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Development and Implementation of a Group-Based Behaviour Change Intervention for Clinical Instructors Using the BOPPPS Model

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Abstract

Background

Clinical instructors are required to be both skilled practitioners and effective teachers; however, most lack formal training in teaching skills. This gap often results in a disconnect between conceptual knowledge and clinical practice. Although the BOPPPS model has demonstrated effectiveness in enhancing learning outcomes, limited attention has been given to supporting instructors in its practical implementation. Group-based behaviour change interventions offer a promising approach to advancing professional development in complex educational environments. The present study details the development and implementation of such an intervention to support clinical instructors' adoption of the BOPPPS model, employing a checklist to enhance the reporting of group-based behaviour change interventions.

Methods

Twenty clinical instructors from diverse disciplines participated in a three-day Instructional Skills Workshop, organised into four stable interdisciplinary groups of five. The intervention had three phases: pre-workshop preparation (distribution of BOPPPS materials, course-planning templates, and assessment rubrics), structured workshop delivery, and group reflection. Grounded in Kolb's experiential learning cycle and guided by the Behaviour Change Wheel, each day followed a standard cyclical sequence: BOPPPS-structured mini-lesson delivery, private self-evaluation and facilitator feedback, structured peer assessment, and facilitated group discussion. These activities used five behaviour change techniques: behavioural rehearsal, feedback on behaviour, discrepancy identification, social comparison, and social support with joint problem-solving. The intervention ended with a joint poster reflection and a gallery walk to consolidate group learning and support professional identity formation.

Discussion

This intervention reconceptualises clinical faculty development as a dynamic process of professional behaviour change rather than a passive transfer of knowledge. Embedding BOPPPS practice within stable interdisciplinary group structures enabled the workshop to utilise peer accountability, iterative feedback, and social learning as mechanisms for change, fostering psychological safety, reflective practice, and educator identity formation. This theoretically grounded methodology is applicable to other clinical specialities and healthcare education contexts. Future research should incorporate controlled pre–post designs with observer-rated assessments and longitudinal follow-up to assess sustained behaviour change.

1. Background

Effective clinical education requires not only instructors' medical expertise but also their ability to plan and deliver structured, student-centred lessons. Most clinical faculty members are trained primarily as clinicians rather than educators and frequently lack formal preparation in lesson planning, instructional methods, or student assessment [1]. Traditional lecture-based approaches typically prioritise content coverage over practical skill development [2], thereby widening the gap between classroom learning and clinical practice. As a result, clinical instructors must fulfil dual roles as expert practitioners and effective teachers, yet often lack adequate support in teaching methodologies.

Faculty development programmes have been widely advocated as a means of tackling this gap. Among the structured teaching frameworks which have secured acceptance in clinical education, the BOPPPS model — comprising Bridge-in, Objectives, Pre-assessment, Participatory Learning, Post-assessment, and Summary — has accumulated a substantial evidence base. A growing body of cross-speciality clinical evidence suggests that BOPPPS-structured teaching outperforms conventional didactic methods in four key domains: deepening conceptual knowledge, sharpening clinical reasoning, refining practical skills, and fostering learner engagement [3–5]. Its effectiveness has been documented in nursing, anaesthesia, oncology communication, and the clinical laboratory industry [6–9], as well as in continuing professional education formats such as pharmacist training workshops[10]. Collectively, this body of evidence positions the BOPPPS model as a strong and transferable framework for structuring clinical teaching.

Despite substantial evidence supporting the BOPPPS model, a notable gap persists: most research focuses on its impact on students rather than on strategies to facilitate instructors' adoption of these teaching techniques. Introducing a new teaching model alone is insufficient; meaningful change in teaching practice requires targeted support addressing motivation, cognition, and the instructional environment. Group-based behaviour change interventions (GB-BCIs) utilise social processes such as peer modelling, structured feedback, social comparison, and group reflection to assist professionals in modifying their educational practices [11]. While these methods have proven effective in other healthcare training contexts, their use in clinical faculty development remains limited.

This study addresses this gap by describing the development and implementation of a group-based behaviour change intervention to support clinical instructors in applying the BOPPPS model in their teaching. The intervention was delivered during a three-day Instructional Skills Workshop (ISW) and was informed by behaviour change theory and Kolb's experiential learning cycle [12]. This approach conceptualised clinical teaching as a skill that can be practised, observed, and refined through iterative cycles of group practice and feedback, rather than as a process of knowledge transmission. To enhance transparency, this article follows a checklist for reporting group-based behaviour change interventions [13], with the completed checklist included in Additional file 1. The article presents the theoretical rationale, design, and delivery of the intervention to inform others interested in utilising group-based behaviour change strategies for faculty development.

2. Methods

The primary objective of this study was to develop and rigorously evaluate a group-based behaviour change intervention designed to support clinical instructors in the systematic acquisition and internalisation of BOPPPS-based instructional behaviours within the formal structure of an ISW.

2.1 Design and procedure

The faculty development intervention was implemented in three phases: intervention design and pre-workshop preparation, structured workshop delivery, and group reflection and gallery walk. The present article reports on all three phases. The reporting of this intervention was guided by the checklist for improving the reporting of group-based behaviour-change interventions [13]. The completed checklist, specifying the location (page and section) where each item is addressed in this manuscript, is provided in Additional file 1.

Grounded in the ISW framework, the intervention was guided by the BOPPPS model, with particular emphasis on encouraging behaviour change [14] and supporting learner engagement and competency development [15]. The programme was developed collaboratively by volunteer faculty members from surgery, internal medicine, psychology, and nursing as part of a regional initiative to promote a shared pedagogical approach to clinical teaching.

Twenty experienced clinical instructors from diverse departments participated in the intervention. They were organised into four stable groups of five participants each. Group allocation was conducted purposefully by the research team: participants were first stratified into three experience tiers (senior, moderate, and junior) based on years of professional practice, and then distributed across the four groups to guarantee a balanced mix of experience levels and disciplinary backgrounds inside each group. Each group included both physicians and nurses to support interdisciplinary exchange. To promote effective collaborative learning, group membership remained stable throughout the intervention, as research indicates that intact groups with consistent membership facilitate the development of key collaborative behaviours and sustained peer engagement, both of which prove essential for meaningful learning [16].

Phase 1: Intervention design and pre-workshop preparation

The intervention adopted a sequential delivery process in which trained facilitators introduced the BOPPPS teaching model, faculty members applied this model through mini-lessons, and the process culminated in structured evaluations with faculty self-reflection and colleague feedback. This circular design, incorporating didactic input, practical application, and reflective feedback through structured mentoring, is consistent with evidence-based approaches to curriculum development. In-depth feedback from content experts on the elements of the competency-based curriculum ensured that its patterns and concepts were relevant and grounded in both theoretical structures and pragmatic needs [16]. Such structured feedback loops, when combined with mentoring components, including continuous communication between facilitators and trainees and appropriate feedback strategies, have been shown to enhance the development of teaching competencies [17]. The conceptual underpinning of the

intervention draws on Kolb's experiential learning theory, which claims that learning occurs through a cyclical process of concrete experience, reflective observation, abstract conceptualisation, and active experimentation [12]. By requiring trainees to design and deliver courses using the BOPPPS model, the intervention aimed to promote behaviour change through hands-on practice, immediate feedback, and iterative self-assessment. The mechanism of change operates through three interconnected pathways: (a) cognitive restructuring via structured lesson planning; (b) skill acquisition through deliberate practice and peer observation; and (c) reflective practice facilitated by self-evaluation and multi-source feedback.

Physical environment

The group sessions were delivered in a Project-Based Learning (PBL) classroom. The classroom was configured into three functional zones: a discussion area with movable tables and chairs; a presentation area equipped with a projector, a whiteboard, and a flip chart; and a materials area stocked with paper, markers, sticky notes, scissors, and other prototyping supplies. In addition, two 360-degree rotatable displays were mounted on opposite walls to support multi-angle prototype presentations, and the walls themselves were writable, allowing participants to draw, write, post sticky notes, and revise mind maps at any time. The classroom configuration was designed to support the cyclical learning process by permitting seamless transitions between individual preparation, group discussion, and presentation activities.

Pre-workshop preparation

One week before the workshop, facilitators distributed BOPPPS model materials and course planning to all trainees. Participants were also provided with self-evaluation forms and peer assessment rubrics, which served as structured tools to guide preparation, reflective review, and feedback throughout the workshop. These materials were used both during and outside the group sessions to support iterative revision of teaching practice. Trainees were required to prepare a complete course plan in accordance with the BOPPPS framework before the workshop, using the distributed template as an instructive reference. This pre-workshop preparation ensured that all participants arrived with a baseline understanding of the BOPPPS structure and a draft course ready for refinement and delivery.

Session structure, timing, and dose

The intervention was delivered over three consecutive full days (one session per day per group; three sessions in total). Each group session lasted approximately six hours (about 36 hours of group contact time in total per group across the three days). Within each session, every participant delivered one BOPPPS-structured mini-lesson of approximately 15 minutes, followed by a private self-evaluation and facilitator feedback (approximately 10 minutes), structured peer assessment (approximately 5 minutes), and a facilitated group discussion (approximately 10 minutes), giving a full practice cycle of approximately 40 minutes per participant. With five participants per group, one full round of cyclical practice occupied approximately three to four hours per day, with the remaining time allocated to ice-breaking and a facilitator demonstration on Day 1, and to a collaborative poster reflection and gallery

walk on the afternoon of Day 3. Across the three days, each participant therefore completed multiple full practice cycles, ensuring repeated behavioural rehearsal, feedback, and reflection.

Phase 2: Intervention content and workshop delivery

The intervention employed a cyclical, group-based structure grounded in experiential learning and behaviour change principles. The three-day workshop was delivered in a standardised sequence of activities, guaranteeing consistency across all groups and participants. Each day followed an identical procedural format designed to support repeated behavioural rehearsal, feedback, and reflection. Figure 1 illustrates the implementation process for the GB-BCIs.

Day 1: Model introduction and initial practice cycle

The first day began with an ice-breaking activity to establish psychological safety and interpersonal trust within the interdisciplinary groups. This was followed by a facilitator-led demonstration, in which a trained ISW facilitator delivered a live mini-lesson structured according to the BOPPPS model. This demonstration served as a concrete behavioural model for participants, showing how the six components (Bridge-in, Learning Objectives, Pre-assessment, Participatory Learning, Post-assessment, Summary) could be integrated into clinical teaching practice.

Following the demonstration, participants were allocated to their respective groups and moved to separate PBL classrooms, each accompanied by one assigned facilitator. A warm-up activity was conducted to transition participants into the practice phase. The intervention then entered its core cyclical structure: each participant, in turn, delivered a mini-lesson on a self-selected clinical topic, structured according to the BOPPPS model (Behaviour Change Technique (BCT) 8.1: Behavioural practice/rehearsal) [18]. Upon completion, the presenting participant and the facilitator withdrew to a private room for self-evaluation and facilitator feedback (BCT 2.2: Feedback on behaviour; BCT 1.6: Discrepancy between current behaviour and goal) [18]. The participant then returned to the classroom for peer assessment (BCT 6.2: Social comparison) [17], followed by a group discussion (BCT 3.1: Social support; BCT 1.2: Problem-solving) [17]. This cycle was repeated until all participants had presented.

Day 2: Continued rehearsal and refinement

Day 2 followed the same cyclical structure, beginning with a warm-up activity and proceeding directly into the practice cycle: mini-lesson delivery, self-evaluation and facilitator feedback, peer assessment, and group discussion. Participants were encouraged to integrate insights from Day 1 into their revised presentations, reinforcing iterative skill development and reflective practice.

Day 3: Final practice and transition to collective reflection

The morning of Day 3 replicated the Day 2 structure, retaining the cyclical format to ensure all participants completed multiple rounds of practice and feedback. In the afternoon, the intervention transitioned to Phase 3: Group reflection and gallery walk.

The delivery of GB-BCIs is presented in Table 1

Table 1
Three-day cyclical structure of the ISW intervention

Day	Activity	Description	BCT
1	Ice-breaking	Facilitators conducted an ice-breaking activity to establish psychological safety, reduce interpersonal distance, and foster group cohesion.	—
	BOPPPS model introduction	The lead facilitator introduced the BOPPPS teaching model and its six components.	—
	Facilitator demonstration	A trained ISW facilitator delivered a live mini-lesson using the BOPPPS model to provide a concrete behavioural example for participants.	—
	Group allocation	Participants were divided into four interdisciplinary groups of five and moved to separate PBL classrooms, each with one assigned facilitator.	—
	Cyclical practice begins:		
	1. Warm-up activity	Facilitators conducted a brief warm-up to transition participants into the practice phase.	—
	2. Mini-lesson delivery	Each participant presented a self-selected clinical topic structured according to the BOPPPS model.	BCT 8.1
	3. Self-evaluation & facilitator feedback	The presenting participant and facilitator withdrew to a private room. The participant first conducted a self-evaluation, followed by the facilitator's structured feedback based on BOPPPS criteria.	BCT 2.2, BCT 1.6
	4. Peer assessment	The participant returned to the classroom, where peers provided structured feedback.	BCT 6.2
	Cycle repeats until all participants present		
	5. Group discussion	The group engaged in collective reflection and problem-solving.	BCT 3.1, BCT 1.2
2	Cyclical practice continues:		
	1. Warm-up activity	Brief facilitator-led warm-up.	—
	2–5. Same as Day 1	Mini-lesson delivery → Self-evaluation & facilitator feedback → Peer assessment → Group discussion.	BCT 8.1, 2.2, 1.6, 6.2, 3.1, 1.2
3	Practice cycle repeated (Day 2)	Brief facilitator-led warm-up→Mini-lesson delivery → Self-evaluation & facilitator feedback → Peer assessment → Group discussion.	BCT 8.1, 2.2, 1.6, 6.2, 3.1, 1.2

Content and procedural standardization

The content of each mini-lesson was entirely trainee-determined: each participant independently selected a clinical topic from their own disciplinary domain. The only prescribed structural requirement was that each session incorporate all six components of the BOPPPS framework. This design enabled participants to integrate the BOPPPS framework into their existing disciplinary expertise while maintaining a consistent and observable pedagogical structure across all presentations, thereby facilitating meaningful peer comparison and group-level reflection. The order of mini-lesson presentations within each group was self-determined by participants rather than assigned by facilitators, thereby supporting learner autonomy and a sense of shared ownership of the group's learning process. Across all three days and all four groups, the procedural sequence remained identical, making sure all participants experienced the same intervention components regardless of their presentation order.

BCT operationalization

The intervention operationalised four behaviour change techniques (BCTs) drawn from the BCT Taxonomy v1 [18], each directly mapped to a specific activity within the cyclical practice sequence:

(1) BCT 8.1: Behavioural practice/rehearsal — Each participant delivered a mini-lesson on a self-selected clinical topic, structured in accordance with all six BOPPPS components, requiring them to enact the target teaching behaviour in a realistic group setting, with repeated opportunities for refinement across the three-day workshop.

(2) BCT 2.2: Feedback on behaviour and BCT 1.6: Discrepancy between current behaviour and goal — Upon completing their mini-lesson, every presenting participant withdrew to a private room with the assigned facilitator. The participant first completed a structured self-evaluation form, identifying perceived strengths and domains for enhancement in relation to the BOPPPS criteria. The facilitator then provided a structured assessment aligned with the same framework, facilitating participants to recognize discrepancies between current practice and the target teaching behaviour.

(3) BCT 6.2: Social comparison — The presenting participant returned to the group classroom, where the remaining participants provided structured peer assessment using a standardised rubric, permitting participants to observe and compare varied applications of the BOPPPS model across disciplinary contexts.

(4) BCT 3.1: Social support and BCT 1.2: Problem-solving — Following peer assessment, the group engaged in a facilitated discussion in which all members reflected on the presented lesson, identified shared challenges, and collaboratively generated practical solutions. This cycle was repeated for each participant in turn until all members had presented, with the concluding group discussion on each day incorporating cumulative reflections from all sessions delivered that day.

Phase 3: Group reflection and gallery walk

Phase 3 was delivered over an approximately four-hour afternoon session on the final day and comprised three sequential components: within-group poster creation (approximately one hour), a gallery walk (approximately two hours), and a facilitator-led summary with a final team-building activity (approximately one hour). Each group first completed a structured reflection task as the intervention's concluding activity. Group members collaboratively created a poster that visually represented their collective learning journey, changes in teaching practice, and key professional insights obtained during the three-day workshop.

By completing a shared poster and participating in the gallery walk, each group provided a visible summary of its learning outcomes and completed the intervention with a common reflective endpoint. Finally, the facilitators led a whole-group summary that consolidated the key learning points from across the three days, followed by a brief team-building activity that strengthened group solidarity and brought the intervention to a shared, positive close.

Facilitators

Four facilitators delivered the faculty training programme, each assigned to a specific group throughout the three-day intervention to maintain continuity and stable group dynamics. The facilitators were certified trainers who had completed the ISW qualification programme. Their personal characteristics, including age, gender, professional discipline, and years of teaching experience, are summarised in Table 2. They received thorough training in both intervention delivery and group facilitation methods, including instruction on introducing the BOPPPS teaching framework, conducting structured observations, providing professional feedback, guiding warm-up activities, facilitating self-reflection exercises, and conducting peer evaluations. Facilitators were provided with a facilitator guide, BOPPPS assessment rubrics, evaluation sheets, markers, and sticky notes as materials to guide session delivery.

Table 2
Facilitators' characteristics

Facilitator	Age(year)	Gender	Professional background	Years of teaching experience(years)
1	46	Female	Pathogeny biology	24
2	45	Female	Chemistry	20
3	43	Female	Cardiology	10
4	41	Female	Nursing	12

Facilitation style

The intended facilitation style was systematic yet interactive. Each session began with a warm-up activity, followed by the cyclical practice sequence. After each mini-lesson, facilitators provided structured professional feedback and guided participants through self-reflection and peer evaluation during group discussions, prompting them to identify specific areas for improvement. Participants were

instructed to record their reflections on paper at the end of each training day, enabling them to construct a personal teaching development map upon completion of the three-day programme. The overarching goal was to guide participants in adopting the BOPPPS model while simultaneously cultivating essential teaching skills—including speech projection, language use, facial expressions, eye contact, and gestures—thereby cultivating their own distinctive teaching styles.

Fidelity of intervention delivery

Maintaining adherence in the delivery of group-based behaviour change interventions is important to ensure that the intervention is implemented as intended and that measured outcomes can be reliably attributed to the specified intervention components. In the present study, fidelity was operationalised across multiple dimensions to address both structural adherence to the BOPPPS framework and procedural dependability in workshop delivery. Structural exactness was ensured through standardised BOPPPS assessment rubrics used during facilitator and peer evaluations, which verified that each trainee's mini-lesson incorporated all six required components (Bridge-in, Learning Objectives, Pre-assessment, Participatory Learning, Post-assessment, and Summary). This criterion-based approach permitted facilitators to systematically monitor whether participants enacted the target pedagogical structure during each practice cycle. Procedural fidelity was maintained by implementing an identical sequence of activities across all four groups and all three workshop days, as detailed in Table 1, thereby reducing variability in intervention delivery. To support facilitator adherence to the intervention protocol, all four facilitators received standardised training and were provided with a common facilitator guide, reference materials, and assessment tools, promoting consistency in how feedback, reflection, and group discussion were facilitated. Furthermore, the multilevel evaluation structure—integrating self-evaluation, facilitator assessment, and peer assessment—generated triangulated data that enabled real-time detection of deviations from the intended intervention design and provided participants with formative feedback on their adherence to BOPPPS principles. Collectively, these mechanisms ensured that the intervention was delivered with sufficient fidelity to support valid interpretation of its effects and to enable future replication in comparable instructional settings.

3. Discussion

This study describes the development and implementation of a group-based behaviour change intervention designed to support clinical instructors in adopting the BOPPPS model. Rather than conceptualising faculty development as a one-way transmission of pedagogical knowledge, the intervention framed clinical teaching as a modifiable professional behaviour that can be specified, practised, monitored, and refined. This approach is consistent with the Behaviour Change Wheel (BCW), which provides a systematic method for intervention design: defining the behavioural problem, specifying the target behaviour, identifying what needs to change through behavioural diagnosis, and selecting appropriate intervention functions and behaviour change techniques aimed at addressing the identified determinants [19]. Previous evidence syntheses have shown that behaviour-change theories and technique taxonomies help specify intervention content and identify potentially effective "active

ingredients," such as goal setting, self-monitoring, and feedback [20, 21]. In the present intervention, the target behaviour was clinical instructors' use of BOPPPS-based teaching behaviours, including structured lesson planning, participatory learning, formative assessment, feedback, and summary. The workshop was therefore not simply a training programme about the BOPPPS model, but a structured behaviour change intervention aimed at changing how clinical instructors design, deliver, evaluate, and reflect on their teaching.

A central feature of the intervention was the use of the group as an active mechanism for behaviour change. Participants were organised into stable interdisciplinary groups that remained intact throughout the three-day workshop, creating repeated opportunities for behavioural rehearsal, observation, feedback, social comparison, and shared reflection. GB-BCIs are particularly valuable when the target behaviour is complex and socially situated, as participants learn not only from facilitators but also from one another's experiences and performances. Similar intervention development studies have recognised social support, modelling, feedback, monitoring, and enablement as active components of behaviour change [22]. In our workshop, peer observation and peer assessment enabled participants to compare different applications of the BOPPPS model and to consider their own teaching in relation to group norms. These findings correspond with previous research applying the BCW and Theoretical Domains Framework, which identified social influences, environmental context, beliefs about capabilities, and reinforcement as key determinants of behaviour change [23]. By embedding BOPPPS practice within a stable group format, the intervention used the group not merely as a delivery setting, but as a source of accountability, social learning, and collective professional development.

The mechanisms enabling this group process depended on a supportive relational foundation. Small groups promote behaviour change through group-specific mechanisms such as social identification, cohesion, group norms, social support, and interpersonal interaction [24]. Within such contexts, processes including normalisation, peer support, social learning, and cognitive reframing function as means through which change is negotiated, modelled, and sustained [25]. These processes depend on psychological safety—a shared belief that the group is safe for interpersonal risk-taking[26] —since participants are unlikely to engage in honest self-disclosure or corrective feedback without sufficient interpersonal security. This was especially relevant in our workshop, where clinical instructors from different departments, disciplines, and hierarchical positions were brought together. The ice-breaking activity therefore functioned not as a mere introductory exercise but as a structured, facilitative strategy, reducing interpersonal distance and establishing the trust and cohesion necessary for subsequent behavioural rehearsal, peer assessment, and group discussion to operate as genuine mechanisms of change rather than as procedural exercises [13, 27].

Self-evaluation and feedback on behaviour formed complementary core components of each practice cycle. By completing a structured self-evaluation before receiving facilitator feedback, participants were prompted to identify discrepancies between their intended teaching design and their actual performance (BCT 1.6)[18], thereby fostering reflective capacity and self-directed improvement. This structured self-assessment reflects broader evidence that reflective practice is an essential attribute for professionals

working in complex clinical environments [28]. Facilitator and peer feedback were then linked directly to observable teaching behaviours—the clarity of learning objectives, the use of pre-assessment, the design of participatory activities, and the effectiveness of post-assessment and summary. Evidence from health professional education indicates that feedback on behaviour is among the most frequently used and impactful behaviour change techniques [29]; audit and feedback produce small-to-moderate improvements in professional practice, particularly when feedback is specific, delivered by a credible source, and accompanied by clear action plans [29]. Chauhan et al.[30] similarly reported that interactive, multifaceted training combined with feedback effectively improved knowledge and professional practice among healthcare professionals.

The final poster reflection and gallery walk reinforced the group-based architecture of the intervention as a consolidation strategy. By inviting each group to construct a visual representation of their collective learning, the activity translated individual experiences into a shared group narrative—reflecting the social construction of knowledge, whereby beliefs, practices, and identities are shaped by how groups interact and make meaning together [31]. This visual mapping functioned as a site of collective sense-making, reinforcing a shared behavioural identity within each group. The subsequent gallery walk extended this process through a rotating-station design that supports cumulative knowledge generation, whereby participants actively read, annotate, and build upon others' contributions, fostering peer learning while mitigating the dominance effects common in verbal group formats [32]. From a behaviour change perspective, these activities supported collective reflection and professional identity formation. Reflection in health professions education is not merely an individual cognitive process but is shaped by social interaction and dialogue, through which learners co-construct knowledge and develop the dispositional changes needed to reshape future practice [33]; such reflective thinking is significantly enhanced through structured peer-to-peer and instructor-to-learner interactions [34].

Taken together, the intervention integrated the BOPPPS model within an Instructional Skills Workshop format, grounded in established behaviour change theory and Kolb's experiential learning cycle [12], and employed evidence-based techniques, including behavioural rehearsal, feedback, self-evaluation, social comparison, and shared reflection. By embedding these techniques within a stable group structure, the workshop created conditions in which clinical teaching behaviour could be specified, practised, observed, and refined through iterative cycles of performance and feedback. The use of the group as an active mechanism—rather than merely a delivery setting—distinguishes this approach from conventional faculty development programmes and aligns it with emerging frameworks for GB-BCI design [27, 22]. Collectively, the intervention components formed a coherent, theoretically grounded system in which group processes, facilitator guidance, and structured reflection scaffolded individual behaviour change.

3.1 Limitations

Several limitations of the present study warrant acknowledgement. First, the intervention was implemented with a relatively small sample of twenty clinical instructors from a single provincial medical centre, which limits the generalisability of the findings to other institutional contexts, specialities, or

healthcare systems. Larger, multi-site replications would be needed to establish the external validity of this approach[35]. Second, although fidelity monitoring was embedded throughout the intervention via structured assessment, standardised procedures, and multi-source evaluation, the absence of an independent fidelity observer or audio-visual recording means that facilitator variability across groups cannot be fully ruled out. Third, the present article focuses on intervention development and delivery rather than outcome evaluation; no controlled comparison or follow-up data on teaching behaviour change in the clinical workplace were collected. Future studies should incorporate pre–post measures of teaching behaviour, observer-rated assessments, and longer-term follow-up to evaluate whether changes in teaching practice are sustained beyond the workshop context. Fourth, participants self-selected into the programme and were volunteers from a single institution, which may introduce selection bias and limit the sample's representativeness. Finally, whilst the BOPPPS model provided a clear and observable behavioural framework, its applicability across highly diverse clinical specialities and teaching formats — such as bedside teaching, simulation, and outpatient supervision — has yet to be systematically examined within a behaviour change intervention framework.

Abbreviations

BOPPPS: Objectives, Pre-assessment, Participatory Learning, Post-assessment, and Summary

GB-BCIs: Group-based behaviour change interventions

ISW: Instructional Skills Workshop

PBL: Project-Based Learning (PBL)

BCT: Behavior Change Technique

BCW: Behaviour Change Wheel

Declarations

Ethics approval

The studies involving humans were approved by the Medical Ethics Committee of Hainan General Hospital, Affiliated Hainan Hospital of Hainan Medical University. The studies were conducted in accordance with the Declaration of Helsinki, the local legislation, and institutional requirements.

Consent for publication

Not applicable.

Availability of data and materials

All data reported in this paper are made available in the methods section

Competing interests

The authors do not report any competing interests

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Authors' contributions

Haina Xing participated in the study design and prepared this manuscript; Rong Liu wrote this manuscript. Correspondence to Rong Liu. All authors have read and approved this manuscript.

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Figures

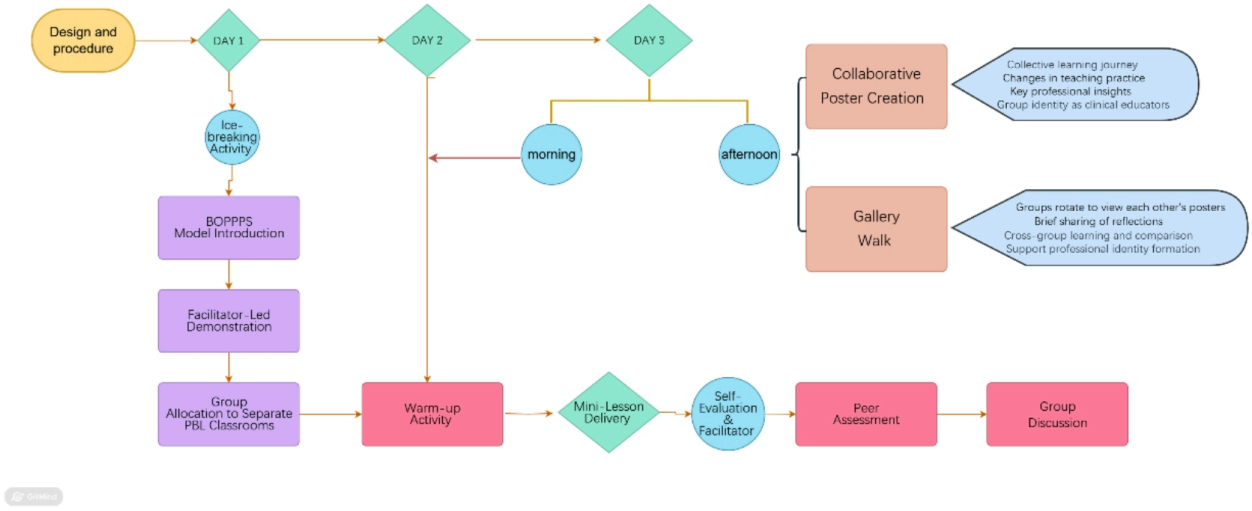


Figure 1

Implementation process for GB-BCIs.

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