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Active methodologies in medical education: between pedagogical innovation and the persistence of the lecture.

Active methodologies in medical education: between pedagogical innovation and the persistence of the lecture-based class.

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Summary.
Active learning methodologies have gained significant relevance in the last decade, and their incorporation into syllabi has become frequent or mandatory in certain contexts. Even so, their implementation in the classroom does not always replace traditional lecture-based teaching, which continues to occupy an important place in the organization of learning. **Objective.** To describe the perception and experience of seventh-semester undergraduate medical students regarding the use of active learning methodologies in the teaching-learning process. **Methods.** A descriptive, cross-sectional, observational survey study was conducted in March 2026 with seventh-semester medical students at the Catholic University of Cuenca, Ecuador. A census was conducted, and 104 valid questionnaires were analyzed. Data collection was carried out using an online self-administered form with sociodemographic questions, multiple-choice questions, frequency scales, and Likert-type scales, designed to explore classroom experience, participation patterns, perceived barriers, and format preferences. **Results.** The lecture format was predominant in the last semester (54.8%) and also the most valued for addressing complex topics (47.1%). However, students recognized significant benefits of active learning methodologies: 84.6% considered them helpful in identifying knowledge gaps, 64.4% perceived them as beneficial for fostering clinical thinking, and 78.8% positively valued the feedback received. The main barrier to participation was the fear of making mistakes (53.8%). Furthermore, 78.8% reported having avoided speaking up for fear of making mistakes at least a few times, and 76.9% reported leaving class with unresolved questions or perceiving the pace of the class as too fast. **Conclusions.** Student perceptions of active learning methodologies were nuanced and not limited to absolute acceptance or rejection. The findings point to the desirability of hybrid learning sequences that integrate lectures, guided activities, concrete feedback, and psychologically safe conditions that promote more authentic participation.

Keywords: active learning, undergraduate medical education, medical students, teaching, learning.

Abstract.
Active methodologies have gained considerable relevance over the past decade, and their incorporation into course syllabi has become mandatory. However, their implementation in the classroom does not always displace traditional lecture-based teaching, which continues to play an important role in the organization of learning. **objective.** To describe the perception and experience of seventh-cycle undergraduate medical students regarding the use of active methodologies in the teaching-learning process. **Method.** An observational, descriptive, cross-sectional survey study was conducted in March 2026 among seventh-cycle medical students at the Catholic University of Cuenca,

Ecuador. A census-based approach was used, and 104 valid questionnaires were analyzed. Data were collected through an online self-administered form that included sociodemographic questions, multiple-choice items, frequency scales, and Likert-type items aimed at exploring classroom experience, participation patterns, perceived barriers, and format preferences. **Results.** The lecture-based class was the predominant format during the previous academic cycle (54.8%) and was also the most valued format for addressing complex topics (47.1%). However, students recognized relevant benefits of active methodologies: 84.6% considered that they help identify knowledge gaps, 64.4% stated that they promote clinical reasoning, and 78.8% positively valued the feedback received. The main barrier to participation was fear of making mistakes (53.8%). In addition, 78.8% reported having avoided speaking due to fear of making mistakes at least sometimes, and 76.9% reported either leaving class with unresolved doubts or perceiving the pace of the class as too fast. **Conclusions.** Students' perceptions of active methodologies were nuanced and were not limited to absolute acceptance or rejection. The findings suggest the need for hybrid teaching sequences that integrate teacher-led exposition, guided activities, concrete feedback, and conditions of psychological safety that promote more authentic student participation.

Keywords: active learning, undergraduate medical education, medical students, teaching, learning.

1. Introduction

University medical education is shifting from models focused on knowledge transmission to student-centered, participatory approaches that promote the active construction of learning and the development of competencies applicable to complex clinical contexts. Within this framework, active methodologies foster situated learning, decision-making, and meaning-making—aspects that are especially relevant in environments with high cognitive and emotional demands (1-2). Furthermore, the need to complement traditional teaching with experiences that strengthen student motivation, curiosity, creativity, and engagement has been raised (3-4). These strategies include guided discussion, case-based learning, collaborative work, the flipped classroom, and simulation.

Despite this, lecture-based classes continue to predominate in many universities due to factors such as curriculum organization, assessments focused on declarative knowledge, and institutional dynamics that are unfavorable to change (5-6). Furthermore, they are often considered more viable in large groups and extensive curricula, especially when instructors have limited resources for designing active learning activities (7). However, their dominance has been questioned due to their limitations in developing skills such as clinical reasoning, communication, collaboration, and autonomous learning (8). Although several reviews show potential benefits of participatory methodologies, they also point to the need for a better understanding of the conditions of implementation and their actual effects on learning (9).

The current debate is not simply a matter of choosing between lectures and active learning. Some studies show that well-structured traditional approaches can be associated with better results in certain assessments and with medium-term knowledge retention (10-11). Therefore, it is proposed to integrate both approaches through hybrid designs that combine the presentation of complex concepts with activities aimed at applying knowledge, analyzing situations, receiving feedback, and developing professional skills (12). In higher education, this integration requires planning that is consistent with the expected learning outcomes (13).

The implementation of active learning methodologies faces multiple barriers. Among the most frequent are the lack of time to prepare materials, group size, limited institutional support, and insufficient teacher training (14). Resistance to change, technological limitations, difficulties in generating participation, and fear of making mistakes have also been identified, factors that affect collaborative work and student engagement (15). Furthermore, new generations expect multimodal

learning experiences oriented toward the development of competencies, which challenges exclusively expository models (16). In Medicine, moreover, increasing absenteeism from lectures and greater use of self-directed learning resources have been described (17).

Student perception is fundamental because the acceptance of a methodology depends not only on its theoretical effectiveness but also on the quality of its implementation. Aspects such as clear instructions, teacher support, equitable participation, coherent assessment, and psychological safety influence the learning experience. Furthermore, student preferences vary according to the discipline, the level of study, the institutional culture, and prior experiences (18-19). Understanding these preferences is important for maintaining motivation and academic engagement (20). In Medicine, factors such as learning styles and preferences for more conceptual or more participatory approaches also influence how these methodologies are experienced (21).

Psychological safety is understood as the perception that the environment allows one to ask questions, express doubts, or make mistakes without fear of humiliation or reprisals. In medical education, this condition fosters authentic participation and the formative use of error; its absence can generate silence and superficial participation, even in active activities (31-32).

This study aims to describe the perceptions and preferences of seventh-year medical students regarding the use of active learning methodologies, identifying participation patterns, perceived barriers, and formats that facilitate the learning of complex topics. Its purpose is to provide local evidence that will allow for the design of realistic hybrid proposals that integrate lectures and meaningful participation, in accordance with current medical training recommendations (6). Although active learning methodologies are proposed to strengthen analysis, decision-making, and the transfer of knowledge to clinical settings, the lecture continues to occupy an important place in medical education. Therefore, it is necessary to understand how students experience these methodologies, what factors favor or hinder their participation, and which formats they consider most useful for learning complex content. The lack of this information can lead to designs poorly suited to the classroom reality, superficial participation, or the persistence of barriers such as fear of making mistakes, low participation, and lack of feedback. Furthermore, there is limited evidence that simultaneously integrates teaching preferences, participation patterns, perceived barriers, and psychological safety conditions, particularly among Ecuadorian medical students in their intermediate and advanced years. The research question we posed is: How do seventh-year undergraduate medical students perceive and experience the use of active learning methodologies, and what participation patterns, perceived barriers, and format preferences emerge for learning complex topics?

Therefore, the objective has been to describe the perception and experience of seventh cycle undergraduate medical students regarding the use of active methodologies, identifying participation patterns, perceived barriers and format preferences for learning complex topics.

2. Methods

A descriptive, cross-sectional, observational survey study was conducted in March 2026 in the Medicine program at the Catholic University of Cuenca, Ecuador. Data collection coincided with the start of the March-August 2026 academic term and was integrated as an initial diagnostic assessment to describe students' perceptions and experiences with the use of active learning methodologies in the teaching-learning process. The aim was to include all students enrolled in their seventh semester; therefore, the invitation was intended to be a census, and no prior sample size calculation was performed. However, participation was contingent upon voluntary acceptance of the informed consent form and completion of the questionnaire; consequently, the 104 cases analyzed constitute a non-probability sample based on voluntary participation. To reduce the possibility of coercion,

participants were informed that participation was anonymous, would have no academic repercussions, and that the results would be analyzed in aggregate. Even with these measures, self-selection bias cannot be ruled out, since those who decided to respond may differ from those who did not participate.

The instrument was administered via a Google Forms form, shared through the Virtual Teaching-Learning Environment (EVEA) before the formal start of the course. Participation was individual, self-administered, and online. The form began with general information about the study and a digital informed consent form. Students were informed that participation was voluntary, that they could choose not to respond without academic repercussions, and that the estimated completion time was 5 to 10 minutes. The instrument was developed by the researchers and was designed to explore students' perceptions of active learning methodologies and their classroom experience. It consisted of 28 items distributed across the following categories: 1) sociodemographic characteristics (5 items), including sex, region of origin, area where they lived most of their life, current job, and caregiving responsibilities for family members or children; 2) recent pedagogical experience and classroom context (5 items), in which the predominant class format in the last cycle was investigated, the usual behavior in activities or discussions, the reaction to the lack of prior preparation, the main barriers to participation and the format considered most useful for learning complex topics; 3) frequency of behaviors and difficulties during the educational experience (7 items), with an ordinal scale of five categories from "never" to "almost always", to explore predominantly receptive participation, requirement of verbalization of reasoning, prior review of material, perception of accelerated pace, persistence of doubts, avoidance due to fear of making mistakes and uncertainty regarding the evaluation; 4) perception on the usefulness and requirements of active methodologies and expository classes (9 items), valued using a five-point Likert scale from "totally disagree" to "totally agree"; and 5) experience of teacher clarification and feedback (2 dichotomous items), referring to requests for clarification during the class and receipt of concrete feedback on performance.

The instrument was developed specifically for this study, based on the research objective and the dimensions considered relevant for describing the student experience with active learning methodologies. Prior to analysis, it underwent a technical and content review by the co-author, a Full Professor II at the National University of Education and director of the TRENDS research group, who has expertise in quantitative research and statistical analysis. The review focused on assessing the items' alignment with the study objective, the clarity of the wording, the appropriateness of the response categories, and the consistency of the coding. Validation was not performed using an external panel of experts, nor was a content validity index calculated; therefore, this procedure is considered an internal expert review and not a formal psychometric validation. Due to the heterogeneity of the response formats, an overall coefficient for the 28 items was not calculated. As a complementary analysis, the internal consistency of the block of nine Likert-type statements was examined, yielding a Cronbach's alpha of 0.742. This result was interpreted as an exploratory indicator of the block's internal consistency and not as evidence of unidimensionality or comprehensive validation of the instrument. The study's main variables were perceptions of active methodologies and classroom experience, participation patterns, perceived barriers to intervening in class, and prior preparation of materials. Secondary variables included preferred formats for addressing complex topics and the cohort's sociodemographic characteristics.

For statistical analysis, categorical variables were summarized using absolute frequencies and percentages. Ordinal and Likert-type items were described using measures of central tendency and dispersion, including mean, standard deviation, median, and interquartile range. Additionally, exploratory bivariate analyses were conducted to identify differences in some perceptions and experiences according to sex, current job, caregiving responsibilities, and feedback received. The

Mann-Whitney U test was used to compare ordinal variables between two groups, and Spearman's rho coefficient was used to explore associations between selected ordinal variables. Inferential results were interpreted with caution due to the cross-sectional nature of the study, the non-probability sampling, and the primarily descriptive purpose of the research. A two-tailed significance level of α = 0.05 was adopted. Tabulation, descriptive analyses, internal consistency, Mann-Whitney U tests, and Spearman correlations were performed using GNU PSPP version 2.1.1.

Ethical and regulatory aspects. The study was not submitted to an ethics committee for review. An anonymous, minimal-risk survey was administered, without the collection of personal identifiers or clinical data. Participation was voluntary and preceded by digital informed consent. Names, identification numbers, and personal email addresses were not requested in order to safeguard confidentiality and anonymize the information from the outset. Participants were expressly informed that the decision to participate or not would have no academic, evaluative, or teaching-related consequences. The data were used exclusively for research purposes and reported in aggregate form.

3. Results

One hundred and four complete questionnaires were analyzed, with no missing records. The sociodemographic characteristics of the sample are presented in Table 1. The majority of participants were female (73.1%), came from the Sierra region (73.1%), and resided in urban areas (83.7%). Additionally, 16.3% of the students reported currently working, and 11.5% indicated having caregiving responsibilities for family members or children.

Regarding recent teaching experiences, the predominant class format in the last semester was the lecture, reported by 54.8% of participants, followed by case-based learning (26.0%) and group work with a final product (10.6%) (Table 2). When the class included practical activities or discussions, more than half of the students (54.8%) indicated that they usually waited to understand the material before participating, while 21.2% reported only participating if asked, and 12.5% preferred to work silently and listen. Only 10.6% reported participating from the beginning. In the absence of prior review of the material, 47.1% indicated that they could only follow the class partially and with gaps in their understanding, while 26.9% preferred to take notes and review them later on their own. The main perceived barrier to participation was fear of making mistakes (53.8%), followed by insufficient mastery of the topic at that time (21.2%). To address a complex topic prior to an assessment, the format considered most useful was teacher-led instruction with note-taking (47.1%), followed by brief lectures combined with guided exercises (22.1%). More clearly active formats, such as small group case studies, flipped classrooms, and simulations, were selected less frequently (Table 2).

Table 1. Sociodemographic characteristics of the sample (n = 104).

Variable	Category	n	%
Sex	Women	76	73.1
	Man	28	26.9
	Saw	76	73.1
Region	Coast	21	20.2
	East	7	6.7
Area where he lived most of his life	Urban	87	83.7
	Rural	17	16.3
Currently working	Yeah	17	16.3
	No	87	83.7
Take care of family members/children	Yeah	12	11.5
	No	92	88.5

Table 2. Classroom context, perceived barriers and preferred learning format.

Variable	Category	n	%
In the last cycle, the format that predominated in the classes was	Lecture (teacher speaks most of the time)	57	54.8
	Clinical case-based learning	27	26.0
	Group work with a final product (task/presentation)	11	10.6
	Guided discussion with questions from the teacher	7	6.7
	Flipped classroom (preliminary review + in-class application)	2	1.9
When the class includes practical activity or discussion, it is most common that you	Wait to understand first, then participate	57	54.8
	Participate only if you are asked.	22	21.2
	You prefer to work in silence and listen	13	12.5
	Participate from the beginning	11	10.6
	Delegate participation to others in the group	1	1.0
If you arrive at a class without having reviewed the material beforehand, you will most likely...	You continue partially, but with gaps	49	47.1
	Take notes and then review them on your own.	28	26.9
	Don't participate so you don't make a mistake	10	9.6
	You get lost in the activity and depend on others	8	7.7
	You can continue as before without any problem	5	4.8
	You get frustrated and disconnect	4	3.8
What situations make it most difficult for you to participate in class?	Fear of making a mistake	56	53.8
	Lack of time to prepare	13	12.5
	Insufficient mastery of the subject at that time	22	21.2
	Too big a group	4	3.8
	Preference for learning in silence	4	3.8
	Unsafe environment (fear of ridicule/judgment)	3	2.9
	Unclear instructions	2	1.9
For a complex topic, which format makes it easier for you to perform well on an assessment?	Teacher presentation + notes	49	47.1
	Brief presentation + guided exercises	23	22.1
	Clinical cases discussed in plenary	13	12.5
	Simulation/practical stations	9	8.7
	Case studies in small groups with a guide	5	4.8
	Flipped classroom (preliminary material + application)	5	4.8
In the last semester, did you ask for clarification or repetition of an explanation during the class?	Yes	59	56.7
	No	45	43.3
In the last cycle, did you receive specific feedback (what to improve and how) on your performance?	Yes	50	48.1
	No	54	51.9

The frequency items showed a predominantly receptive participation pattern (Table 3). In classes with activities, the most common behavior was listening and taking notes (M = 3.85; SD = 0.93; Md = 4; Q1-Q3 = 1.25), with 70.2% of responses falling into the "frequently" or "almost always" categories. In contrast, only 28.8% reported being frequently asked to explain their reasoning to the group. Reviewing the material beforehand was not a consistent practice: 68.3% indicated doing so "sometimes" or less frequently, and only 31.7% reported doing so "frequently" or "almost always." Similarly, 76.9% indicated that they sometimes perceived the pace of the class as too fast to keep up with the content, and the same proportion reported leaving class with unresolved questions at least sometimes. Likewise, 78.8% indicated that they avoided speaking for fear of making a mistake in

front of others at least sometimes, and 74.0% reported uncertainty about how an activity was rated at least sometimes.

Table 3. Frequency items on participation, prior preparation and difficulties in class.

Item	M	OF	Md	Q1–Q3	Frequently/Almost always, n (%)
In classes with activities, my participation was mainly listening and taking notes	3.85	0.93	4	3–4.25	73 (70.2)
I was asked to explain a line of reasoning to the group.	3.09	0.85	3	3–5	30 (28.8)
I reviewed the material before the class so I could follow the session.	3.14	0.81	3	3–4	33 (31.7)
I felt the pace of the class was too fast to keep up with the content	3.02	0.88	3	3–3.25	26 (25.0)
I left class with doubts that I couldn't resolve at the time.	2.96	0.75	3	3–3	22 (21,2)
I avoided speaking for fear of making a mistake in front of others	3.26	1.10	3	3–4	40 (38.5)
I felt uncertain about how an activity was graded	2.98	0.86	3	3–4	25 (24.0)

Note. M = mean; SD = standard deviation; Md = median; Q1–Q3 = interquartile range expressed as 25th and 75th percentiles. The response scale was from 1 = never to 5 = almost always.

Regarding perceptions of the learning experience, a dual assessment was observed between the structure of the lecture format and the formative value of active learning methodologies (Table 4). 59.6% agreed or strongly agreed that it is easier to identify main ideas when the teacher lectures (M = 3.72; SD = 0.92; Md = 4; Q1-Q3 = 1). However, only 44.2% reported being able to maintain their attention throughout a mostly lecture-based session without difficulty (M = 3.33; SD = 1.07; Md = 3; Q1-Q3 = 1). In parallel, classroom activities received favorable ratings in relevant formative dimensions: 84.6% considered that they help to detect knowledge gaps (M = 4.12; SD = 0.73; Md = 4; Q1-Q3 = 1), 64.4% indicated that they provide real opportunities to practice clinical thinking (M = 3.68; SD = 0.98; Md = 4; Q1-Q3 = 1) and 78.8% reported that the feedback received is useful to improve in the next activity (M = 4.04; SD = 0.89; Md = 4; Q1-Q3 = 1). However, tensions associated with participation were also identified: 41.3% expressed feeling more pressure or anxiety in participatory classes than in expository classes (M = 3.26; SD = 1.06; Md = 3; Q1-Q3 = 1.25), 42.3% acknowledged that they find it difficult to start work when cases or problems are used (M = 3.32; SD = 0.97; Md = 3; Q1-Q3 = 1), and 40.4% considered that their learning in group activities depends too much on the commitment of their peers (M = 3.23; SD = 1.14; Md = 3; Q1-Q3 = 2).

In the dichotomous block, 56.7% of students indicated that they had asked for clarification or repetition of an explanation during the class, while 48.1% reported having received concrete feedback on what to improve and how to do it (Table 2).

Table 4. Perception of lecture-based classes and active methodologies.

Item	M	OF	Md	Q1–Q3	Agree/Strongly agree, n (%)
When the teacher presents, I find it easier to identify the main ideas.	3.72	0.92	4	3–4	62 (59.6)
In group activities, my learning depends too much on the commitment of my	3.23	1.14	3	2–4	42 (40.4)

classmates.					
Class activities help me identify my knowledge gaps	4.12	0.73	4	4–5	88 (84.6)
In participatory classes, I feel more pressure or anxiety than in lecture-based classes.	3.26	1.06	3	2.75–4	43 (41.3)
In class, I have real opportunities to practice clinical thinking, not just memorize.	3.68	0.98	4	3–4	67 (64.4)
When using case studies or problems, I find it hard to get started because I don't know where to begin.	3.32	0.97	3	3–4	44 (42.3)
The instructions are sufficient for me to work independently.	3.62	0.95	4	3–4	61 (58.7)
The feedback I receive is useful for improving in the next activity	4.04	0.89	4	4–5	82 (78.8)
When the class is mostly lecture-based, I maintain my attention throughout the entire session without difficulty.	3.33	1.07	3	3–4	46 (44.2)

Note. M = mean; SD = standard deviation; Md = median; Q1–Q3 = interquartile range expressed as 25th and 75th percentiles. The response scale was from 1 = strongly disagree to 5 = strongly agree.

In the exploratory subgroup analyses, statistically significant differences of an exploratory nature were observed (Table 5). Women reported a higher frequency of avoiding speaking up for fear of making mistakes in front of others than men (U = 1382.5; p = 0.015). Students who were currently working reported greater difficulty getting started when cases or problems were used, compared to those who were not working (U = 982.0; p = 0.025). Meanwhile, those with caregiving responsibilities perceived the instructions as more sufficient to work independently (U = 792.0; p = 0.010) and, simultaneously, reported less dependence on their peers' commitment in group activities (U = 364.0; p = 0.049). Furthermore, students who reported receiving specific feedback showed a lower frequency of leaving class with unresolved doubts than those who did not receive it (U = 1020.5; p = 0.017).

Finally, the correlation analysis identified moderate exploratory associations among several variables in the teaching-learning process (Table 5). Perceiving the pace of the class as too fast was associated with leaving class with unresolved questions (rho = 0.44; p < 0.001). Similarly, feeling greater pressure or anxiety in participatory classes was related to greater difficulty initiating work when cases or problems were used (rho = 0.41; p < 0.001). A positive association was also observed between avoiding speaking for fear of making mistakes and experiencing greater anxiety in participatory classes (rho = 0.34; p < 0.001). Taken together, these findings support the interpretation that the perceived acceptance of active strategies may depend not only on the methodological format but also on conditions such as the pace of the class, the clarity of the scaffolding, feedback, and the student's perceived psychological safety.

Table 5. Exploratory analyses: comparisons between subgroups and correlations between selected variables. Panel A. Comparisons between subgroups. Panel B. Spearman correlations.

PANEL A Grouping variable	Variable compared	Group 1: n; Md (Q1-Q3)	Group 2: n; Md (Q1-Q3)	OR	p	r_rb
Sex (female vs. male)	He avoided speaking for fear of making a mistake	Female: 76; 3 (3-4)	Male: 28; 3 (1.75-4)	1382.5	0.015	0.299

Are you currently employed (yes vs. no)	Difficulty getting started with cases or problems	Yes: 17; 4 (3-4)	No: 87; 3 (3-4)	982.0	0.025	0.328
Take care of family members/children (yes vs. no)	Sufficient instructions to work independently	Yes: 12; 4.5 (4-5)	No: 92; 4 (3-4)	792.0	0.010	0.435
Do you take care of family members/children (yes vs. no)	Dependence on the commitment of colleagues	Yes: 12; 2.5 (2-3)	No: 92; 3 (2.75-4)	364.0	0.049	-0.341
Specific feedback (yes vs. no)	She left class with unanswered questions	Yes: 50; 3 (2-3)	No: 54; 3 (3-4)	1020.5	0.017	-0.244

Note. Md = median; Q1-Q3 = interquartile range; U = Mann-Whitney U statistic; r_rb = rank-biserial correlation. The sign indicates the direction relative to the first group. For descriptive guidance, absolute values close to 0.10 are considered small, around 0.30 moderate, and from 0.50 large.

PANEL B. Variable 1	Variable 2	rho	p
The pace of the class was too fast.	I left class with unanswered questions	0.443	< 0.001
Anxiety in participatory classes	I have trouble getting started when using cases or problems.	0.414	< 0.001
I avoided speaking for fear of making a mistake	Anxiety in participatory classes	0.340	< 0.001

Note: Comparisons were performed using the Mann-Whitney U test, given the ordinal nature of the variables. Correlations were estimated using Spearman's rho. The analyses should be interpreted as exploratory due to the cross-sectional design and non-probability sampling.

These differences are interpreted as exploratory findings from the analyzed cohort. The cross-sectional design, non-probabilistic participation, and small size of some subgroups preclude attributing causality or extrapolating the results to other medical students.

Overall, the results show a coexistence between the appreciation of the expository structure and the recognition of the benefits of active learning methodologies. At the same time, barriers were observed related to fear of making mistakes, anxiety about participation, the pace of the class, persistent doubts, and the clarity of the support provided. Subgroup comparisons and correlations were exploratory and showed small to moderate magnitudes.

4. Discussion

The findings of this study suggest that students' preference for lectures could be interpreted as a need for initial structure to address complex content. In our sample, students valued lectures for identifying main ideas, but they also recognized that in-class activities help them detect knowledge gaps, practice clinical thinking, and take advantage of feedback. This apparent tension is consistent with recent literature, which has shown that active learning does not necessarily replace lectures, but rather is often more effective when articulated with clear scaffolding, prior preparation, and well-designed pedagogical sequences (22-24).

The low preference observed for simulation and the flipped classroom should be interpreted as a finding that requires consideration of the implementation conditions. In clinical simulation, its educational value depends on a structured design with clear objectives, deliberate practice, repetition, feedback, and debriefing; in fact, recent medical education literature describes it as a relevant strategy for developing technical and non-technical skills and meaningful learning,

provided it is coherently integrated into the curriculum (25-27, 35). From this perspective, low student choice could be more related to how the simulation is experienced, assessed, or integrated into the subject than to an intrinsic limitation of the methodology.

Similarly, the flipped classroom can foster participation, motivation, and the link between theory and practice, but its effectiveness is neither uniform nor automatic. Recent studies show that digital resources and active face-to-face activities can improve satisfaction and performance; however, it has also been noted that academic outcomes are not always explained solely by the methodology used, which necessitates considering the student's prior preparation, the quality of the materials, and the added value of face-to-face activities (28-30, 36). In the cohort studied, the limited prior review of materials and the preference for an expository structure could help explain the low choice of these modalities, without implying a rejection of them as training strategies.

From this perspective, the fact that the highest-rated format for performing well on complex topics was "teacher presentation and notes," followed by "brief presentation and guided exercises," should not be interpreted as a defense of the traditional lecture in its purest form. Rather, it seems to express a preference for hybrid modalities in which the teacher organizes and prioritizes the content before requiring more autonomous participation. This interpretation aligns with recent studies showing that medical students do not always understand active learning as the deep construction of knowledge, but often as visible participation or assisted memorization, which reinforces the need for explicit, progressive, and student-centered implementations (22). Additionally, a recent systematic review and meta-analysis on flipped classrooms in medical education concluded that this type of strategy can improve learning and satisfaction, although its benefits depend on the quality of the instructional design and not just on a nominal change in methodology (24).

One of the most relevant findings of this study was that the main barrier to class participation was the fear of making mistakes. This was compounded by a high frequency of avoidance of speaking in front of others, as well as significant levels of anxiety in participatory classes. This pattern is particularly important in medical education, where verbalizing reasoning, asking timely questions, and expressing one's own thoughts are part of the professional learning process. Recent literature has indicated that psychological safety is a central element in medical education, as it conditions a student's willingness to take interpersonal risks, ask for help, formulate doubts, and tolerate the possibility of error without fear of ridicule or disqualification (31, 32). Our results suggest that the challenge lies not only in introducing active learning activities, but also in building contexts where participation is perceived as safe and educationally valuable.

This reading also helps to interpret the importance attributed to feedback. Although a considerable proportion of students considered feedback useful for improving in the next activity, not all reported receiving specific comments on what to improve and how to do so. This aligns with recent research showing that feedback is most effective when it occurs in a relationally safe, culturally sensitive, and specific environment, especially in groups that may feel more vulnerable within the educational interaction (33). Therefore, in our study, the positive assessment of feedback likely expresses not only a need for academic correction but also a demand for clear, concrete, and emotionally safe pedagogical support.

Another relevant aspect was the perception that learning in group activities depends excessively on peer commitment. This finding does not invalidate the value of collaborative work, but it does suggest that active methodologies can lose effectiveness or be experienced less favorably when group dynamics are left to chance or when the tutor assumes an excessively distant role. Along these lines, Kassab et al. (34) found that, in problem-based learning, the quality of the group process and the tutor's interventions significantly predict students' emotional and cognitive engagement. Similarly,

recent studies on active learning in face-to-face and virtual contexts show that the impact of these strategies depends less on their methodological label and more on the coherence between structure, teacher facilitation, and actual conditions of participation (23, 34).

The exploratory differences observed by sex also deserve attention. In this study, women reported greater avoidance of speaking up for fear of making mistakes in front of others. Although these results should be interpreted with caution, they could reflect differences in the subjective experience of participation rather than differences in intrinsic ability or willingness. Recent literature on psychological safety and participation in medical education has emphasized that engagement behaviors cannot be understood apart from the classroom climate, perceived hierarchy, and how faculty respond to error and uncertainty (31-33). Therefore, rather than individualizing the difficulty, it is more appropriate to consider these findings as indicators of an environment that can still be strengthened in terms of trust, the legitimacy of doubt, and safe participation.

Taken together, our results support a non-dichotomous view of medical education. Students appear to value both clarity of exposition and opportunities for application, provided these are offered with sufficient scaffolding. This aligns with recent evidence that active learning environments tend to be better received when accompanied by realistic prior preparation, explicit instructions, cases graded in difficulty, and useful feedback; that is, when the methodological design reduces unproductive uncertainty and transforms participation into a cognitively demanding yet pedagogically contained experience (22-24). From this perspective, the lecture would not disappear but rather be repositioned as a moment of conceptual organization within broader hybrid sequences.

This study has several limitations. A cross-sectional design and a non-probability sample based on voluntary participation in a single cohort and institution were used, which limits generalizability and prevents the establishment of causal relationships. Although the entire cohort was invited and measures were taken to reduce coercion, self-selection bias cannot be ruled out. Data were obtained through self-reporting, and therefore may be affected by social desirability bias, recall, or subjective interpretation. The instrument underwent technical and content review by an experienced researcher, but not by an external panel or formal psychometric validation. Furthermore, the questionnaire incorporates different dimensions and response formats and was not designed as a unidimensional scale; therefore, the internal consistency of the Likert block and the bivariate analyses should be interpreted as exploratory. Finally, some comparisons included small subgroups, particularly among students with caregiving responsibilities, so the results require confirmation in larger, multicenter samples.

Even so, the study provides useful local evidence to understand an issue widely discussed in recent literature: that the success of active methodologies depends not only on the format, but also on psychological safety, the quality of scaffolding, group functioning and the clarity of feedback (32-34).

As a practical implication, the results suggest that in undergraduate medical studies, it is advisable to design hybrid sequences that combine micro-learning, guided exercises, progressive case analysis, low-risk participation, and concrete feedback. Rather than completely replacing lectures, it seems more pertinent to redefine their function within a pedagogical model where the initial explanation, participation, and feedback are progressively integrated. Future studies should explore this phenomenon with multicenter and mixed-methods designs, also incorporating variables such as psychological safety, academic workload, prior preparation, and assessment experiences, in order to understand more deeply why certain active methodologies are accepted, resisted, or experienced with anxiety by medical students (22, 24, 31).

5. Conclusions

- Students in this cohort expressed a mixed view of active learning methodologies in undergraduate medical studies, acknowledging both benefits and limitations and challenges. They identified significant advantages in active methodologies, particularly in identifying knowledge gaps, fostering clinical reasoning, and leveraging feedback. These findings suggest the need for a more balanced pedagogical approach that integrates both traditional and traditional methods.
- The results suggest that the perceived acceptance of active learning methodologies depends not only on their formal incorporation into the classroom, but also on the conditions under which they are implemented. Barriers such as fear of making mistakes, anxiety about participation, the perception of a fast pace, and dependence on peer commitment appear to limit their effectiveness.
- From a practical perspective, it is recommended to design hybrid teaching sequences that combine brief, structured lectures with guided activities, progressive case analysis, low-risk participation, and concrete feedback. For future studies, it is recommended to expand the analysis to multicenter samples and mixed-methods approaches to further explore the role of psychological safety, prior preparation, academic workload, and group dynamics in the student experience with active learning methodologies.
- It is recommended that active learning sequences incorporate: 1) a brief introductory presentation outlining objectives and key concepts; 2) written instructions and assessment criteria available before the activity; 3) progressive participation, beginning with individual or pair work before the plenary session; 4) explicit assignment of roles within groups; 5) planned breaks for questions and clarifications; 6) concrete feedback on what to improve and how to do so; and 7) a brief closing check to identify any remaining questions. These measures can be assessed using indicators such as the percentage of students participating, the number of questions recorded, role fulfillment, feedback delivery, and perceived clarity of the activity.
- Take-home message: Pedagogical innovation in medical education is not about abandoning the lecture, but about strategically integrating it with active methodologies, concrete feedback, and psychological safety to foster authentic student participation.

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