

Experiential Learning of Active Learning Strategies in Mentor Learner Web-based Discussions: A Perceptions Study

Abstract

Background: Active learning strategies (ALSs) in medical education are valued for their effectiveness but face adoption challenges among educators, underscoring the need for a deeper understanding of their implementation and impact. **Aim:** The aim of the study was to investigate the perceptions of medical educators regarding the effectiveness and challenges of ALS through mentor–learner (ML) web-based discussions. **Settings and Design:** The retrospective cross-sectional study analyzed data from 32 medical educators enrolled in the Foundation for Advancement of International Medical Education Research course at Christian Medical College, Ludhiana. It utilized a mixed-method approach, gathering both quantitative and qualitative data through ML web discussions. **Materials and Methods:** The study used a “dual-method” approach, combining traditional online discussions with a “role-reversal” method on an ML web platform, promoting experiential learning. Participant responses on ALS implementation tasks were collected and analyzed within these discussions. **Results:** Participants shared various ALS for collaborative learning (20), classroom engagement (26), assessing prior knowledge (12), and note-taking during lectures (10). Further, among the 11 ALS examined, the ease of implementation varied significantly among participants ($P < 0.0001$). Challenges in ALS implementation included inadequate faculty training (91%), motivation (84%), resource constraints (81%), student (75%), and administrative resistance (69%). Four themes emerged as recommendations for effective ALS implementation: empowering educators, engaging students, streamlining support systems, and monitoring impact. **Conclusion:** The study highlights a mixed perspective of medical educators on ALS. Although ALS was perceived as effective in fostering critical thinking and developing collaborative learning among students, various challenges, such as a lack of skilled faculty and resources, necessitated robust faculty development initiatives.

Keywords: Active learning strategies, experiential learning, mentor–learner interactions

Introduction

Active learning strategies (ALSs) are any type of activity during class (face-to-face, online, or outside of class) that engages learners in deep thought about the subject matter in the course. It is gaining momentum in medical education as educators strive for more engaging and effective learning environments.^[1,2] Graffam suggested that any active learning technique (ALT) should have three components: intentional engagement, purposeful observation, and critical reflection to promote an immersive learning process.^[3] These strategies, characterized by student-centered approaches, have enhanced students' understanding, retention, and application of complex medical concepts.^[4–6] Nevertheless, the implementation of ALS presents

challenges, requiring educators to navigate through diverse methodologies, each with unique strengths and limitations. Therefore, understanding the need, techniques, challenges, and perspectives of active learning is crucial, especially from the viewpoints of medical educators. Existing studies in the literature frequently rely on surveys, questionnaires, and interviews to gather perspectives on ALS from health professionals.^[6,7] However, none have explored the holistic perspective of medical educators through web-based platforms specifically designed to foster discussions and provide experiential learning.

Research indicates that web-based discussions can be just as effective as face-to-face discussions.^[8] Mentor–Learner (ML) web-based learning approach stands out for its emphasis on expert facilitation,

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interactive content, open dialogue, and a feedback loop to encourage active guided engagement, distinguishing it from other web-based discussion techniques.^[9] Previous literature has demonstrated the effectiveness of ML web-based learning within the Foundation for Advancement of International Medical Education Research (FAIMER) institutes.^[9-11]

The novelty of the study is leveraging the ML web discussions to enhance our understanding of ALS in health professionals' education through an innovative "dual method" approach. The first methodological approach involved the conventional online discussion method to capture medical educators' perspectives "as teachers." The second methodological approach involved educators in the "learner's role" using the "role reversal" method. As medical educators, our inherent preconceptions may lead us to perceive ALS from a narrow perspective. However, this limited viewpoint could impede our comprehensive understanding of ALS, hindering our ability to grasp its potential benefits and applications in educational settings fully. By examining learners' perspectives on ALS, medical educators can enrich their teaching practices, foster greater student engagement, and ultimately achieve more effective learning outcomes.

Lowe proposed that a "role reversal" approach enables educators to reconsider their professional assumptions by assuming the role of students.^[12] Since then, this concept of role reversal has been widely acknowledged as a potent instrument for reflection, allowing participants to present more comprehensive and insightful viewpoints.^[13,14] Role-playing, stemming from this concept, has proven effective in medical education for prompting reflection.^[5,6] Role reversal approach has the potential to dismantle barriers, stimulate creativity, cultivate empathy, broaden knowledge, and mitigate bias.^[15] Moreover, through teacher-student role reversal activities, medical educators gain first-hand experience that allows them to understand the way students think and feel. Reflecting on these experiences equips them to find better ways to support students in their learning journey.

By providing a well-rounded view of ALS implementation, the study aims to empower medical educators with the required knowledge of ALS. The objectives are to evaluate the faculty perspective and identify the challenges and solutions toward ALS and the implementation of various ALTs in health professional education.

Materials and Methods

The study utilized a mixed-method research design incorporating both quantitative and qualitative research approaches. It involved a retrospective cross-sectional design with a sample of 32 medical educators including the four authors; however, their responses were excluded from the feedback analysis. They were from diverse branches of healthcare, including medical, dentistry, and homeopathy,

across various universities in India and abroad. A written informed consent was taken from all the participants for using their responses for research and publication. The study period spanned for 6-month duration from October 1st, 2023, to March 31st, 2024, which included the planning, implementation, and evaluation of activities on ALS by the authors.

Faculty perspectives were gathered through assigned tasks on sharing their experiences on ALS use and implementation process along with reflecting on the learning at the end of the month followed by evaluation through a feedback survey and a quiz activity. All the assessment tools used in the study were pre-validated and pilot tested by authors before data collection.

To facilitate ML web discussions, a Google group was created for study participants, enabling asynchronous web-based discussions through Gmail over a month-long period. The topic of ALS was discussed under the headings of introduction to active learning, exploring ALSs and various tools and techniques, implementation process challenges encountered, and solutions to overcome it. It was guided through meticulously designed tasks, each involving one or more ALS to offer experiential learning opportunities.

1. Task 1 - Introduction to active learning through ALT of narrative writing
 - Learning objectives
 - a. Define active learning and differentiate it from passive learning
 - b. Identify the need for and importance of ALSs in medical education
 - c. Reflect on their professional experience of active learning as a teacher or as a student
2. Task 2 - Exploring ALS through ALT of interactive concept mapping
 - Learning objectives
 - a. Discuss various techniques for active learning
 - b. Discuss the implementation of ALSs for the given scenarios
3. Task 3 - Implementing ALS through ALT of virtual jigsaw method
 - Learning objectives
 - a. Demonstrate active learning by being a part of a jigsaw classroom
 - b. Determine the factors facilitating and restraining the implementation of ALSs
4. Task 4 - Challenges and solutions for implementation of ALS through ALT of Retrospective speedboat analysis
 - Learning objectives
 - a. Identify the challenges and recommend solutions to overcome these challenges while implementing ALSs
5. Task 5 - Feedback and evaluation through ALT of reflective writing, exit ticket survey, and online quiz
 - Learning objectives

- Reflect upon the discussion during the intersession month
- Self-assess the learning by responding to a quiz
- Submit a feedback on ML web-based discussion on ALS

Each week, learners received emails containing tasks that encouraged them to review literature, brainstorm ideas, engage with different forms of active learning techniques (ALT), and respond individually through the same email correspondence.

At the end of the discussion, participants self-evaluated their knowledge, confidence, and awareness of ALS pre- and post-discussion by responding to a pre-validated feedback form shared by moderators. They assessed themselves on scores on a scale of 1–10 before and after the session. The change in scores was further analyzed to compare the outcomes. Likewise, the assessment of learning ALS techniques covered in the discussion was done through an online quiz platform Quizalize.^[16] There were 15 questions related to active learning strategies (ALSs) and various tools and techniques discussed throughout the month, including multiple-choice, short-answer, and matching questions.

Statistics

The collected data were entered into Microsoft Excel and analyzed quantitatively using SPSS software version 24. Wilcoxon sign test was employed to compare retrospective pre- and post-test scores. Descriptive statistics were utilized to summarize participants' responses on Likert scale items, including percentages, mean, median, standard deviation, and range. Significance was assessed at a 95% confidence interval, with a $P = 0.05$ considered significant. Participants' responses to open-ended questions were subject to thematic analysis manually. Initially, descriptive codes were assigned to each response. These codes were then organized to identify overarching themes and subthemes within the data.

Ethical statement

The study adheres to ethical standards, ensuring participant consent, confidentiality, anonymity of data, and approval from the institutional ethics committee (HFW/ME/DYSPGMC/IEC/2024-19). The present paper is a fragment of experiential findings of online ML Web discussion, which is a part of the FAIMER Fellowship Course Program. The written permission was obtained from the Director of the concerned FAIMER institute for the publication of the findings of the conducted activity.

Results

Among all who participated in the study, 37% were males and 63% were females. Out of the 32 participants, 13 (41%) were from clinical disciplines, 14 (43%) participants had pre- and paraclinical qualifications, and 5 (16%) participants were in allied health sciences. All study participants had a teaching experience ranging from

8 to 15 years as faculty members. There were 658 e-mails exchanged in response to the online weekly tasks for asynchronous discussions during the moderation month.

Task 1: Narrative Writing

The results of the thematic analysis of the responses are depicted in Table 1.

Task 2: Interactive Concept Mapping

Participants in the study utilized an Interactive Concept Map with Fill-ins to address common classroom challenges. They frequently utilized ALTs aimed at enhancing learning outcomes in classroom teaching. Pooled data from participants' responses identified ALTs in different categories; 20 of them for fostering collaborative learning, 26 for enhancing classroom engagement, 12 for assessment of prior knowledge, 10 for note-taking during lecturing, 18 for inability to relate to real-life situations, and 20 for poor metacognition skills [Supplementary Table 1]. The participants mentioned the top 3 ALTs in each of the 4 categories mentioned in Figure 1.

Task 3: Virtual Jigsaw Method and Think- Pair-Share

The discussions focused on four categories of ALTs: peer connections, enhancing continuous engagement, promoting reflective practices, and posing questions, and the responses by participants engaged through online jigsaw activity

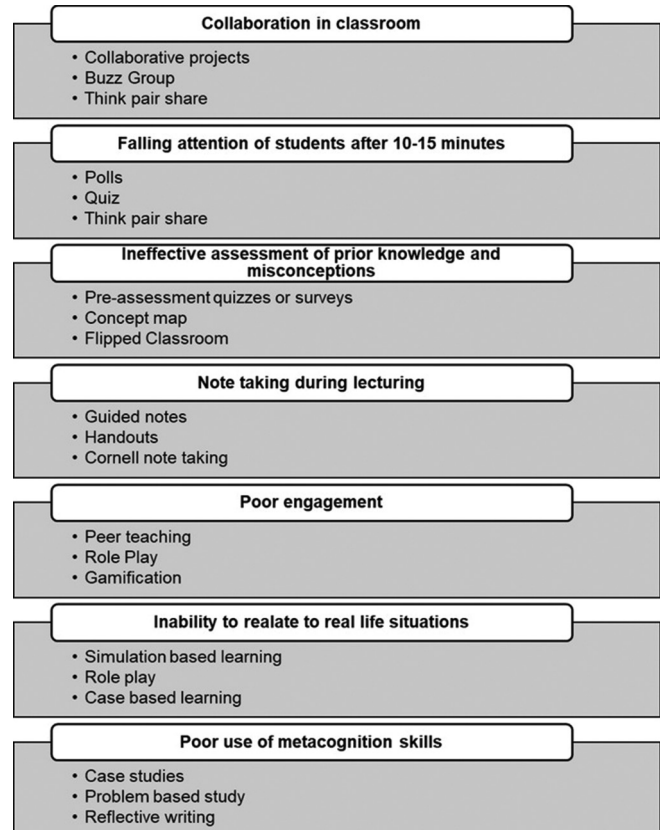


Figure 1: Frequently used Active Learning Techniques for addressing teaching-learning challenges

were analyzed to identify various ALTs listed under each category depicted in Figure 2 and Supplementary Table 2.

Task 4: Retrospective Speedboat Analysis

The study participants cited major challenges in ALS implementation as lack of trained faculty 29 (91%), lack of faculty motivation 27 (84%), resource constraints 26 (81%), time constraints 25 (78%), student resistance 24 (75%), and administrative resistance 22 (69%). The suggested solutions emerged as themes mentioned in Figure 3.

Task 5: Feedback and Reflection

Figure 4 depicts the ranking of 11 ALS explored in the discussion based on ease of use on a 5-point Likert scale (5 – very difficult, 4 – difficult, 3 – moderate,

2 – easy, and 1 – very easy). There was no statistically significant association observed on Chi-Square test between the ranking order of ALTs and variables, such as gender, years of experience, or department affiliation.

The analysis of the feedback indicated that a significant number of participants perceived the ML web-based discussions as effective and well-executed in terms of content clarity (93.3%), relevance (94.1%), mentor support (82.3%), and session pace (81.9%) and a substantial improvement in participants' understanding and proficiency in ALS following the ML web discussion was reflected in terms of their self-perceived enhancement of knowledge, confidence, and awareness of ALS and its techniques. The pre- and post-session mean scores showed a statistically

Table 1: Thematic analysis of responses by study participants on needs and scopes of active learning

Theme/s	Code/s	Verbatim responses
Enhanced student engagement	Cognitive engagement	"The classrooms are lively, with an actively engaged and interested audience"
	Interpersonal skills development	"Students are taking ownership of their learning"
Real-world application	Application of theoretical concepts	"Students emphasized that they learn most effectively when collaborating with their peers"
	Problem-solving skills development	"Encourages lateral thinking and links theoretical concepts to real-world applications"
Continuous learning and development	Professional development	"It cultivates the problem-solving capacity of the learners, fostering a more holistic and impactful educational experience"
	Adaptive learning technologies	"Instilling a mindset of continuous learning, encouraging learners to stay curious"
		"Virtual simulations, and digital platforms, keep learners updated on technological advancements"

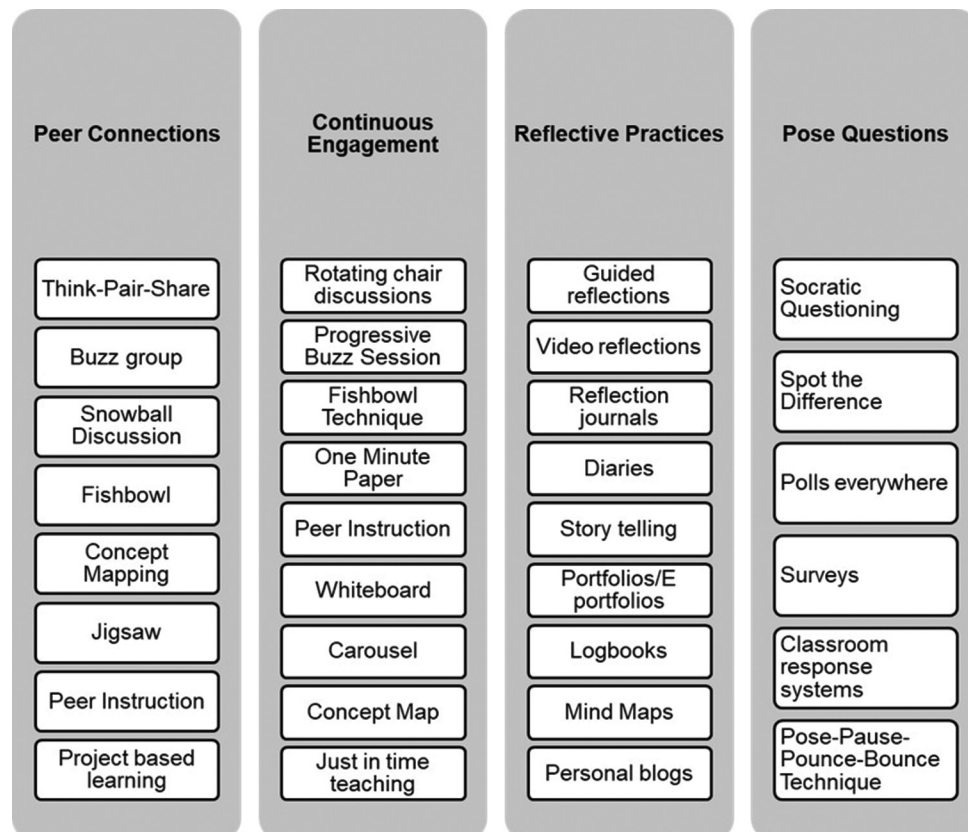


Figure 2: List of Active Learning Techniques (ALTs) under various ALSs as perceived by study participants

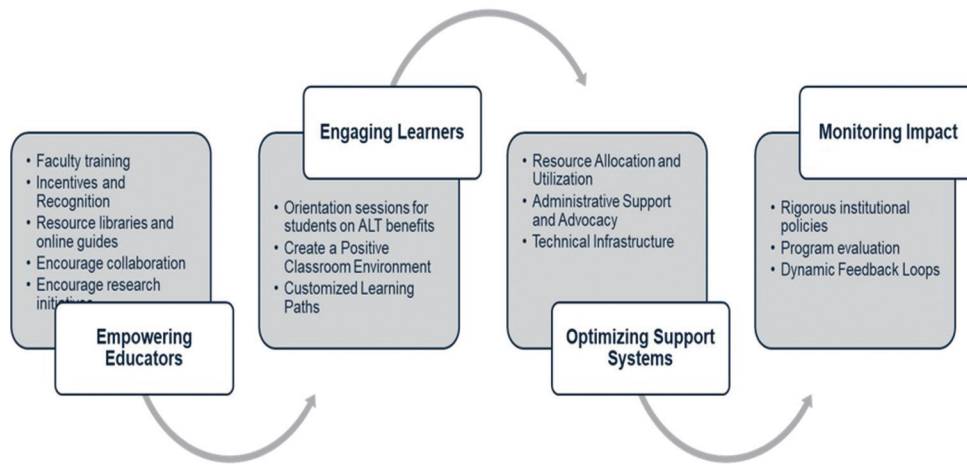


Figure 3: Thematic analysis of recommendations by participants for effective implementation of Active Learning Strategies

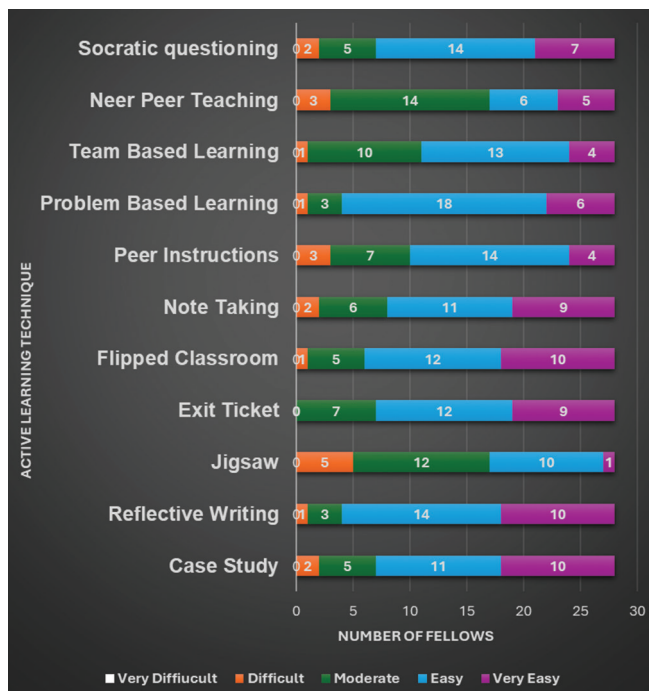


Figure 4: Ease of implementing Active Learning Strategies by study participants on 5-point Likert scale

significant difference ($P < 0.001$) with a gain in awareness from 4.91 to 8.41, confidence from 5.93 to 7.97, and knowledge from 4.56 to 8.16 on ALS. The mean score for the quiz was 11.24 out of the total maximum score of 15.

Discussion

The present study delved into the perspectives of medical educators regarding various aspects of ALS. Utilizing a dual approach for gaining insights, the study yielded enriching data, offering a comprehensive understanding of knowledge, attitudes, challenges, and usage of ALS. The implementation of the “role reversal” approach in the ML web session facilitated a unique shift in perspective, enabling educators to grasp crucial aspects of ALS by

experiencing them as both learners and teachers. This immersive approach provided educators with valuable insights into the strengths and limitations of ALS from the student’s viewpoint, enhancing their ability to reflect on and evaluate these strategies effectively. Furthermore, the study provided practical insights to identify key challenges in the effective implementation of ALS and proposed potential solutions.

The study participants’ narrative description of their undergraduate experiences as students and their current roles as faculty teaching the millennial students demonstrated a significant transformation from traditional, teacher-centered teaching methods to student-centered approaches. An important catalyst for this change has been the adoption of ALS in medical education. “Narrative Description,” is a higher-order technique that stimulates critical thinking and promotes active learning.^[4,17,18] Similarly, through the process of creating a “concept map,” learners identifies key concepts, clarify relationships between them, and articulate their own interpretations.^[11,19] This engagement enhances comprehension by encouraging critical thinking, synthesis of information, and the application of prior knowledge, thereby deepening understanding. The virtual jigsaw method and think pair share foster active learning by engaging study participants in collaborative research, critical discussion, and the synthesis of diverse perspectives.^[4,20,21] The responses from collaborative discussions among participants were analyzed under four categories from data gathered during an online jigsaw activity. Retrospective speedboat analysis involves reflecting on challenges (anchors) that have impeded progress or achievement of goals. It requires identifying these barriers and then brainstorming solutions (adjusting motors) to overcome them.^[22] This self-analysis promotes active learning by encouraging reflection, problem-solving, and enabling more effective strategies for future endeavors. They emphasized the pivotal role of ALS in the learning process, highlighting its effectiveness in fostering critical

thinking, enhancing collaboration, and establishing relevance to real-world scenarios ALS has a significant role in promoting active engagement and problem-solving abilities.^[2,4,23,24]

It has been rightly said by Bernstein that rather than questioning the effectiveness of age-old ALS, the instructors should focus on identifying the most effective techniques for given particular circumstances.^[25] In the face of selecting the most appropriate ALTs, medical educators encounter a notable challenge because of the array of options available.

The findings from the study revealed various ALTs for common teaching challenges faced by study participants in their settings. Each participant offered a unique set of techniques, echoing existing research and highlighting the absence of a “one-size-fits-all” approach. Educators must discern the most suitable methods to fulfill their teaching objectives and cater to the diverse learning behaviors of students.

According to Sytnik, to enhance active learning’s effectiveness, teachers must select teaching methods and consider the students’ behavior styles that make active learning effective.^[26]

In McCoy’s study, the influence of faculty preferences on selecting specific ALS was found despite participants’ familiarity with 25 listed active learning methods.^[7] The present study noted that ALTs like discussion/debate were the most frequently chosen technique, whereas annotations or notes were the least preferred by the participants.

In our study, variability in the ease of implementation was observed among the 11 common ALSs, with no correlation with the sociodemographic factors; the findings suggest that preferences for ALTs vary widely among educators, emphasizing the importance of considering personal preferences, proficiency, and teaching styles when selecting ALTs.

Heck found that preferences of ALTs varied personally and even based on gender. They found that men utilized a wider range of active learning modalities compared to women ($P < 0.0036$) and reported less frequent use of educational games than women ($P < 0.031$).^[6]

A survey by AlRuthia *et al.* for faculty members in healthcare institutions of 17 Middle Eastern countries found that institutional funding did not affect the choice of active learning methods.^[27] However, they did find that ALTs were used more frequently by female responders. Similarly, the current study observed that the availability of resources and feasibility at the institution had influenced their choice of ALS selection and implementation.

These insights underscore the need for educators to adopt a flexible approach in integrating ALS and ALTs into their teaching practices, ensuring alignment with their

instructional goals and adapting to the diverse needs of both educators and students.

This study revealed that specific ALTs, such as buzz group, think-pair-share, mind map, and concept map, have been employed by participants to address various aspects of active learning, including engagement, collaboration, and reflection. This discovery holds significance for medical educators, emphasizing the importance of identifying such multifaceted ALS that could be effectively implemented across diverse educational settings. Utilizing ALTs with multiple benefits reduces the necessity for extensive resource development and faculty training for each individual ALT, streamlining the implementation process.

Notably, the majority of study participants identified faculty-related factors as major challenges to the implementation of ALS, followed by challenges from students and administration. Addressing the primary obstacles of lack of trained faculty and lack of faculty motivation requires utmost attention and remediation. Participating in faculty development programs on ALS equips educators with essential knowledge, skills, and confidence to effectively apply these strategies in their teaching practice.

The findings of this study are consistent with Heck’s research, which highlighted that a majority of faculty identified familiarity with lecture-based methods (74%), insufficient training (65%), and limited time for material development (57%) as primary barriers to adopting active learning.^[6]

Similarly, Miller and Michael identified a perceived lack of training (22%) and insufficient time to prepare materials (33%) as significant obstacles to active learning implementation.^[28] Faculty members’ lack of motivation may arise from various factors, including a fixed mindset, a lack of enthusiasm for innovative approaches.^[7]

The successful implementation of ALTs hinges significantly on strategic focus areas: empowering educators, engaging students, and optimizing support systems. Further, continuous evaluation and adaptation of these strategies are crucial for integrating ALTs effectively within educational settings.

Desselle’s research further underscores this point, suggesting that faculty members actively engaging in professional development programs are more inclined to integrate ALS into their lectures effectively.^[29]

Furthermore, actively engaging students in their learning creates a conducive environment that amplifies the effectiveness of any ALTs. Understanding the need and aligning it with suitable ALT is crucial as far as effective teaching–learning is concerned. In addition, due consideration of learning styles should be given to tailor ALS effectively.

Prashanti and Ramnarayan explored the ten maxims for creating a safe learning environment. They stated that irrespective of the generation to which the student belongs, the learning environment is pivotal for determining the students' learning abilities.^[30] It is evident that by cultivating an atmosphere where students feel comfortable and valued, educators can foster greater engagement, collaboration, and ultimately, more effective learning outcomes.

Conclusion

This ML web session achieved its learning objectives due to meticulous preparation, strong participant motivation, valuable resources, and insightful peer interactions, collectively enhancing participant learning. The study highlights a mixed perspective of medical educators on ALS. Although ALS was perceived as effective in fostering critical thinking and developing collaborative learning among students, various challenges necessitated robust faculty development initiatives. Despite numerous external factors, such as infrastructure, funding, and institutional support, the personal preferences of teachers wield significant influence on the choice of ALTs. Addressing implementation barriers to ALS demands targeted interventions and a robust monitoring system. Moreover, nurturing a culture that values and promotes commitment and collaboration among all stakeholders within the medical education system is crucial for the successful integration of ALS into the curriculum.

Limitations

One significant limitation of our study was the relatively small sample size of 32 study participants. This limited sample size may affect the generalizability of our findings and the reliability of statistical analyses. In addition, our study focused on a specific subset of ALS, while omitting others that could potentially contribute valuable insights. This limitation suggests that our findings may not fully capture the range of ALTs available, thus constraining the length and breadth of our conclusions.

Data availability statement

The data will be shared at a reasonable request.

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Conflicts of interest

There are no conflicts of interest.

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Supplementary Table 1: Pooled participant response on active learning techniques for common classroom teaching–learning challenges

Common classroom teaching-learning challenges	Number of ALTs	Frequently utilized ALTs
Assessment of prior knowledge	12	Concept map, conceptual questions, exit tickets, know (K), what they want to know (W), and what they learned (L) charts, mind maps, 1-min papers, peer evaluation, picture prompt, pretest entry slip, quick write up, think-aloud protocols
Developing metacognition skills	20	Debates, learning journals, narrative writing, observed structured clinical examination, optimist/pessimist, peer feedback, portfolios, problem-solving scenarios, projects, reflections, role play, role reversal (teacher as learner), rubrics/criteria, Socratic dialog, storytelling, strategy instruction, think-aloud strategies, think-pair-share
Enhancing classroom engagement	26	Brainstorming, case studies, collaborative online tools, debate, experiential learning, flipped classroom approach, gallery walks, gamification, interactive polling systems (e.g., clickers), inquiry-based learning, live demonstrations, online collaborative platforms, pass the pointer, PBL, PBL, punctuated lectures, reflective journals, reverse Socratic questioning, role-playing exercises, Socratic questioning, simulations, student-led seminars, trigger films (cinema education), and VR
Fostering collaborative learning	20	Buzz group, collaborative projects, debates, field visits, fishbowl, jigsaw technique, online collaborative tools, peer teaching, quiz, research, role play, round robin, service learning, snowballing, student-led seminars, team-based learning, think-pair-share, PBL, flipped classroom approach, simulation-based learning, peer teaching, and service learning
Note taking during lecturing	10	Charting method, concept map, Cornell method, flow diagram, outline method, paragraph shrinking, REAP method, sentence method, SQR3, and Q/E/C
Relating to real-life situations	18	Case-based learning, community-based projects, conferences, debates on current issues, early clinical exposures, field-based learning, guest speakers, IPE, journal club, problem-based scenarios, real data/lab reports use, role-playing real-life situations, service learning, simulations, video case studies, virtual internships, virtual simulations, and workplace simulations

PBL: Project-based learning; IPE: Interprofessional education; SQR3: Survey question read recite review; Q/E/C: Question/evidence/conclusion method; REAP: Read, encode, annotate, ponder; VR: Virtual reality; ALTs: Active learning techniques

Supplementary Table 2: Active Learning Techniques Overview

ALT	Steps involved	Potential benefits	Limitations	Logistics
CONTINUOUS ENGAGEMENT				
Rotating chair	Participants rotate between discussion chairs Each rotation addresses a specific aspect of the topic	Encourages diverse perspectives Encourages students to listen actively to a selected speaker and encourages communal dialogue	Difficult to conduct in the large group A constant vigil was needed Discussion can become off-track Time management Unfocussed discussion	Requires a physically adaptable room setup for rotating seats
Progressive buzz	Individual reflection Sharing with partner Group formation Whole-class discussion	Gradual sharing of ideas Promotes active engagement	Time management Clear discussion prompts needed	Structured progression, requiring designated time for each step
PP	Students were asked to analyze a problem posted by the teacher Pause period is allowed to think and analyze	Analytical thinking improved No extra time is required Not resource intensive	Pauses may be placed at nonstrategic points Unduly long pauses can cause distraction from the topic Ineffective utilization of the pause	
1 min paper	Briefly jot down thoughts on a specific question Share responses with a partner or small group Discussion on the question posed	Can get feedback instantly for improvement Reflection on Individual Performances Quick to administer	Difficult to prepare questions that can be immediately comprehended Analysis of the answers may be time-consuming May not capture in-depth understanding Some students may need more time for thoughtful responses	Need paper or digital devices for writing
Just-in-time teaching	Preclass preparation by students In-class assessment of understanding Immediate feedback	Real-time adaptation of teaching Enhances student–teacher interaction	Requires diligent preclass preparation Immediate customized feedback is difficult	Requires a system for preclass materials and mechanisms for real-time feedback
Whiteboard method/ group writing method	Students are organized into groups The teacher introduces a topic or idea Each student writes their initial thoughts Students read and add to each other's responses Papers circulate, refining ideas with each pass Collaboration enhances understanding and perspective	Encourage critical thinking Keep students attentive and invested in learning Collaborative learning	Time constraints Limited discussion time Uneven participation Dependence of initial idea	Spacing arrangement for passing paper Timekeeper and adequate supply of writing material

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Supplementary Table 2: Contd...

ALT	Steps involved	Potential benefits	Limitations	Logistics
Mind map	Identify a central theme or idea Connect ideas with lines Explore relationships in learning	Visual representation of ideas Enhances creativity and nonlinear thinking Promotes meaningful organization related to topics	Complex maps may be challenging to interpret May not be suited to all learned styles or topics	Personal writing space (digital or physical)
Carousel	Chart placed to create stations on different topics Groups rotate between stations and respond (write on charts) in each station At the end, all assemble for discussion	Students are exposed to various perspectives Enhances student accountability Physical movement invariably involve all learners	Encourage passive consumption of information Lack of sufficient space in the classroom to accommodate multiple stations and student movement	Requires space with designated stations and a clear rotation schedule
POSE QUESTIONS				
Socratic questioning	Pose open-ended questions Encourage individual responses Pass the question to the next until desired response is random calling using a popsicle/index card	Encourages exploration of diverse perspectives Develops analytical and reasoning skills	Requires skillful facilitation to guide discussions May face resistance in open discussions Some overconfident students may dominate the class	Learning space Audio video aids Question guide Popsicles/index cards
Spot the difference	Demonstration of error-free procedure Demonstration of performance with errors Spot the difference between the two Ask the students to perform the procedural skill Assessment	Enhances visual discrimination skills Triggers recall Promotes engagement Develop communication skills Challenging and capture the interest of students	Time constraints Uneven participation	Images of questions Multimedia
Pose-pause-pounce-bounce	Pose a question to the entire group (pose) Allow a pause for individuals to think (pause) Select a student to answer (pounce) Bounce the question to another student for additional input	Encourages active listening and participation from all students Encourage pause for thinking Promotes quick thinking and responsiveness	Some students may feel pressured during the “Pounce” phase Timing can be challenging, ensuring equitable participation	Requires a well-managed classroom environment
Survey	Survey with multiple formal questions shared Collect and analyze Provide feedback	Flexible question formats Anonymous response possible	Delayed feedback Lack of real-time interaction	Survey creation and distribution tools (online platforms, paper surveys)
Classroom response system	Pose a question Students use polling devices to respond The immediate result is displayed	Real-time monitoring of learning Encourage gauging of gaps of knowledge immediate Increase student engagement	May not provide in-depth responses Potential for technical issues	Classroom response system or polling tools (clickers, online platforms, etc.) Technical support in case of issues

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Supplementary Table 2: Contd...

ALT	Steps involved	Potential benefits	Limitations	Logistics
REFLECTIVE PRACTICES				
Guided reflections	Provide structured prompts Provide guidance on specific areas of reflection	Focuses on specific learning objectives An aligned approach helps learner to identify strengths and weakness in the target areas	Limits development of independent reflection Reflections may lack diversity	May require predetermined topics and structured prompts Personal writing space (digital or physical)
Video reflections	Set up recording equipment and environment Review and edit the video if necessary Consider privacy and copyright concerns before sharing	Concrete and retrievable record Evidence-based reflection increases the acceptability of feedback Captures nonverbal cues and emotions	Time-consuming for recording and editing Privacy concerns and hesitancy to share Technical issues (equipment, software, etc.)	Requires video recording equipment, good lighting, and video editing tools
Reflective journals	Set aside time for daily reflection Identify the theme of the learning experience Write freely about experiences, thoughts, and feelings	Enables personal daily reflections Insightful and unique individual perspective	Reflects the writer's style Lacks standardization Lacks focus	Can be done in a physical journal or digitally through various apps
Blogs	Assign reflection topics or questions for each post Students write reflections and publish them on their blogs. Encourage students to read and provide constructive feedback	Allows students to express thoughts and experiences Facilitates learning through reading and commenting on peer's	Students might be hesitant to share personal reflections Assessing subjective reflections can be time-consuming Technical challenges	User-friendly platform accessible to all students Offer assistance for any technical issues that may arise
Vlogs	Choose a platform for blogging or vlogging Plan content and structure for each post or video Consider ethical issues before sharing	Allows public sharing of reflections A platform for ongoing dialogue and feedback	Requires high technical expertise May not accommodate all teaching styles Time-consuming	Online platforms, high-quality technical equipment, careful consideration of recording environments
Storytelling	Identify a relevant experience to share Share the story with, either verbally or in writing	Bridges the worlds of patients and doctors Evoke emotions and create deeper connections Insight into lived in experiences makes them personalized and unique	Time-consuming for developing narratives Different reader interpretations Lack of objectivity	Requires a platform for sharing stories, or an online blog
Portfolios	Continuously reflect on the learning task Organize into categories to identify progress or pattern	Reflects progress and growth of the learner	Time-consuming for busy learners	Digital platforms or physical folders
Logbook	Experience a task/activity Analyze thoughts and reactions Conclude and summarize the insights	Chronological documentation Efficient for quick note-taking	Limited depth in reflective thoughts Limited space for in-depth reflections	Journaling apps or notebooks

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Supplementary Table 2: Contd...

ALT	Steps involved	Potential benefits	Limitations	Logistics
PEER CONNECTIONS				
Think pair share	The teacher presents a question or problem Students think individually Students discuss in pairs Pair share their thoughts	Fosters collaboration and communication skills Builds critical thinking and listening skills	Unequal participation: Some students may dominate discussions Limited depth: Surface-level discussions may occur	Textbooks and educational resources
Jigsawmethod	Students become experts on a topic Each group has one expert on each topic Students share their expertise	Promotes in-depth understanding Enhances teamwork and cooperation	Unequal preparation: Some students may not contribute equally to their group Time-consuming Miscommunication	Displaying visual aids, presentations, or multimedia content
Fishbowl	Arrange students in two circles – an inner circle and an outer circle Pose a question related to the topic The inner circle engages in a focused discussion, and answers The outside circle observes and takes notes on the discussion After a set time, switch roles Pose another question and repeat the process	Promotes focused discussion Facilitates peer learning	Clear discussion guidelines are needed May be intimidating for some students	Requires a suitable seating arrangement for both inner and outer circles
Projects	Define the project's goals and objectives Students plan their approach to the project Students execute the project plan	Develops critical thinking and problem-solving skills Promotes creativity and innovation	Group dynamics: Potential for conflicts within teams Assessment challenges	Access to books, articles, and online resources for project research

PP: Pause procedure, ALT: Active learning technique