The Role of Learning Preferences in Shaping Perceptions of the Clinical Learning Environment: A Preliminary Study

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Abstract

The clinical learning environment (CLE) is a critical component of medical education, shaping both the quality of learning experiences and the readiness of learners for clinical practice. At the same time, individual learning preferences influence how learners engage with and evaluate this environment. Examining the association between learning preferences and perceptions of CLE is therefore important for informing more adaptive clinical teaching strategies. This preliminary cross-sectional study explored differences in perceptions of the CLE based on the learning preferences of medical clerks and co-assistants. A total of 30 participants undertaking clinical rotations at a teaching hospital were included in the study. Learning preferences were assessed using the Learning Preference Inventory (LPI), while perceptions of CLE were measured with the Undergraduate Clinical Education Environment Measure (UCEEM). Data were analyzed using the Mann–Whitney test. The results indicated significant differences between learning structure preferences and perceptions of CLE, particularly in the domains of preparedness for learning and student readiness ($p < 0.05$). Participants who preferred individual learning structures reported higher CLE scores compared to those who favored group-based structures. In contrast, no significant differences were observed for preferences related to content delivery (abstract or concrete) or instructional type (teacher or student-centered). These findings suggest the need for flexibility in clinical teaching design, particularly by accommodating learners who prefer individualized learning, to optimize the overall clinical education experience.

Keywords: clinical learning environment, learning preferences, medical clerks, medical education

Introduction
The clinical learning environment (CLE) constitutes a central component of medical education,

providing the setting in which medical students transform theoretical knowledge into professional competence through experiential learning (1). A well-structured and supportive CLE, characterized by effective supervision, inclusivity, constructive feedback, and structured opportunities for clinical practice, plays a pivotal role in shaping students' preparedness for future professional roles (2). Within this environment, students are exposed to real-world clinical situations that promote not only the acquisition of clinical skills but also the development of professional attitudes, teamwork, and self-directed learning.

The CLE refers to an interactive network within the clinical setting that involves staff, patients, mentors, and educators (3,4). This dynamic ecosystem influences clinical learning outcomes and has a direct impact on students' professional behavior (5). A conducive CLE supports the integration of theoretical knowledge into practice, encourages comprehensive and human-centered care, and promotes innovative problem-solving through guidance from clinical staff and facilitators (6,7). Conversely, challenges within the CLE—such as limited resources, interpersonal conflicts, and negative attitudes from healthcare personnel (7)—can impede learning and lower student motivation. These issues highlight the importance of implementing educational strategies that align the clinical learning environment with learners' individual needs and learning preferences.

In the Indonesian context, the clerkship and co-assistant phases of medical education emphasize patient-centered, supervised experiential learning within teaching hospitals (*Rumah Sakit Pendidikan*). These settings provide authentic exposure and opportunities for reflective practice under clinical supervision. However, the quality and impact of such experiences are strongly influenced by how well the CLE accommodates students' learning preferences, which refer to the preferred ways in which individuals perceive, process, and engage with information.

Learning preferences significantly shape how students interact with and benefit from the CLE (8,9). These preferences evolve alongside clinical exposure; for instance, senior students often develop a stronger preference for self-directed learning due to the independent nature of clerkship training (9). Understanding and accommodating these preferences can enhance learning outcomes by enabling educators to adopt learner-centered approaches, such as case-based or problem-based learning (9,10). The Learning Preference Inventory (LPI) provides a structured means to assess these preferences across three domains: content delivery (concrete vs. abstract), instructional type (teacher-centered vs. student-centered), and learning structure (individual vs. interpersonal), offering insights into how learners engage most effectively.

Aligning the CLE with diverse learning preferences can optimize educational outcomes by fostering deeper engagement, improving knowledge retention, and facilitating the practical application of clinical skills when students' preferred learning modes are met (9). For example, students who favor collaborative learning environments tend to thrive in CLEs that emphasize teamwork and group problem-solving. In contrast, those who prefer independent study excel in settings that provide opportunities for autonomous learning and reflection. Such alignment is consistent with competency-based or outcome-based education (OBE) frameworks, which prioritize lifelong learning and prepare students to navigate the complexity and autonomy required in clinical training (11).

While numerous studies have examined the quality and characteristics of the clinical learning environment in Indonesia (e.g., (12)), relatively few have investigated how students' learning preferences, particularly regarding learning structure, relate to their perceptions of that environment. Given the diversity of student learning styles and the demanding nature of clinical rotations, a mismatch between teaching strategies and learning preferences may lead to reduced engagement and hinder

learning effectiveness. Therefore, it is necessary to examine whether different types of learning preferences, such as preferences for individual or group learning, are associated with distinct perceptions of the clinical learning environment among medical clerks and co-assistants.

This study aims to explore differences in perceptions of the clinical learning environment based on the learning preferences of medical clerks and co-assistants. The analysis focuses on three domains of learning preference: learning structure (individual vs. interpersonal), content delivery (concrete vs. abstract), and instructional type (teacher-centered vs. student-centered), to determine whether these factors influence students' evaluations of their clinical learning experiences.

The findings from this study are expected to provide valuable insights for clinical educators and curriculum designers in developing flexible, learner-centered clinical teaching strategies. By recognizing and accommodating diverse learning preferences, educators can create clinical learning environments that enhance students' readiness, engagement, and self-efficacy in clinical practice. Ultimately, such an approach contributes to improving the overall quality of medical education and preparing future physicians who are not only clinically competent but also adaptive, reflective, and lifelong learners.

Material and Methods

Study Design and Participants.

This study employed a cross-sectional design as a preliminary investigation to explore differences in perceptions of the clinical learning environment (CLE) based on the learning preferences of medical clerks and co-assistants. A total of 30 participants, all aged 18 years or older, were recruited from the Faculty of Medicine at Universitas Surabaya. All participants were undertaking their clinical rotations at RSUD Ibnu Sina Gresik, a teaching hospital affiliated with the university. The inclusion criteria were: (1) age above 18 years, (2) willingness to participate voluntarily, and (3) the absence of any barrier in understanding the questionnaire content. The exclusion criteria comprised (1) students who were on study leave or were inactive during the data collection period, and (2) respondents who did not complete all questionnaire items. Considering that the total population of eligible medical clerks and co-assistants at the time of study was relatively small ($n = 69$), no specific sampling technique was employed. Instead, a total sampling approach was initially adopted, where all eligible students were invited to participate. However, due to logistical and time constraints, data collection was concluded once 30 complete responses were obtained. All research procedures were reviewed and approved by the Research Ethics Committee of RSUD Ibnu Sina Gresik, Indonesia, ensuring compliance with institutional and national ethical standards for research involving human participants.

Materials

Perceptions of the clinical learning environment were measured using the *Undergraduate Clinical Education Environment Measure* (UCEEM) developed by Strand et al. (13). The CLE construct reflects the physical, social, and educational contexts in which medical students gain practical experience during their clinical clerkships. The questionnaire used in this study was an Indonesian-adapted version, translated and validated through previous research (12,14). The original UCEEM consists of 25 items grouped into four dimensions: opportunities to learn in and through work, preparedness for student entry, workplace interaction patterns and inclusion, and equal treatment (15). Each statement is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). To improve contextual relevance for Indonesian medical students in clinical education, three additional items were developed

based on prior findings by (12), resulting in a total of 28 items. Experts in medical education reviewed the adapted instrument to ensure content validity. The statistical analysis of reliability demonstrated excellent internal consistency, with a Cronbach's alpha value of 0.96, which is categorized as very high reliability and indicates substantial homogeneity among items.

Learning preferences were assessed using the *Learning Preference Inventory* (LPI) developed by (9,10), which had been translated into Bahasa Indonesia. The LPI measures three primary domains of learning preference: content delivery (concrete vs. abstract), instruction type (teacher-centered vs. student-centered), and learning structure (individual vs. interpersonal). For example, in the content domain, a learner may prefer performing a clinical procedure (concrete) rather than studying theory (abstract). Similarly, in the instructional domain, a learner may prefer to follow an outline provided by the teacher (teacher-centered) or construct their own (student-centered). In the structure domain, learners may prefer studying alone (individual) or with others (interpersonal). The instrument presents a series of prompts that require participants to rank six statements from "promotes learning least for you" to "promotes learning most for you." An example prompt asks respondents to rank the general value of various learning activities such as studying a textbook, engaging in an internship, or preparing a class project with peers. The scores are then calculated according to a standardized algorithm to determine each individual's dominant learning preference within the three domains.

Due to its ordinal, ranking-based scoring system, the LPI was not subjected to internal consistency testing, as standard reliability statistics such as Cronbach's alpha do not apply to this type of instrument. Nevertheless, the LPI has been widely used and validated conceptually in studies involving medical students (9,16,17), supporting its validity and appropriateness for the present research context. Both instruments, the UCEEM and the LPI, were reviewed by medical education experts prior to administration, ensuring clarity and content relevance to the Indonesian clerkship setting.

Data Collection and Analysis

Data collection was carried out over three weeks during the clinical rotation schedule at RSUD Ibnu Sina Gresik. Participants were approached after completing their clinical duties and provided with a brief explanation of the study's objectives, assurances of confidentiality, and instructions for completing the questionnaires. After obtaining informed consent, participants were asked to complete two instruments: the UCEEM and the LPI. The average completion time for both questionnaires was approximately 15–20 minutes. All responses were collected anonymously using printed forms, and participants were allowed to seek clarification from the researcher if they encountered any ambiguous statements.

The collected data were checked for completeness before entry and coding. Any questionnaires with missing responses on key variables were excluded from the analysis in accordance with the predefined exclusion criteria. Data were entered into IBM SPSS Statistics version 26.0 for analysis. Prior to inferential testing, descriptive statistics were generated to summarize the demographic characteristics of participants, including age, gender, academic stage, clinical department, and prior training experience related to learning strategies or stress management. Mean, standard deviation, frequency, and percentage values were calculated as appropriate.

The UCEEM scores were analyzed as continuous variables, while learning preferences derived from the LPI were categorized into dichotomous groups for each domain: *concrete versus abstract (content delivery), teacher-centered versus student-centered (instruction type), and individual versus interpersonal* (learning structure). The data were first assessed for normality using the Shapiro–Wilk

test. As the assumption of normal distribution was violated for several variables, nonparametric tests were employed for inferential analysis. Specifically, the Mann–Whitney U test was used to examine differences in mean CLE scores between the two preference groups within each LPI domain.

The level of statistical significance was set at $\alpha < 0.05$. Results were presented in tables summarizing mean scores, standard deviations, and Mann–Whitney test outcomes for each comparison. Additionally, effect size values were interpreted qualitatively to provide context for the magnitude of the observed differences. All findings were reviewed in conjunction with relevant literature to facilitate a meaningful interpretation and contextualization of the data within the broader framework of medical education.

Results and Discussion

Participant Characteristics

Table 1 summarizes the demographic characteristics of 30 medical clerks and co-assistants participating in the study. The mean age was 22.8 ± 1.26 years, with a predominance of female participants (66.7%). One-third (33.3%) were in the clerkship phase (semester 0), while others were distributed across semesters 1 to 3, representing varying levels of clinical experience. Participants were drawn from several departments, including Surgery (26.7%), Internal Medicine (23.3%), Radiology (20.0%), Pharmacology (16.7%), and Neurology (13.3%), ensuring a balanced representation of clinical disciplines.

Regarding prior training, 30.0% of respondents had attended sessions related to learning strategies or stress management during their medical education, while 70.0% had not. This finding indicates that most participants entered the clinical phase without formal preparation in adaptive learning or coping approaches, which may influence their engagement and perceptions of the clinical learning environment.

Table 1. Demographic Characteristics of Participants

Variable	Category	frequency	percentage
age	(mean ± SD)	22.8 ± 1.26	
gender	male	10	33.3
	female	20	66.7
semester	Clerkship	10	33.3
	1	5	16.7
	2	6	20.0
	3	9	30.0
current stage	Surgery	8	26.7
	Pharmacology	5	16.7
	Internal	7	23.3
	Neurology	4	13.3
	Radiology	6	20.0
Prior Training	Yes	9	30.0
	No	21	70.0

Relationship between Clinical Learning Environment and Learning Preference Inventory

Both instruments used in this study, the UCEEM and the LPI, were first reviewed and validated by experts in medical education to ensure content validity and contextual appropriateness for clinical learning settings. Statistically, the UCEEM demonstrated excellent internal consistency, with a Cronbach's alpha of 0.96, which is categorized as *very high reliability*, indicating strong homogeneity among its items. In contrast, the LPI was not subjected to reliability testing due to its ordinal, ranking-based structure and specialized scoring approach. Nonetheless, it has been widely applied in previous research involving medical students (9,16,17), supporting its validity and suitability for the current study.

The analysis of the LPI revealed distinct patterns across the three assessed domains—content, instruction, and learning structure (Table 2). More than half of the participants (56.7%) preferred concrete content delivery, reflecting a stronger orientation toward practical, experience-based learning rather than abstract conceptualization. This preference aligns with the nature of clinical education, where direct patient encounters and procedural practice provide tangible learning experiences that resonate with concrete learners. In the instructional domain, 43.3% of participants favored teacher-centered approaches, while 30.0% preferred student-centered learning, suggesting that although self-directed learning is increasingly emphasized, many learners still value structured guidance from clinical supervisors.

In terms of learning structure, 43.3% of participants preferred individual learning, whereas 30.0% favored interpersonal (group-based) approaches. This distribution implies that a substantial portion of medical clerks and co-assistants are inclined toward autonomous study habits, likely reflecting the self-directed demands of clinical rotations. Nevertheless, collaborative learning remains relevant, especially in multidisciplinary clinical teams. Eight participants did not complete all LPI items, accounting for minor missing data.

Figure 1 illustrates the distribution of the CLE, represented by the average UCEEM scores, across learning preference domains. The overall mean UCEEM score of 3.92 ($SD = 0.63$) indicates a generally positive perception of the clinical learning environment among participants. Further analysis using the Mann–Whitney U tests revealed that neither content preference ($U = 39.0$, $p = 0.78$) nor instructional preference ($U = 41.0$, $p = 0.24$) showed significant differences in CLE scores, suggesting that these dimensions had minimal influence on how learners perceived the overall quality of the CLE.

Table 2. Summary of Learning Preference Inventory

Domains	sub-domain	Frequency	Percentage
content	abstract	5	16.7
	concrete	17	56.7
instruction	teacher-centered	13	43.3
	student-centered	9	30.0
learning	individual	13	43.3
	interpersonal	9	30.0
	missing	8	

In contrast, a significant difference was found for learning structure preference ($U = 24.0$, $p = 0.02$). Participants who preferred individual learning reported higher mean CLE scores ($M = 4.18$, $SD = 0.33$) compared with those who preferred interpersonal or group-based learning ($M = 3.78$, $SD = 0.33$). This finding suggests that learners who favor independent study may perceive greater support and clarity in

the clinical environment, possibly due to the autonomy and self-initiative inherent in clinical rotations. Independent learners might also experience higher perceived preparedness and confidence when navigating patient care responsibilities.
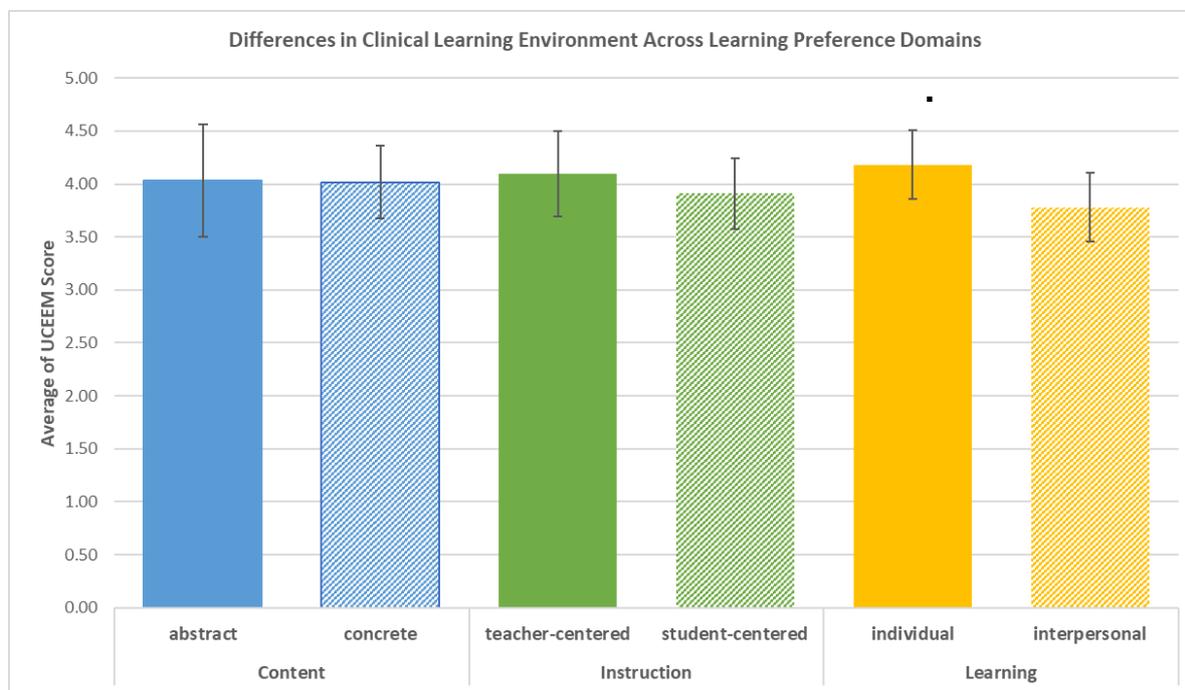

Figure 1. Bar chart showing mean Clinical Learning Environment (CLE) scores by learning preference domains. Error bars indicate standard deviations. A significant difference ($p < .05$) was observed only for learning structure, with higher scores among those who preferred individual learning.

This result is consistent with previous studies describing the CLE as a context that inherently promotes autonomy, accountability, and self-directed learning (3,18). In clerkship settings, medical trainees are expected to take responsibility for patient care tasks under supervision, which naturally benefits those comfortable with self-regulation and individualized goal setting (12). A supportive CLE provides opportunities for reflection, integration of theory into practice, and independent clinical reasoning—features that align closely with the preferences of learners who value individual study (6,7).

Learning preference theory also helps explain this relationship. As proposed by Senok et al (19) and further discussed by (8,9), students who favor individual learning tend to be more self-directed and intrinsically motivated, making them better suited to environments that demand initiative and adaptability. These learners may derive greater satisfaction from the flexibility and autonomy of clinical rotations, where supervision is often indirect and learning is largely experiential. Conversely, group-oriented learners may perceive less support because collaborative opportunities in clinical education are frequently informal and limited by hierarchical structures (20,21). The individualized nature of supervision and assessment in clinical settings can further restrict peer collaboration, reducing engagement and perceived inclusivity among socially oriented learners (22).

Overall, the results indicate that learning structure preference plays a more critical role in shaping perceptions of the clinical learning environment than other learning preference domains. The positive association between individual learning preference and CLE perception highlights the importance of autonomy and self-regulation in clinical education. To ensure that all learners benefit equally, clinical

educators should incorporate structured peer-learning sessions, small-group case discussions, and reflective learning activities that strike a balance between independence and collaboration. Blending individual reflection with teamwork-based learning may foster an inclusive and adaptive environment that supports both autonomous and socially oriented learners in teaching hospitals.

Practical Implications

The findings of this study highlight the importance of developing flexible and adaptive clinical teaching strategies that acknowledge the diversity of learning preferences among medical trainees. Educators should provide balanced opportunities for both individual reflection and collaborative learning, ensuring that students who prefer independent study can maintain autonomy. At the same time, those who thrive in group contexts receive sufficient peer interaction. Structured mentorship, personalized feedback, and flexible supervision formats can help bridge the gap between differing learning preferences. At the institutional level, incorporating short preparatory workshops on learning strategies and self-regulation before or during clinical rotations may further enhance students' readiness and engagement within the clinical learning environment.

Conclusion
This preliminary study explored differences in perceptions of the clinical learning environment (CLE) among medical clerks and co-assistants based on their learning preferences. The findings revealed that while preferences related to content delivery and instructional type did not significantly influence perceptions of the CLE, differences in learning structure were statistically significant. Participants who preferred individual learning reported more positive perceptions of the CLE, particularly in domains related to learning preparedness and student readiness. These results suggest that autonomy and self-direction may enhance students' engagement and confidence within the clinical context. In contrast, group-oriented learners may require more structured opportunities for collaboration and peer interaction.

Despite its valuable insights, this study has several limitations. The sample size was small and drawn from a single teaching hospital, which limits the generalizability of the findings. The cross-sectional design also restricts causal interpretation, and reliance on self-reported questionnaires may introduce subjective bias. In addition, while both instruments demonstrated strong conceptual and psychometric foundations, further validation of the adapted UCEEM and LPI versions in broader Indonesian settings is warranted.

Future research should involve larger, multi-center samples and consider employing mixed-methods designs to capture deeper qualitative insights into how learning preferences shape students' clinical experiences. Investigating mediating factors such as self-regulated learning, supervisor feedback style, and coping strategies may also provide a more comprehensive understanding of learner–environment interactions. Ultimately, educators are encouraged to adopt flexible, learner-centered approaches that accommodate diverse learning structures to optimize engagement and preparedness in clinical education.

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