

# Task-based Online Module in Medical Education Technology for Postgraduate Residents: A Mixed-methods Educational Intervention Study

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## ABSTRACT

**Introduction:** Competency-based Medical Education (CBME) mandates postgraduate residents to acquire pedagogic competencies such as teaching skills, assessment literacy, reflective practice, and leadership. Structured, task-based Medical Education Technology (MET) modules delivered through digital platforms may enhance motivation and applied educational skills; however, evidence from Indian postgraduate settings remains limited.

**Aim:** To design, implement and evaluate a structured online MET module for postgraduate residents and assess its feasibility, engagement, motivational impact and development of selected pedagogic skills.

**Materials and Methods:** This mixed-method, descriptive educational intervention study was conducted at Burdawan Medical College and Hospital, West Bengal, India, from March 2025 to August 2025. The MET module was developed by six faculty members trained in medical education, representing the Departments of Physiology, Community Medicine, and the Medical Education Unit. To facilitate feasibility of intervention and interaction, participants were divided into three groups (Group A: 43, Group B: 44, Group C: 43) to facilitate moderated discussions. A one-month asynchronous MET module comprising four threads and eight tasks was implemented for postgraduate residents across clinical and non clinical departments. Of 145 enrolled residents, 130 completed the module (clinical: 94; non clinical:

36). Quantitative data were collected using a structured, pre- and post intervention motivation scale, task completion records and punctuality metrics, while qualitative data were obtained from reflective submissions and Focus Group Discussions (FGD). Quantitative data were analysed using paired t-tests, with p-value <0.05 considered statistically significant. Qualitative data underwent thematic analysis.

**Results:** Of the 145 residents enrolled, 130 (89%) completed all assigned tasks, and among these, 118 (91%) submitted their work within the stipulated timelines. Participation remained consistent across all four weeks, with slightly higher engagement among non clinical residents. Optional face-to-face Objective Structured Clinical Examination/Objective Structured Practical Examination (OSCE/OSPE) sessions were attended by 98/130 participants (75%). Critical reflection beyond descriptive levels was demonstrated by >90% of submissions, while 109/130 (84%) of OSCE/OSPE stations were competency-aligned. Mean motivation scores showed a statistically significant improvement across all domains, including CBME awareness, reflective practice, assessment confidence and self-directed learning (p-value <0.001).

**Conclusion:** The structured online MET module demonstrated high feasibility, engagement, and significant improvement in motivation and applied pedagogic competencies among postgraduate residents. This task-based, asynchronous model offers a scalable and replicable framework for strengthening CBME implementation in postgraduate medical education.

**Keywords:** Competency-based education, Educational technology, Motivation, Postgraduate medical training, Reflective practice

## INTRODUCTION

Medical education has undergone a paradigm shift globally with the adoption of CBME, which emphasises learner-centered strategies, measurable outcomes, and integration of adult learning principles [1]. Competency frameworks developed by the World Federation for Medical Education (WFME) and similar bodies highlight not only clinical skills but also reflective practice, self-directed learning, and lifelong professional development as critical outcomes [2].

In India, the National Medical Commission (NMC) has mandated and operationalised CBME across undergraduate and postgraduate programs, underscoring the need for structured teaching, skill-based assessments, and continuous feedback to prepare graduates for complex healthcare environments [3]. This reform demands innovative instructional strategies and robust educational tools to complement traditional apprenticeship-based training, which often falls short in ensuring measurable competency development [4].

The MET, which includes e-learning platforms, task-based learning, digital logbooks, and structured online modules, has become a key facilitator of CBME. Systematic reviews show that blended and technology-enhanced learning approaches notably improve knowledge acquisition, learner engagement, and clinical reasoning compared to traditional methods [5-8]. For postgraduate residents, in particular, MET interventions can support flexible, self-paced, and reflective learning, helping them manage educational requirements alongside demanding clinical duties [9].

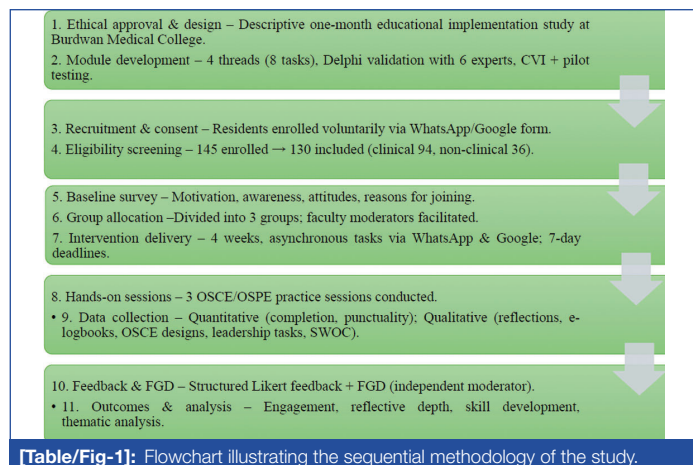
Recent studies have also emphasised the value of structured reflection and objective assessment tools in postgraduate training. Reflection-based modules have been shown to enhance critical thinking, performance, and self-assessment accuracy in surgical residents, while validated logbook and rubric-based assessments promote accountability and measurable progress [10-12]. Despite these benefits, participation of residents in additional educational activities in India is often constrained by

heavy clinical workload, limited resources and lack of Institutional support.

Feasible and accessible models are therefore essential. Online, task-based modules that are asynchronous, structured in weekly regular threads, and supported by curated and appropriate resources offer a practical solution by allowing engagement anytime, anywhere, without disrupting routine responsibilities. However, there is very limited published evidence from India evaluating such structured, task-based MET interventions for postgraduate residents across multiple specialities. Most Indian studies to date have focused on undergraduate education or faculty development, leaving a critical gap in postgraduate training, except for in a few Institutions in India. Hence, the present study aimed to design, implement and evaluate a structured online MET module for postgraduate residents in a multi-speciality medical college in Eastern India and to assess its feasibility, engagement, motivational impact and development of selected pedagogic skills.

## MATERIALS AND METHODS

This study was a mixed-method, descriptive educational intervention study conducted at Burdwan Medical College and Hospital, West Bengal, India, from March 2025 to August 2025. The intervention consisted of a structured, asynchronous online MET module delivered over a period of one month. The MET module was developed by six faculty members trained in medical education, representing the Departments of Physiology, Community Medicine, and the Medical Education Unit. Ethical approval was obtained from the Institutional Ethics Committee of Burdwan Medical College and Hospital (IEC No: BMC /IEC/481, dated 20 March 2025). Participation was voluntary, and written informed consent was obtained electronically from all participants before enrolment. The sequential methodology of the study, including module development, is illustrated in [Table/Fig-1].



[Table/Fig-1]: Flowchart illustrating the sequential methodology of the study.

### Inclusion criteria:

- Postgraduate residents from clinical and non clinical departments (Phase 1, Phase 2 and Phase 3 disciplines as per NMC classification);
- Residents willing to participate voluntarily and able to dedicate a minimum of two hours per day for module-related activities.

### Exclusion criteria:

- Residents unwilling to provide informed consent;
- Residents unable to commit to the required time for task completion;
- Residents who failed to complete one or more tasks during the intervention period.

### Study Procedure

The faculty members had 8-20 years of teaching experience and prior exposure to CBME implementation. Module development

followed a two-round Delphi technique. In the first round, experts proposed learning objectives, tasks and resources aligned with CBME guidelines and adult learning principles [3]. In the second round, the refined module was reviewed for clarity, relevance, and alignment with learning outcomes. Consensus was defined as  $\geq 80\%$  agreement.

Content validity was assessed using the Content Validity Index (CVI), which yielded a scale-level CVI of 0.89. Face validity of the module was assessed through pilot testing with five postgraduate residents, selected by convenience from departments not included in the main study, to avoid contamination of the study sample. These residents were chosen to represent both clinical and non clinical disciplines and different phases of postgraduate training. Feedback during pilot testing was collected using a structured written format, which included items related to clarity of instructions, relevance of tasks, perceived workload, feasibility within routine duty schedules, and overall comprehensibility of the module. Suggestions provided by the pilot participants were reviewed by the faculty team and minor modifications were made to task wording and sequencing before final implementation. The internal consistency of the motivation questionnaire used in the study demonstrated a Cronbach's alpha of 0.82.

No sampling technique was employed, as all postgraduate residents at the Institution were invited to participate through an open Institutional WhatsApp invitation and enrollment was entirely voluntary. Out of approximately 402 postgraduate residents enrolled, 145 residents voluntarily registered for the MET module following an open invitation circulated through official academic WhatsApp groups. As this was an educational implementation study, formal sample size calculation was not performed.

Of the 145 residents enrolled, 15 were excluded due to incomplete task submission, and data from 130 residents (clinical: 94; non clinical: 36) were included in the final analysis. To facilitate feasibility of intervention and interaction, participants were divided into three groups (Group A: 43, Group B: 44, Group C: 43) to facilitate moderated discussions. The module was conducted through WhatsApp and Google Groups. Each participant was required to submit their responses individually through designated Google links, ensuring accountability and personal engagement. Faculty moderators verified the authenticity of submissions and ensured that the task reflected the residents' own effort. Faculty moderators monitored the discussions, clarified queries, and encouraged constructive exchanges to enrich the overall learning experience.

The intervention consisted of a structured online training module in MET. Participants were engaged through four weekly threads, each comprising two tasks (a total of eight tasks across the one-month duration). The design emphasised asynchronous, task-based learning, with curated study resources provided alongside each task. Participants were required to submit responses within seven days of task allocation [Table/Fig-2].

### Thread 1: Small-group teaching and competency-based curriculum

In the first week, the learning objectives were to help residents analyse small-group teaching methods, understand group dynamics and design competency-based learning objectives linked to appropriate teaching and assessment strategies. Participants reflected on departmental teaching practices, examined the role of group processes, and developed one competency-based objective. Study materials included Gibbs' Reflective Cycle, presentations on group dynamics and innovative methods for small-group learning, available via shared Google links.

### Thread 2: Reflection and educational alignment

The second week emphasised reflection and educational alignment. The objectives were to strengthen participants' reflective writing

Thread number	Tasks given to the postgraduate residents	Links provided for study/reference
1.	<ol style="list-style-type: none"> <li>1. Reflect on the teaching and learning sessions in your department and explain the methods of small-group teaching used in these sessions and how group dynamics develop during this process. (Write within 200 words).</li> <li>2. NMC implemented a Competency-Based Medical Education (CBME) in 2019. Please state a competency of your discipline that you feel the MBBS students must learn and enumerate the objectives, teaching-learning methods, and assessment tools for the same competency with justification. (Within 200 words)</li> </ol>	<p><a href="https://drive.google.com/file/d/1wsRtMQ3EdkBwnbvBKEqgDAxyACe0gx4O/view?usp=sharing">https://drive.google.com/file/d/1wsRtMQ3EdkBwnbvBKEqgDAxyACe0gx4O/view?usp=sharing</a></p> <p><a href="https://docs.google.com/presentation/d/1Ct3HwjmvqNQrapLyZLu2_kqUluJRtu13/edit?usp=sharing&amp;ouid=116598672927475049399&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1Ct3HwjmvqNQrapLyZLu2_kqUluJRtu13/edit?usp=sharing&amp;ouid=116598672927475049399&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/12KgshkyP6nxvosWlVMQ6KqP_AkKTC-I5/edit?usp=sharing&amp;ouid=116598672927475049399&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/12KgshkyP6nxvosWlVMQ6KqP_AkKTC-I5/edit?usp=sharing&amp;ouid=116598672927475049399&amp;rtopf=true&amp;sd=true</a></p>
2.	<ol style="list-style-type: none"> <li>1. Reflect on the learning experience you had in these two threads: What happened? So, what? What next?</li> <li>2. You know that NMC has introduced E-logbooks. Please prepare a plan for an E-Logbook (1 week) for your department: Mention the objectives, contents, reflections, teaching-learning activities, and assessment strategies.</li> </ol>	<p><a href="https://docs.google.com/presentation/d/1MaLt_9_IR_1z4GkuNE6J_PSnf-5Wur52/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1MaLt_9_IR_1z4GkuNE6J_PSnf-5Wur52/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/1niGcwBQ6QqknkTz7mAphVJZZ50suR0ZQ/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1niGcwBQ6QqknkTz7mAphVJZZ50suR0ZQ/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/1uknG_JRo7chIXqE7KHL014wV7nRL0np3/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1uknG_JRo7chIXqE7KHL014wV7nRL0np3/edit?usp=sharing&amp;ouid=113669648917399942142&amp;rtopf=true&amp;sd=true</a></p>
3.	<ol style="list-style-type: none"> <li>1. CBME came into practice in India in 2019. Reflect on the assessment practices of your department and suggest methods to improve them. Add a note on the feedback strategies followed.</li> <li>2. Please go through the PDF document attached to this thread and prepare OSCE or OSPE stations for a summative assessment of your department. Please prepare a rubric to assess the same.</li> </ol>	<p><a href="https://docs.google.com/presentation/d/1Qc3qOe365r5tBSfGy5LM0MdnQWWPrhsQ/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1Qc3qOe365r5tBSfGy5LM0MdnQWWPrhsQ/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/1kX4NBWvyi7gqzTd473BfMx4e61AxvF0/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1kX4NBWvyi7gqzTd473BfMx4e61AxvF0/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/1buk9XVlkyOerhafDa6TJG-tC-XQ_Wwhd/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1buk9XVlkyOerhafDa6TJG-tC-XQ_Wwhd/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true</a></p>
4.	<ol style="list-style-type: none"> <li>1. You have been asked to teach Leadership skills as an elective to MBBS students. Please prepare a module that the students will complete in 15 days.</li> <li>2. You all have been going through a new learning experience over the last month. Prepare a Strengths, Weaknesses, Opportunities, and Challenges (SWOC) of this learning experience within 500 words</li> </ol>	<p><a href="https://docs.google.com/presentation/d/1-qVzzAhsvDbbY5GiqVBSjpkYxr1t5HMW/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1-qVzzAhsvDbbY5GiqVBSjpkYxr1t5HMW/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true</a></p> <p><a href="https://docs.google.com/presentation/d/1NKJ7M3YJJqs8XkEizgJmD9v9GIYohhf/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true">https://docs.google.com/presentation/d/1NKJ7M3YJJqs8XkEizgJmD9v9GIYohhf/edit?usp=sharing&amp;ouid=101558641574206940017&amp;rtopf=true&amp;sd=true</a></p>

**[Table/Fig-2]:** Summary of the tasks assigned to postgraduate residents during the four-week Medical Education Technology (MET) module, along with the corresponding reference materials and study resources provided to support task completion.

skills using the “What? So what? What next?” framework and to build capacity in designing an electronic departmental logbook. This framework was chosen because it is concise, easy to apply, and promotes higher-order thinking by guiding learners from description (What?) to interpretation (So what?) and application (What next?). Its simplicity makes it particularly suitable for postgraduate residents with limited time, while still ensuring critical appraisal of experiences and translation into future practice.

Residents developed logbook plans specifying objectives, contents, teaching-learning activities, reflections, and assessment strategies. Resources included presentations on learning objectives, educational theories, and constructive alignment [Table/Fig-3].

### Thread 3: Assessment Practices and OSCE/OSPE Design

In the third week, the focus shifted to assessment practices and the design of objective structured stations. The objectives were to enable residents to critically examine departmental assessment approaches, reflect on feedback methods, and design OSCE/OSPE stations aligned with CBME competencies. Residents also developed rubrics for evaluation to promote reliability and

objectivity. Supporting study materials consisted of presentations on assessment strategies and rubric development.

In addition to the online activities, three face-to-face sessions were organised for hands-on training in OSCE/OSPE. These sessions were arranged in response to participant requests for practical exposure and allowed residents to directly practice station design, checklist preparation, and structured evaluation under faculty supervision. The offline component complemented the online module by reinforcing psychomotor and practical aspects of assessment that are best experienced in a simulated environment.

### Thread 4: Leadership and SWOC Analysis

The final week addressed leadership and reflective appraisal. The objectives were to prepare residents to design a short elective module on leadership for undergraduate students and to critically appraise their own learning through a SWOC analysis of the one-month MET module. Participants submitted their elective design and SWOC reflections, supported by study materials on curriculum planning and leadership in medical education [Table/Fig-4].

What happened?	So what?	What next?
Residents engaged in small-group teaching reflections and competency framing	Shift from passive learning to active pedagogical awareness	Incorporate structured small-group methods regularly in departments
Participants used Gibbs and Kolb frameworks for reflective writing	Over 90% produced critical rather than descriptive reflections	Institutionalise reflective practice as part of postgraduate training
Residents designed e-logbooks and OSCE/OSPE stations	82% e-logbooks comprehensive; 84% OSCE stations competency-aligned	Standardise rubrics and expand use in formative assessments
Leadership elective design introduced modules for UG students	76% included communication and teamwork training	Pilot electives and integrate into CBME curriculum
Strengths, Weaknesses, Opportunities, and Challenges (SWOC) reflections highlighted flexibility and peer learning	Participants appreciated accountability and collaborative spirit	Use SWOC regularly as a tool for evaluating teaching innovations

**[Table/Fig-3]:** Structured reflection outcomes across module threads.

Strengths	Weaknesses	Opportunities	Challenges
Asynchronous flexibility allowed residents to learn despite clinical workload	Limited infrastructure and internet issues	Potential integration of module into CBME curriculum across Institutions	Lack of protected time for academics
High task completion and punctuality rates (>85%)	Slight decline in engagement in later weeks	Opportunity to create multi-Institutional collaborative modules	Variable departmental support for innovative teaching
Peer-assisted learning promoted accountability and cross-learning	Workload perceived as high by some residents	Scope for hybrid model combining online and offline OSCE/OSPE sessions	Sustaining momentum without continuous faculty facilitation
Development of reflective practice, leadership, and assessment skills	Need for more standardised rubrics and feedback methods	Digital expansion through e-logbooks, mobile apps, micro-learning	Self-selection bias may limit generalisability

**[Table/Fig-4]:** SWOC analysis of the MET intervention.

### Motivation and Feedback

Before the start of the module, residents completed a short questionnaire to assess their awareness, attitudes and motivation towards MET. This included self-assessed gaps, learning preferences, and perceived relevance.

At the end of the intervention, structured feedback was collected from all participants regarding the content, delivery, workload, relevance and applicability of the tasks and study materials. Feedback was used to evaluate participant satisfaction and perceived utility of the MET module.

### Focus Group Discussion (FGD)

A FGD was organised at the end of the module with a purposive sample of 10-12 residents from different phases, along with six senior residents. Senior residents were included to provide an external, experience-based perspective on the design and feasibility of the module, and to comment on its potential utility in departmental teaching. Their broader clinical and academic exposure enabled critical reflections on the strengths, challenges, and applicability of the MET intervention. The FGD was moderated by a faculty member not directly involved in module delivery to minimise bias, and the discussions were thematically analysed to supplement the survey-based findings.

### Data Collection

Both quantitative and qualitative data were collected. Quantitative data included task completion rates and punctuality of submissions,

while qualitative data comprised reflective writings, E-logbook models, OSCE/OSPE designs, leadership modules, and SWOC analyses. All responses were anonymised prior to analysis.

### Outcome Measures

The primary outcomes were engagement and compliance with the program, which were measured by timely task completion, reflective and applied learning, which was assessed through participant responses, and skill development, from the quality of task outputs such as OSCE stations and E-logbooks.

Participants' motivation and perceptions related to CBME were assessed using a structured, self-administered questionnaire developed by the authors for the purpose of this study. The questionnaire consisted of five items, each mapped to key domains including awareness of CBME principles, perceived usefulness of reflective writing, confidence in assessment design (OSCE/OSPE), motivation for self-directed learning, and willingness to apply CBME-based approaches in future teaching practice. Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated greater agreement and higher perceived motivation. The internal consistency of the questionnaire was found to be acceptable, with a Cronbach's alpha of 0.82.

### STATISTICAL ANALYSIS

The data was analysed using Statistical Package for Social Sciences (SPSS) version 26.0, which was used for statistical evaluation. Quantitative data were analysed using paired t-tests, with p-value <0.05 considered statistically significant. Qualitative data underwent thematic analysis.

### RESULTS

Of approximately 402 postgraduate residents undergoing training at the Institution during the study period, 145 residents voluntarily enrolled in the MET module. After exclusion of 15 residents due to incomplete task submission, data from 130 postgraduate residents were included in the final analysis. The final cohort comprised 94 (72.3%) residents from clinical departments and 36 (27.7%) from non clinical departments [Table/Fig-5].

Variables	Category	Participants, (n) %
Department type	Clinical	94 (72.3)
	Non clinical	36 (27.7)
Year of postgraduate training	First year	37 (28.5)
	Second year	64 (49.2)
	Third year	29 (22.3)
Phase of discipline (NMC classification)	Phase 1	19 (14.6)
	Phase 2	17 (13.1)
	Phase 3	94 (72.3)
Total participants		130 (100)

**[Table/Fig-5]:** Demographic and academic profile of postgraduate residents participating in the MET module.

Overall engagement with the MET module was high. Of the 145 enrolled residents, 130 (89%) completed all assigned tasks. Among those who completed the module, 91% (118/130) submitted their tasks within the stipulated timelines. Completion rates were marginally higher among residents from non clinical departments (92%) compared to clinical departments (87%); however, this difference was not statistically significant. Weekly completion rates showed a gradual decline over the duration of the module, with completion rates of 96% in week 1, 94% in week 2, 88% in week 3 and 85% in week 4.

Although the MET module was designed as an asynchronous online intervention, optional face-to-face OSCE/OSPE practice sessions

were conducted. Of the 130 participants, 98 (75.4%) attended at least one session and 32 (24.6%) attended all three sessions.

Analysis of task outputs showed improvements across multiple pedagogic domains. Critical reflection beyond descriptive narration was observed in more than 90% of reflective submissions. In the assessment domain, 84% (109/130) of OSCE/OSPE stations developed by residents were complete, competency-aligned and accompanied by appropriate rubrics. Faculty review indicated that 82% of electronic logbooks were comprehensive.

Mean motivation scores showed statistically significant improvement across all measured domains following the intervention, including awareness of CBME, perceived usefulness of reflective practice, confidence in assessment design, motivation for self-directed learning, and willingness to apply CBME-based strategies in future teaching ( $p$ -value  $<0.001$ ) [Table/Fig-6].

Question asked to participants	Pre-intervention (Mean±SD)	Post-intervention (Mean±SD)	p-value
I am aware of the principles of Competency-Based Medical Education (CBME).	3.42±0.61	4.56±0.52	<0.001
Reflective writing is useful for my learning and professional growth.	3.28±0.73	4.39±0.49	<0.001
I feel confident in designing assessment tools such as OSCE/OSPE stations.	3.11±0.68	4.21±0.58	<0.001
I am motivated to engage in self-directed learning during my training.	3.65±0.70	4.48±0.51	<0.001
I am willing to apply CBME-based approaches in my future teaching practice.	3.59±0.67	4.62±0.44	<0.001

[Table/Fig-6]: Motivational scale scores pre- and post-intervention.

Structured end-of-module feedback demonstrated high participant satisfaction. Mean scores across feedback domains ranged from 4.4 to 4.7 on a five-point Likert scale, with the highest ratings reported for relevance of content and motivation to apply learning in future teaching [Table/Fig-7].

Feedback domain	Mean score
Relevance of content	4.7
Clarity of delivery	4.5
Applicability to teaching practice	4.6
Workload manageability	4.4
Overall satisfaction	4.6
Motivation to apply in future teaching	4.7
Readiness to recommend to peers	4.5

[Table/Fig-7]: Feedback analysis (Likert Scale, Mean scores out of 5; n = 130 participants. Scale: 1 = strongly disagree, 5 = strongly agree).

## DISCUSSION

Despite the demanding clinical workload characteristic of postgraduate training, the module achieved a high overall task completion rate of 89%, with 91% of participants submitting tasks within stipulated timelines. These findings indicate that well-structured, asynchronous educational interventions can be effectively integrated into postgraduate training without significantly disrupting routine clinical responsibilities.

Engagement remained high across the duration of the module, with only a modest decline in completion rates in later weeks.

This pattern is consistent with previous reports suggesting that sustained engagement in longitudinal educational interventions requires careful calibration of workload and relevance to learners' immediate professional needs. Importantly, completion and punctuality rates were comparable between clinical and non clinical residents, underscoring the broad applicability of the module across specialities. The slightly higher engagement among non clinical residents, although not statistically significant, may reflect relatively greater flexibility in academic scheduling, a factor also noted in earlier studies of postgraduate blended learning [8,11,13].

A key strength of the intervention was its integrated, multi-domain design. By sequentially addressing small-group teaching, reflective practice, assessment literacy, and leadership within a single scaffolded framework, the module enabled residents to progress from foundational concepts to applied pedagogic skills. Over 90% of reflective submissions demonstrated critical reflection beyond descriptive narration, supporting evidence that structured reflective frameworks can meaningfully enhance higher-order thinking in postgraduate learners [8,11,13]. Similarly, the development of competency-aligned OSCE/OSPE stations by 84% of participants and comprehensive electronic logbooks by 82% reflects tangible acquisition of assessment and curriculum-planning skills rather than passive knowledge uptake.

The observed improvement in motivation scores across all measured domains further supports the educational impact of the intervention. Statistically significant gains were noted in awareness of CBME principles, perceived usefulness of reflective practice, confidence in assessment design, motivation for self-directed learning, and willingness to apply CBME-based strategies in future teaching roles. These findings were consistent with meta-analyses and systematic reviews demonstrating that technology-enhanced and blended learning approaches improve learner motivation, engagement, and confidence when compared with traditional didactic formats [5,14]. The asynchronous design likely contributed to this effect by offering flexibility and learner autonomy, both of which are highly valued by postgraduate residents.

Although the core intervention was asynchronous, the optional face-to-face OSCE/OSPE sessions were attended by three-quarters of participants and were consistently identified as valuable. These sessions appeared to complement the online tasks by reinforcing psychomotor and practical assessment skills that are difficult to acquire through digital platforms alone. This hybrid approach resonates with international evidence suggesting that limited, targeted in-person sessions can enhance the effectiveness of predominantly online postgraduate education without compromising feasibility [15,16]. An Indian scoping review highlighted that digital education enhances access, flexibility, and learner engagement among health professionals, while also emphasising the need for more evaluative studies in postgraduate settings [17].

Findings from the FGD provided further insight into participant perceptions. Residents highlighted asynchronous flexibility and peer-assisted learning as major strengths of the module, echoing existing literature on the benefits of collaborative learning and peer comparison in medical education [18]. At the same time, challenges such as a lack of protected academic time, infrastructural limitations, and variable departmental support were acknowledged. These barriers are well-documented in both Indian and global contexts and underscore the need for Institutional commitment to support sustainable implementation of CBME-aligned educational innovations [19-21].

Compared with earlier studies that have focused on isolated domains such as assessment methods or reflective writing, the present intervention offers a more comprehensive and integrated approach. By embedding reflection, assessment design, leadership training and educational technology within a single programme, the module contributed not only to discrete pedagogic competencies

but also to broader professional identity formation among postgraduate residents. This aligns with emerging CBME discourse that emphasises the development of reflective practitioners and future educators alongside clinical competence [22,23].

Overall, these findings suggested that carefully designed, task-based MET modules can achieve high engagement, meaningful skill development, and positive motivational outcomes even in resource-constrained settings. The integration of asynchronous learning with selective face-to-face components appears to be a particularly effective strategy for postgraduate medical education.

### Limitation(s)

The present study has certain limitations. Being a single Institution study, the findings may have limited generalisability. The relatively short duration of the intervention precluded assessment of long-term retention and transfer of pedagogic skills into routine teaching practice, as this was an educational intervention. Use of self-reported motivation measures may have introduced response bias. Additionally, voluntary participation may have introduced self-selection bias, with more motivated residents being over-represented. Future studies should explore multi-institutional implementation, longer follow-up periods and objective measures of teaching performance to further validate the effectiveness of such interventions.

### CONCLUSION(S)

The present study shows that a structured, asynchronous, task-based MET module is feasible and effective for postgraduate residents. High engagement, punctuality and task completion highlight its integration potential despite clinical workload. The intervention improved reflective practice, assessment literacy, leadership orientation, and motivation toward CBME. By combining small-group teaching, reflection, assessment design, and leadership in one scaffolded framework, it fostered broader professional identity formation. The blend of online tasks with limited face-to-face sessions enhanced skill transfer. This flexible, scalable model offers a replicable approach for postgraduate capacity-building, with future research needed on long-term and multi-institutional impact.

### REFERENCES

- [1] Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR, et al. Competency-based medical education: Theory to practice. *Med Teach*. 2010;32(8):638-45.
- [2] World Federation for Medical Education. Standards for postgraduate medical education. WFME; 2015. Available from: [https://wfme.org/wp-content/uploads/2015/01/PGME\\_2015\\_V2.pdf](https://wfme.org/wp-content/uploads/2015/01/PGME_2015_V2.pdf).
- [3] National Medical Commission. Competency-based postgraduate curriculum for the Indian Medical Graduate. New Delhi: NMC; 2019. Available from: <https://www.nmc.org.in/information-desk/for-colleges/postgraduate-curriculum/>.
- [4] Holmboe ES, Sherbino J, Long DM, Swing SR, Frank JR, International CBME Collaborators. The role of assessment in competency-based medical education. *Med Teach*. 2010;32(8):676-82.
- [5] Vallée A, Blacher J, Cariou A, Sorbets E. Blended learning compared to traditional learning in medical education: Systematic review and meta-analysis. *J Med Internet Res*. 2020;22(8):e16504.
- [6] George PP, Papachristou N, Belisario JM, Wang W, Wark PA, Cotic Z, et al. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. *J Glob Health*. 2014;4(1):010406.
- [7] Westerlaken M, Christiaans-Dingelhoff I, Filius RM, de Vries B, de Bruijne M, van Dam M. Blended learning for postgraduates: An interactive experience. *BMC Med Educ*. 2019;19(1):289.
- [8] Yygun J, Stuart E, De Paor M, Wallace E, Duffy S, O'Shea M, et al. A best evidence in medical education systematic review to determine the most effective teaching methods that develop reflection in medical students: BEME Guide No. 51. *Med Teach*. 2019;41(1):03-16.
- [9] Ellaway R, Masters K. AMEE Guide 32: e-learning in medical education Part 1: Learning, teaching and assessment. *Med Teach*. 2008;30(5):455-73.
- [10] Ganni S, Botden SM, Schaap DP, Verhoeven BH, Goossens RH, Jakimowicz JJ. Reflection-before-practice improves self-assessment and end-performance in laparoscopic surgical skills training. *J Surg Educ*. 2018;75(2):527-33.
- [11] Rajan S, Sathyan R, Sreelesh LS, Kallerey AA, Antharjanam A, Sumitha R, et al. Objective assessment of microsurgery competency: In search of a validated tool. *Indian J Plast Surg*. 2019;52(2):216-21.
- [12] Phua GL, Owyong JL, Leong IT, Goh S, Somasundaram N, Poon EY, et al. A systematic scoping review of group reflection in medical education. *BMC Med Educ*. 2024;24(1):398.
- [13] Radhika G, Dara AK, Varalaxmi KP, Bhavani C. Perceptions of the introduction of OSPE/OSCE: A pilot study in a government medical college. *J Dr YSR Univ Health Sci*. 2015;4(3):145-49.
- [14] Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions: A meta-analysis. *JAMA*. 2008;300(10):1181-96.
- [15] Shah S, Mahboob U, Junaid SM, Siddiqui S, Jamil B, Rehman S. Challenges faced by teachers of postgraduate health professions blended learning programs: A qualitative analysis. *BMC Med Educ*. 2024;24(1):251.
- [16] Hickey H. Canadian Conference on Medical Education 2022 abstracts. *Can Med Educ J*. 2022;13(2):105-251.
- [17] Jensen LX, Buhl A, Hussain S, Karan A, Konradsen F, Bearman M. Digital education for health professionals in India: A scoping review of the research. *BMC Med Educ*. 2023;23(1):561.
- [18] Ten Cate O, Durning S. Peer teaching in medical education: Twelve reasons to move from theory to practice. *Med Teach*. 2007;29(6):591-99.
- [19] Bansal P, Supe A, Sahoo S, Vyas R. Faculty development for competency-based medical education: Global, national and regional perspectives. *Natl J Integr Res Med*. 2017;8(5):01-06.
- [20] Tan XH, Foo MA, Lim SL, Lim MB, Chin AM, Zhou J, et al. Teaching and assessing communication skills in the postgraduate medical setting: A systematic scoping review. *BMC Med Educ*. 2021;21(1):483.
- [21] Carter MA. Students' perceptions of the online component of a hybrid postgraduate course. *Procedia Soc Behav Sci*. 2013;84:558-68.
- [22] Chow J, Al-Duaij L, Last N, Sheth U, Rehman M, Azim A, et al. Transformational learning and professional identity formation in postgraduate competency-based medical education. *Med Educ*. 2025;59(4):409-17.
- [23] Schultz KW, Kolomitro K, Koppula S, Bethune CH. Competency-based faculty development: Applying transformations from lessons learned in competency-based medical education. *Can Med Educ J*. 2023;14(5):95-102.

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