impact of feedback provided within our institute. While 52.38% of survey respondents agreed that feedback was effective, qualitative findings revealed gaps in its quality. Participants shared that feedback often lacked specific details and actionable guidance, limiting its utility. Students emphasized that effective feedback should address both strengths and weaknesses while providing clear recommendations for further learning. This aligns with findings from previous studies, which highlighted that feedback is most valuable when it includes corrective measures after a weak performance, improves motivation, and promotes self-reflection.^{30,31} Participants noted that inadequate feedback diminished the perceived value of Mini-CEX, particularly when the lack of direct observation led to generic and unhelpful insights. Some students in our study expressed frustration, viewing Mini-CEX as a mere formality rather than a meaningful learning opportunity, citing superficial feedback as a key issue. This, in turn, reduced their engagement with the process. The literature supports these findings, highlighting that direct observation is crucial for delivering impactful feedback, as it fosters trust between students and preceptors and allows for personalized performance evaluations.^{32,33}

The hierarchical teacher-student relationship in our local context further influenced the feedback process. Students reported feeling hesitant and anxious around senior faculty members, which affected their performance. However, junior faculty members were often perceived as more approachable and provided more detailed feedback, which participants found helpful. This observation aligns with studies in similar cultural contexts, such as China, where preceptor-student dynamics significantly influenced the perceived utility of assessment activities.³⁴ Analysis also revealed that impact and acceptance of feedback varied depending on the perceived credibility of the preceptor, which students associated with the level of trust they experienced. Our findings highlight the importance of regular preceptor training to improve feedback quality during Mini-CEX. Such training can ensure that feedback is task-specific, actionable, and motivating, effectively addressing students' learning needs. This approach is supported by literature, which emphasizes that well-trained preceptors are better equipped to provide detailed and constructive feedback, ultimately fostering student growth and confidence.³⁵

Students' Perceptions: Mini-CEX and Feedback

Discussion regarding students' experiences of mini-CEX revealed that they understood the process, but the purpose of assessments remained unclear. Participants noted that some preceptors approached Mini-CEX as a formal requirement for internal assessments, overlooking the importance of detailed feedback and its role in training. This indifference led students to view Mini-CEX as a formality, prioritizing passing the assessment over achieving meaningful learning outcomes. Preceptors must recognize that assessments like Mini-CEX are extensions of teaching, not merely scoring activities.³⁶ Mini-CEX has been implemented across many disciplines for formative purposes on a continuum with OSCE which is used for summative assessments. Their value and impact in enhanced multiple folds when the purpose and their utility are understood clearly.

Traditional methods lacked direct observation and feedback opportunities and focused mainly on the outcomes, whereas strategies like mini-CEX and other WBAs evaluated the process of attaining the required learning objectives. When conducted effectively, it motivates learners, builds self-efficacy, and enhances confidence in their abilities.³⁷ Discussions revealed significant variability in how different departments conducted Mini-CEX. Practices ranged from well-organized processes, with clear communication of competencies, learning objectives, desired outcomes, and assigned preceptors, to less structured or "topsy-turvy" approaches, as described by participants. These inconsistencies in inter-departmental practices were identified as a major factor contributing to the less-than-expected benefits of Mini-CEX. To ensure the effectiveness of the assessment, all assessors must understand the purpose and requirements of the assessment activity, and the competencies being evaluated while adhering to established standards during Mini-CEX interactions.

The attitude of both preceptors and students towards the assessment activity was also found to significantly impact the quality of feedback. Encouraging behaviours by preceptors motivated students to engage with feedback and improve their learning. In contrast, critical feedback delivered without acknowledging strengths or a discouraging attitude negatively affected students' perception of the activity and their approach to feedback.

Providing and receiving feedback is a skill that requires development in both teachers and learners. Teachers must view feedback as an extension of their teaching responsibilities, not merely an evaluative task. Faculty development programs are essential to equip preceptors with the skills to deliver constructive, motivating, and actionable feedback. Similarly, learners must recognize feedback as an opportunity for improvement and focus on its content rather than its delivery.³⁸ Active participation from both students and preceptors in feedback discussions fosters collaboration, addressing weaknesses while reinforcing strengths. This engagement ensures student ownership of the process, with continued self-reflection and feedback streamlining their learning journey. According to the literature, the quality of the assessment and responsiveness of the examinees impact the quality of assessment activity immensely. Proper conduction of the assessment activity, with thoroughly detailed feedback, motivates learners to participate equally. This deeper engagement of learners improves outcomes.¹⁹

Another critical, well-researched aspect of mini-CEX assessments is inter-rater scoring variations. According to available literature, this difference in scoring among preceptors also influenced students' approach towards mini-CEX.^{13,14} Junior faculty members were often perceived as stricter than senior faculty, which participants attributed to the greater accountability expected of them. This variability sometimes led to skewed results, as students were not always assigned to the same preceptors. During the discussion, students noted that the feedback they received often reflected assessors' varying expectations, influenced by their understanding of the purpose of the assessment. However, For Mini-CEX to be effective, assessments should align with students'

current level of attainment of learning objectives. These variations in assessors' approaches sometimes resulted in differences in scoring and generic feedback, less aligned with specific learning needs. They also shared that to improve their scores, they sometimes prepared for mini-CEX according to the requirements of their assigned preceptors. They focused more on examiners' expectations than their educational needs. They explained that when preceptors demonstrated a clear understanding of the assessment's objectives and purpose, it motivated them to prepare thoroughly, enhancing the overall learning experience. Conversely, when assessors lacked clarity or consistency in their approach, students prioritized meeting immediate expectations over addressing their broader learning goals, an aspect supported by another study.³⁸

Clinical teaching and assessments like Mini-CEX are inherently dynamic and often lack continuity due to the varied involvement of clinicians. Participants noted that factors such as scoring differences, preceptors' expectations, and inconsistent approaches occasionally impacted outcomes. Despite these challenges, the overall impact of Mini-CEX has been significant, demonstrated by its strong positive correlation ($r = 0.692$) with OSCE scores. This success was largely attributed to repeated patient interactions, which helped reduce anxiety in exam settings, along with the benefits of direct observation and immediate, specific feedback.

In summary, while feedback remains a cornerstone of Mini-CEX and other WBAs, its effectiveness relies on key factors such as direct observation, preceptor credibility, and the quality of the teacher-student relationship. Addressing these factors through faculty training and fostering a supportive learning environment can enhance the utility of Mini-CEX as a formative assessment tool leading to improved outcomes for students in summative OSCE performances, as well as clinical practices.

Conclusion

With this study, the experiences of students with mini-CEX as an assessment strategy were explored. Our students perceived it as a learning opportunity rather than a mere assessment. This enhanced importance is attributed to the in-built feedback mechanism, which significantly influences future performances. However, some external factors influenced the assessment activity and its associated feedback. These included organizational procedures of scheduling, timing, duration, individual assessor practices of conducting the examination, marking approaches, and feedback provision practices. Our study has revealed a strong interplay between students' performance during mini-CEX and OSCE. Further process refinement requires continued faculty development for properly conducting assessments, training to design performance assessment strategies on a continuum to benefit students even more and training students to receive and utilize feedback effectively. It is essential to emphasize these assessment strategies' strong complementary nature. Once their purpose is clearly defined, there can be a lasting impact on student's clinical competence during performance assessments and lifelong professional practices.

Limitations and Strengths

The mixed-methods design was a strength of the study, allowing for in-depth data analysis. This study provides deeper insight into influencing factors for future improvements and provides evidence supporting the continued use of these assessment strategies in our setup. To better understand the results, studies from the past 10 years were included to analyze and compare them with those of the current study. This allowed a better understanding of results that may be generalized.

However, we acknowledge that time restriction may have been a limitation. In addition, only students' perceptions regarding mini-CEX and feedback practices were obtained. For future research, assessors' perceptions must be included. It is a single institute study; generalization may be limited to other setups with different assessment systems.

Future Research

Focused, targeted research is essential to deepen our understanding of the critical components that influence the effectiveness of Mini-CEX and feedback in the local context. Such studies should explore key factors, including the alignment of assessments with learning objectives, the impact of preceptor-student dynamics, and the role of local and cultural challenges. By addressing these areas, future research can provide actionable insights to optimize the implementation of performance assessment tools and enhance feedback practices, ultimately improving learning outcomes in clinical education.

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Conflict of interest:

The authors declare no conflict of interest.

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M.D, R.S - Conception of study

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