

Learning approaches and experiences in clinical practices of medical students during the Covid-19 pandemic and until the end of the health emergency: a mixed method study.

Enfoques de aprendizaje y experiencias en prácticas clínicas de estudiantes de Medicina durante la pandemia de Covid-19 y hasta la finalización de la emergencia sanitaria: un estudio de método mixto.

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Summary

Introduction: The medical training process during the Covid-19 pandemic resulted in a variety of experiences and uncertainties in undergraduate clinical learning. **Objective:** To analyze the learning approaches and clinical practice experiences of medical students from the beginning of the Covid-19 pandemic until the end of the health emergency. **Method:** A mixed-methods study, structured in three phases. The first quantitative phase involved 159 medical students in their final year of clinical rotations (CPE-R-2F) and administered the Revised Study Process Questionnaire. The second qualitative phase used semi-structured interviews with 10 open-ended questions, conducted in four focus groups and four individual interviews. Univariate and bivariate analyses, as well as correlation of variables, were performed. Methodological analysis included grounded theory and phenomenographic methods. The third phase employed a mixed-methods approach. **Results:** 97.9% of the participants adopted a deep learning approach. Qualitatively, 143 initial categorical units of meaning were identified, with dimensions of variation on clinical learning experiences, which consolidated into 25 categories and 68 inductive subcategories. Sequential triangulation found high valuations for the conception "learning is a process of interpretation with the objective of understanding reality" associated with deep learning, and low valuations for the conceptions "learning is memorization" and "learning is the quantitative acquisition of knowledge" associated with surface learning. **Conclusion :** The types of learning approaches are influenced by academic activity in the context of the COVID-19 pandemic, which, as a crisis situation, also promoted the adaptation of motivations and strategies specific to each type. The variation on clinical learning experiences explains the impact, which affirms the positive management of students' intrinsic

motivation to learn and the critical reflection of institutions and teachers that involves evaluating the evidence of the problem experienced, in order to guide future actions for change.

Keywords: Learning, Learning experiences, Medical students, Clinical practice, Covid-19 pandemic, Phenomenography, Mixed methods study.

Abstract

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1. Introduction

One of the methods traditionally used to analyze learning in university students is the approach to learning theory, initially developed in Sweden based on the studies of Marton and Säljö (1–2) and later expanded in Australia and Hong Kong by Biggs (3–6). From this perspective, several authors have examined the relationship between approach to learning—surface and deep (SA/DA)—and multiple associated variables at different levels of medical training. For this purpose, Biggs' original questionnaire, in its reduced version, the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) (7), has been widely used. This questionnaire, adapted and cross-culturally validated in Spanish as the Cuestionario Revisado de Procesos de Estudio (CPE-R-2F) (8–9), has substantially strengthened research in this field.

Previous studies show that medical students tend to predominantly adopt the DA (Digital Learning) approach over the SA (Student Learning) approach (10–14), accompanied by a marked sense of personal satisfaction derived from their studies (13). Significant correlations have been identified between learning approaches and factors such as personality, academic averages (15), and their predictive capacity for performance (11). However, evidence indicates that neither sex nor year of study is associated with DA, although this approach tends to increase with the student's age and

maturity (12, 16). Other studies have pointed to an inconsistent relationship between learning approaches and academic performance (17).

The development of this theory also progressed toward a qualitative perspective, aiming to identify differences in the quality of learning. In 1981, Marton introduced phenomenography as a specialized field of research (18), offering education an alternative approach to traditional learning theories. This approach incorporates the concept of “conceptions of learning,” understood as different ways of comprehending the knowledge acquisition process and organized into descriptive categories (19). These categories are sequentially ordered from more reproductive and quantitative conceptions to more constructive and qualitative ones, increasing in complexity (2, 19–20). In medical education, most studies relating approaches and conceptions of learning have been primarily quantitative, with little qualitative or mixed-methods research. Some phenomenographic studies have been reported that identify representative categories of conceptions of learning (21) and clinical experiences (22). However, a significant gap remains in the literature to understand how learning approaches influence student motivation and strategies, which are fundamental aspects for generating more effective qualitative learning experiences.

During the Covid-19 pandemic, medical education was profoundly affected. Clinical practice activities were suspended and replaced by synchronous and asynchronous virtual modalities, distancing students from real-world clinical settings. Although online resources provided valuable alternatives, the lack of direct practice limited interaction with patients and reduced feedback derived from clinical observation and supervision (23). This resulted in emotional effects, a sense of lost learning opportunities, and a decreased understanding of real-world practice in various specialties (24–26), even generating insecurity regarding future career decisions. Upon returning to clinical practice, some students expressed anxiety about interacting with patients due to the risk of infection, and there is still no clarity on the true impact of clinical training during this period, which is generally assumed to have been reduced in both quality and quantity (24). These circumstances gave rise to diverse experiences and uncertainties about clinical learning, underscoring the need to critically review this period and strengthen research in medical education.

In this context, the objective of the present research is to analyze the approaches and learning experiences in clinical practice subjects in rotating internship I and II of Medicine at a private university in Colombia, from the beginning of the Covid-19 pandemic until the end of the health emergency.

2. Methods

Type and design of research

This mixed-methods study was conducted in three phases. The first phase employed a quantitative approach with a non-experimental, cross-sectional, and correlational design. The second phase adopted a qualitative approach, using a phenomenographic perspective and focusing on the epistemic conceptions of learning. The third phase incorporated a mixed-methods approach with a sequential explanatory design.

Inclusion and exclusion criteria

The inclusion criteria were final-year medical students enrolled in clinical rotations (I and II) at a private university in Colombia during the second academic period (July-December 2023). Participants had to have completed their clinical rotation courses during the study period, from the beginning of the COVID-19 pandemic until the end of the health emergency. Participation was voluntary and provided through informed consent. Exclusion criteria were incoming exchange

students enrolled in clinical rotation courses and students who had dropped their final-year clinical rotation courses (I and II) during the study period.

Project phases, techniques and tools for information gathering

1. *First phase of quantitative approach* : The data were collected through the Google Forms tool, with the quantitative research instrument, organized in two parts, Part A with the tacit informed consent. Part B with the 20 self-report items of the Revised Study Process Questionnaire (CPE-R-2F), in the short version validated and translated into Spanish (8-9) of the Revised Two Factor Study Process Questionnaire (R-SPQ-2F) by Biggs (7). The 20 items are distributed across two main scales (Deep Approach - DA; Surface Approach - SA, each with 10 items) and four subscales corresponding to the Motivation and Strategy components, each with five items (Deep Motivation - DM; Surface Motivation - SM; Deep Strategy - DS; Surface Strategy - SS). The English acronyms will be used hereafter, following the international guidelines in which these items have been published. Each item on the questionnaire was assigned a five-point Likert scale: 1. Never; 2. Sometimes; 3. Often; 4. Frequently; and 5. Always. All items are scored in the same direction, so the range of scores on the subscales for motives and strategies ranges from 5 to 25 points, and on the scales, i.e., approaches = motive + strategy, ranges from 10 to 50 points (9). This version of the questionnaire has been validated on several occasions, including by the Hernández Pina research group itself, who reported an instrument consistency of 0.908. Applying Cronbach's alpha to the deep and surface approach scales, a reliability index of 0.778 was obtained for the former and 0.700 for the latter, which implies sufficient internal consistency of the instrument, as obtained in previous studies by this research group (27). In this same phase, the overall academic standing of the study population was collected and identified through the University's internal Integrated Information System, supported by the grade report from which the semester and cumulative grade point averages were obtained.

The instrument was administered in a single 60-minute session during regular academic hours. The data was then extracted from the Google Forms form and transferred to Microsoft Excel, and from there directly to an open instance of IBM® SPSS® Statistics, version 27. In SPSS Statistics, nominal and ordinal variables were analyzed to obtain absolute and relative frequencies, and descriptive analyses of ratio variables were performed to calculate the mean or average of age and academic performance with their respective standard deviations. Bivariate and overall correlation analyses were also conducted using parametric statistical tests such as the Student's t-test to assess the correlation between variables, specifically learning approach (nominal) and academic standing, as measured by the cumulative average (ratio), which was assumed to follow a normal distribution.

2. *Second phase of Qualitative approach*. The data were collected through a semi-structured interview, which was carefully designed from a theoretical perspective, thoroughly reviewed and agreed upon by the researchers. It consisted of 10 open-ended and neutral questions intended to elicit detailed perspectives, experiences, and opinions from the participants in their own words. These questions, which comprised the interview, were grouped as follows: 7 questions related to experiences during the pandemic and 3 questions related to experiences during the gradual return to in-person learning, as outlined in the following guide.

Questions related to the pandemic period :

1. How long were you in clinical practice without live patients, and how did you learn during that time?
2. What learning strategies did you use to integrate theoretical knowledge with clinical practice during the Covid-19 pandemic?
3. What motivated you to learn during your clinical training during the Covid-19 pandemic?
4. How did your learning acquired in clinical practice during the Covid-19 pandemic affect your academic performance?

5. Do you consider that the teaching strategies used during the Covid-19 pandemic provided you with sufficient and necessary tools for the development of your practical skills, and why?

6. What aspects do you consider positive about the Covid-19 pandemic and how did they influence your clinical learning?

7. Did the way you learned during the Covid-19 pandemic change you in any way as a person, and why?

Questions related to the period of gradual return to in-person learning :

1. How did you learn during the gradual return to in-person learning?

2. Did it change the reality of your future professional work? Explain.

3. What were your emotional reactions upon returning to your in-person clinical practices?

The interview structure underwent a standard pretest following the methodology proposed by Bernal-García et al. (28, 33). Response coding based on dichotomous (yes/no) options was applied to the interpretation of each item, with the purpose of evaluating its applicability and feasibility in a random sample (28) comprised of students who were not part of the main research but were enrolled in clinical courses and had characteristics similar to the target population. For this purpose, all students enrolled in the tenth semester of the Medicine program at the same university during the second academic period of 2023 were invited to participate voluntarily after providing tacit informed consent. Based on the data obtained, the percentage and level of comprehensibility of the items were determined and classified into the following ranges: high comprehensibility ($\geq 85\%$), medium comprehensibility (80–85%), and low comprehensibility ($< 80\%$) (28).

In order to collect qualitative data and ensure the diversity of experiences necessary to achieve theoretical saturation of the categories, two focus groups were designed for each final-year clinical practice/rotation I and II course, for a total of four focus groups, in addition to four individual interviews. This number was deemed representative for each course, and the focus groups were conducted entirely independently. The qualitative phase, planned consecutively to the results of the quantitative phase, involved recruiting students selected based on the significance of their cases, until categorical saturation was reached. Participation in both the focus groups and the interviews was voluntary, mediated by the signing of an informed consent form and authorization for the use of photographs, audio and video recordings, and film material for research and scientific dissemination purposes, in accordance with the guidelines of the university's ethics and bioethics committee.

Qualitative data were stored and analyzed using ATLAS.ti Qualitative Data Analysis software, version 8®, by creating a hermeneutic unit composed of eight primary documents. From these, matrices were generated using grounded theory procedures and three coding phases: open, axial, and selective. Subsequently, a phenomenographic analysis was conducted based on the students' narratives, allowing for the identification of the spectrum of variation in their experiences.

3. *Third phase of mixed approach.* In this phase, the triangulation of the information obtained in the two previous QUAN-QUAL phases was carried out, using the theoretical perspectives that support the phenomenon under study in this research, to achieve, validate and verify the final results of both the quantitative and qualitative analysis, and to explain how the variation of clinical learning experiences influences the types of learning approaches in the population under study.

Ethical considerations.

The present research was duly evaluated and endorsed by the Ethics and Bioethics Committee of the University of Boyacá, according to consecutive protocol No. RECT- 320/2023, Date: August 25, 2023. It took into account Resolution 008430 of 1993, issued by the Colombian Ministry of Health, which classifies this research as having minimal risk. Likewise, the Declaration of Helsinki,

promulgated by the World Medical Association (WMA) as a proposal of ethical principles for medical research involving human subjects (29,30), was also considered. This research also applied informed consent, and therefore, the voluntary acceptance of participation through this means is a “formal procedure whose objective is to apply the principle of individual autonomy.” (31).

3. Results

3.1. Quantitative Phase

For this phase, all students comprising the study population (n=159) were invited to participate: 81 from clinical practice/rotation I and 78 from clinical practice/rotation II, who met the inclusion criteria. A response rate of 91.19% (n=145) was obtained. Of the total participants, 75% were female and 25% were male. The average age was 24 years, with a range from 21 to 34 years. Regarding the distribution by semester, 76 students (52%) were in clinical practice/rotation I and 69 (48%) in clinical practice/rotation II.

The descriptive analysis of the CPE-R-2F scales and subscales revealed that the majority of students adopted a deep learning (DL) approach (97.9%), consistent with their advanced level of medical training and their interest in understanding. However, a small percentage (2.1%) exhibited a surface learning (SL) approach, reflecting individual differences in how they approach learning, prioritizing memorization of content as an instrumental strategy to meet academic requirements. Regarding the subscales, Deep Motivation (DM) predominated at 75.2%, suggesting the presence of intrinsic motivation. Table 1 presents the detailed results for the scales and subscales of the instrument used.

Bivariate analysis of the influence of learning approaches on categorical variables showed that, with respect to sex, the DA approach was predominant in both groups: 98.2% (n=107) in women, with no statistically significant differences between sexes, thus preventing the establishment of an association between these variables. No significant differences were identified with respect to age either. Finally, academic standing was analyzed based on the reported overall grade point average: a semester average of 4.3 and a cumulative average of 3.86, indicating that all students were in good academic standing.

Table 1. Scales (Types of learning approach) and subscales (Motivation and Strategy)

Scales	Frequency	Percentage
Deep Learning Approach (DA)	142	97.9%
Surface Learning Approach SA	3	2.1%
Total	145	100%
Subscales	Frequency	Percentage
Deep Motivation DM	109	75.2%
DS Deep Strategy	33	22.8%
Superficial Motivation SM	0	0%
SS surface strategy	3	2.1%

3.2. Qualitative phase

Results of the standard pretest (Pilot) of the semi-structured interview (Qualitative research instrument).

The test was administered to a random sample of 62 students in their tenth semester of the Medicine program at the same university, 67% of whom were female and 32% male. These

participants were not part of the study population. The test was administered on August 28, 2023, in the university's computer labs. Initially, the research team introduced themselves and, using audiovisual aids, briefly explained the objectives of both the project and the test. The administration and development of the test took approximately one hour. After analyzing the interview items, a high comprehensibility rate (96.8%) was obtained. Based on the results, the terms deemed necessary were adjusted to improve the instrument's clarity.

Results of the coding and categorization of clinical learning experiences in the study population.

Open coding.

The segmentation of the data in the analytical process allowed for the identification of 143 initial units of meaning, derived directly from the qualitative analysis conducted by the researchers during the conceptual organization and definition of terms. These units were based on 627 quotations from the participants' narratives. In this phase, the general dimension "Clinical Learning Experiences" was assigned as the central category, conceived as the abstract representation of the phenomenon under investigation. The units of meaning, constructed from the data, were analyzed iteratively and grouped according to common patterns into emerging main dimensions. This allowed for the definition of categories and subcategories in terms of their properties and dimensions, until theoretical saturation was reached.

Axial Coding.

A systematic process was carried out to establish relationships between categories and subcategories. This procedure resulted in a categorical system composed of 10 deductive categories, linked to 25 inductive categories and 68 inductive subcategories, which allowed for the identification of the various conditions, actions/interactions, and consequences associated with the phenomenon under study. These relationships served as the basis for the phenomenographic analysis described in the following section.

Results of the Phenomenographic Analysis and Interpretation

Initially, the dimensions of variation in how students experienced clinical learning were examined, considering emerging similarities and differences in the narratives corresponding to each interview question. Subsequently, the relationships between categories were clarified, taking into account the properties of each category and subcategory derived from open and axial coding, in order to refine their inductive integration. Given the size of the corpus and through a process of iterative reading and analysis from a phenomenographic perspective, it was possible to reorganize the central concepts and descriptive aspects, achieving the stabilization of the categorical system (Tables 2 and 3) and establishing the final terminology.

3.3. Sequential Triangulation Phase

The information obtained in the quantitative and qualitative phases of the research was triangulated using the theoretical perspectives that underpin the phenomenon under study. This process allowed for the validation and verification of the final results of both analyses, as well as an understanding of how the variation in clinical learning experiences relates to the types of learning approaches in the study population. To this end, a third level of coding, called selective coding, was implemented. This facilitated the organization of participants' narratives according to the six conceptions of learning, thus constituting a sequential theoretical-methodological triangulation. This coding allowed for the establishment of relationships between conceptions of learning that correspond to the same type of approach, according to Marton and Säljö, who indicate that the first three conceptions reflect a view of learning as a receptive process, focused on the quantitative accumulation of information and its correspondence with objective reality. In contrast, the last three conceptions, to varying degrees, represent a constructivist approach, focused on the meaning and

integration of knowledge. Based on this theoretical framework, it is recognized that the first three conceptions are associated with a surface approach (SA), while the last three are linked to a deep approach (DA) (19).

Based on the above, the results allowed for the construction of a results space that integrates the referential aspects (what) derived from selective coding based on the six conceptions of learning, and the structural aspects (how), oriented from the relationship with the types of learning approaches and the experiences reported by the students. This organization was represented in a matrix theoretically grounded from the phenomenographic perspective, as illustrated in Table 4.

The following section presents some of the theoretical and methodological relationships between the theory of learning approaches and the phenomenographic methodology applied to conceptions of learning, as well as the sequential (QUAN-QUAL) intermethods used in the research, accompanied by fragments of the participants' narratives as representative evidence.

This results section reveals a low hierarchical level corresponding to Conception 2: "Learning is memorization," associated with the surface approach (SA). Several narratives indicate that, although memorization was widely used, the learning acquired was not significantly consolidated, as reflected in the selected quotes:

1:2. "explaining to each other what was being understood, so that he could memorize and internalize the subject."

1:23. "The knowledge I acquired during the pandemic, which I later needed for my clinical practice when we were already in person, I felt there were gaps, even though at the time I had studied it, I had memorized it, to pass the rotation, I think I was learning momentarily, but not so that it would stay with us for life, so later I had to review what I was supposed to already know."

However, at this same hierarchical level, concept 4, "Learning serves to understand or extract meaning from the content," was also placed, corresponding to a DA structure. This also reveals the variation in learning experiences. In this case, some supporting narratives are presented.

6:5. "In dermatology, the doctor would show us and comment on the consultation, about the case of a patient. I had reviewed the topic and made a summary beforehand, and I was able to start differentiating diagnoses and I began to associate them."

8:2. "The doctors were very clear at the time. We would socialize the topic with them beforehand, then they would give us clinical exercises to develop and submit. I tried to use various articles, the university's databases, and access videos that also helped a lot to understand."

The above allows us to differentiate between conceptions that structure the types of learning approaches adopted by students when carrying out their learning activities or tasks in distinct ways. On the one hand, it is observed that the use of memorization does not always contribute to meaningful learning, possibly due to ambiguity in its conceptual understanding. Memorization, understood as the literal repetition of content, differs from the act of memorizing itself, which involves more complex cognitive abilities, such as analysis and comprehension.

Similarly, at a low level, Conception 1 is evident: "Learning is the quantitative acquisition of knowledge," which is also related to the characteristics of the surface approach (SA). This conception is interpreted in various ways: one is linked to exposure to theoretical content with a high academic workload and the adjustments these underwent during the pandemic, especially in clinical practice courses, which in some cases created difficulties for students in self-regulating their learning. Another interpretation is associated with the evaluative factor, in which learning is conceived primarily in terms of the grade obtained in the evaluation processes. In both perspectives, the idea of quantitative

knowledge acquisition predominates, without necessarily integrating a deep or constructive understanding of the content.

3:1. "It really was very difficult because the academic workload was only theory, watching videos... and for practice, what one could do at home."

4:2. "In practice, topics like what happened... one did not remember the topic and the entire clinical aspects of the patient, because one had learned it from books and in theory, which was extensive, but for the same reason, the knowledge did not remain and many topics were forgotten."

4:12 "I was saying, well... let's fill ourselves with theory and study and when face-to-face interaction returns, we'll have more tools to perhaps be able to face it."

4:14 "at least learn the theory...if I'm going to be away from a patient for so long, I need to at least know the theory so I can more or less apply it later."

1:22. "I was taking a quiz... and I was like, but I really studied so much for that quiz, and because of this... I didn't have enough time, I was frustrated and I was like, no, no, I just didn't understand the technology well and I was like... I studied so much and I got a terrible grade."

On the other hand, Conception 6: "Learning is changing as a person," theoretically associated with a middle level and the deep learning (DL) approach, focuses on the narratives that responded to the following question during the interviews: "Did the way you learned during the Covid-19 pandemic change you in any way as a person? Why?" This question sought to encourage reflection on the learning experience and personal development during the pandemic. Participants reported significant changes; some agreed in their assessments, while others offered diverse comments, demonstrating the impact of the experience on their personal development. Selected examples of these narratives, illustrating these transformations, are presented below:

1:30. "Yes...the pandemic allowed us to be more resourceful and creative, it taught us to adapt to adverse circumstances. So, throughout this clinical learning experience, we admitted not to shut ourselves off from what happened, but to focus on finding the positive side of the situation. The fact of stopping and reorganizing things at that moment, of looking for alternatives and solutions, made me more resourceful in solving problems in a more open way. Thus, after the pandemic, I feel that it favored the search for an alternative to solve things that I considered at that moment that nothing could be done."

3:22. "Yes... well, you have to improve your learning process, you have to look for ways to improve yourself every day, because... what kind of healthcare worker do you want to be? And in that aspect, the pandemic really changed me a lot."

3:32. "Yes... it shaped me, not only professionally, but mainly as a person, to be more empathetic, more aware of the patient as a human being going through a particular health situation, and the practice of medicine is not only an instinctive duty of knowledge, but also requires a human component. Our professors at the university always emphasized this to us: in addition to being doctors, we must be people."

This *average level* is noteworthy because it is entirely consistent with the quantitative results, in which 58.6% of participants obtained a DA.

Regarding the other two levels of the hierarchy, they exhibited similar behavior in relation to the types of learning approaches, with the high level being associated with DA and conception 5: "Learning is a process of interpretation with the objective of understanding reality." Meanwhile, the very high level was associated with SA and conception 3: "Learning is the acquisition of data, methods, and procedures for when they are needed." Some narratives related to conception 5, which demonstrate the experiences related to the importance for them of interpreting their learning and knowledge in a way that brings them closer to or allows them to understand reality, are:

1:3. "There is nothing like the association of seeing the patient and the situation live so that the brain can assimilate it more easily and associate it with that event."

2:11. "Facing reality, when I have the patient face to face and define their condition, is a completely different thing, because I have to know how to touch them, how to approach them, how to greet them, how

to talk to them, how to behave when they are actually present, even though we do have the theoretical knowledge, this practice, in the pandemic, seems to me to have a huge deficit.”

3:35. “You might remember things and know them, but let's say that in that moment when everyone is looking at you... and you actually have to do a procedure for the first time, like intubating a patient, it's a very stressful moment... something I remember was that there were too many people... the emergency room doctor, the area doctor, another doctor arrived, the respiratory therapists arrived, all the nurses, the assistants, and I felt a lot of pressure, anxiety, and fear, but they told me, 'Relax, you have a group of professionals here'... So I felt that the support was great and I breathed...”.

Narratives are also extracted that represent conception 3, especially related to the methods they had to use and which served them later.

1:7. “I was one of those who... just read and tried to understand how it worked or what management is given to patients... but during the pandemic, the doctors formulated clinical cases and they tried to make us understand what we had read or what we saw in that class, however, in the rotations of the internship, for example, right now I am in Internal Medicine and I apply the knowledge I learned in the fifth semester in semiology, I realize that I can correlate the theory I saw at that time with the practical aspect of now.”

1:32. “I watched videos, read more, made daily summaries, rewatched the classes recorded by two doctors, and studied on my own. All my pandemic summaries also helped me a lot, because they have been very useful to me so far.”

2:19. “I think one of the positive aspects of this pandemic was learning to find different apps and use them to support learning, as well as how to find information from reliable sources to learn clinical topics. In addition, access to videos and clinical cases provided some help at the time, although later, when you're actually dealing with a patient, that's a different story...”.

Thus, the inter-method triangulation is represented by the results obtained in the quantitative phase, in which the students obtained the DA as predominant, which agrees with the qualitative result whose results yielded a classification of the students among the conceptions of learning with an equivalent perspective.

4. Discussion

The study of learning approaches has been the subject of numerous investigations at various levels of medical education; however, at the level of clinical training semesters, these studies are still scarce globally. This research adopted a sequential explanatory mixed-methods design to delve deeper into the types of learning approaches and students' experiences in their clinical learning, from the beginning of the COVID-19 pandemic until the end of the health emergency. To this end, the results are interpreted by considering questions and their implications, organized into three sections, namely:

Types of learning approaches

Several studies using the R-SPQ-2F have indicated that medical students show a clear preference for adopting a deep learning (DL) approach (16, 32, 34). It has been shown that students tend to transition toward DL as they progress through their training, suggesting that progression within the program fosters intrinsic motivation and deeper learning strategies (12), findings that align with the results of this research. However, in the context of clinical training during the COVID-19 pandemic, several factors altered this landscape. The temporary suspension of clinical rotations and the resulting uncertainty, as well as their gradual resumption as in-person instruction returned, modified the learning experience. Although statistical analyses confirm the predominance of DL among students, this adoption is also linked to the type of virtual academic activities employed, supported by multiple technological tools, which redefined the role of the medical student globally. As a previous study points out, “the Covid-19 pandemic highlighted that knowledge in medicine is extremely dynamic, and we had to learn to work with great uncertainty” (35).

Furthermore, the volume of academic work can influence students' motivation (DM and DS subscales) and learning strategies (SM and SS subscales). According to Lightburn et al. (36), motivational priorities, associated with various learning strategies, allow for the optimization of educational outcomes. In the present study, 75.2% of students had high DM, while 22.8% had DS, which is consistent with the aforementioned findings (36). Learning strategies, for their part, can vary over time, adapting to the demands of the task or the learning context (36).

Regarding the surface approach (SA), only 2.1% of students adopted it, with a 0% sensory understanding (SM), indicating that it depends more on extrinsic factors than intrinsic motivation, and a 2.1% sensory understanding (SS). This suggests that, when faced with an assessment, the student is primarily motivated to pass and tends to focus on memorizing the material provided by the professor (36). A previous study in fifth-year medical students reported a 25% adoption rate of SA with a rote-learning tendency, hindering association with prior knowledge and complicating learning (14). From Biggs' perspective, memorization is considered a SA when it is used instead of comprehension (6). In general, the SA is more frequently observed in first-year students and is less common in later clinical years (37).

Within the framework of Student Approaches to Learning (SAL) theory, approaches are multidimensional, integrating components of motivation and strategy, and their meaning depends on the context. Their relevance is established based on the student's intentions and the teaching-learning context, as well as the quality of the learning outcome (38).

Furthermore, this line of research has allowed for the correlation of learning approaches with various variables, including academic performance, measured by students' grade point averages. In the present study, the predominance of the deep learning (DL) approach aligns with the overall semester grade point average, suggesting that students develop effective strategies and self-management skills linked to intrinsic motivation. These skills facilitate academic planning, organization, and prioritization, contributing to the development of fundamental competencies, especially clinical reasoning. Consistent with the literature, it has been reported that, in clinical assessment contexts, students with better results tend to employ a combination of strategies that promote the integration of knowledge, skills, and professional behavior (39).

Other variables of interest are sex and age. Previous studies with 108 medical students indicate that men tend to prefer DA (Digital Addiction) more than women, although no significant differences were observed for SA (Surgical Addiction) (12). This finding contrasts with the results of the present study, where DA predominated among women (n=107, 98.2%), with no statistically significant differences compared to men (n=35, 97.2%). This discrepancy also differs from other studies that showed no sex differences or reported a more marked preference among women (16, 40), a situation attributed to cultural and contextual factors (12). However, the literature maintains that women tend to achieve better academic performance, including a greater likelihood of graduating with honors and superior performance on clinical assessments (41).

Regarding age, previous research has shown that learning orientation (LO) is more frequent among older students; however, age alone does not fully explain the preference for LO or the orientation toward learning objectives (34). In the present study, no significant differences were identified in the relationship between age and learning approach. Although previous studies suggest the influence of age, the causal factors that determine the adoption of a specific approach remain unclear (40). Biggs argues that age may be a factor because older students possess greater intrinsic motivation, more personal experience, and the ability to organize their activities more efficiently than younger students, who "have less to lose" and, therefore, may have lower intrinsic motivation (4).

In general, the evidence suggests that learning disabilities reflect a unique variation in academic performance, although their relationship with other variables—such as personality and individual intelligence—indicates that the adoption of learning approaches is a complex and multidimensional phenomenon (42).

The variation of clinical learning experiences

The Covid-19 pandemic in 2020 caused significant disruptions to medical education, forcing immediate adjustments. Following the initial closure in March 2020, medical schools worldwide systematically adopted distance learning modalities. Within the category of “learning in times of pandemic,” several subcategories were identified, among which the use of family-based clinical practice as a strategy for acquiring clinical skills stood out. This modality presented variations in its implementation: on the one hand, the experiential learning facilitated by interaction with family members or through direct observation of real clinical cases presented by instructors was a positive and significant aspect; on the other hand, negative aspects were reported, as students faced uncertainty about the accuracy of their actions and limited exposure to the pathology, since family members were generally healthy.

Learning from clinical experience remains an essential component of medical student training, involving participation in evidence-based practices and interaction with other healthcare professionals and peers. This process is strengthened by formal and informal pedagogical support from clinical educators, which facilitates adaptation to the unpredictable nature of clinical encounters and ensures that students can consistently experience the dynamics of the clinical environment (43). In this regard, previous research has highlighted that real-time clinical experiences proved to be a highly satisfactory learning modality for students during the pandemic (43-45). However, concerns have also been raised about patient confidentiality when broadcasting live medical consultations to remote students (46).

Another widely used learning strategy was the creation and viewing of clinical videos, which allowed access to a wide range of topics in an autonomous and flexible manner, facilitating preparation before classes. Furthermore, the creation of individual or group videos promoted information analysis and synthesis skills. Clinical videos are valuable resources for understanding specific clinical signs, and their availability on multiple digital platforms facilitates access for students and healthcare professionals (47).

At the Ibero-American Forum on Medical Education, when asked “How to address the changes to maintain a high level of theoretical and practical education?”, most universities responded that the solution lay in increasing the use of e-learning, with a preference for online educational platforms and videoconferences (48). Within the framework of this research, an inductive category was identified that groups the different types of virtual classes experienced by students, including videoconferences, seminars, discussions, and synchronous and asynchronous virtual classrooms, which facilitated group interaction, assessment, and technological and personal learning.

However, technological limitations and access barriers were evident, coinciding with Gómez Arteta, who points out that “educational subjects, during the pandemic, are not on equal footing to access virtual education: geographical location, economic and technological resources, training and experience in the use of information and communication technology” (49). Likewise, students reported family distractions, limited connectivity and scheduling problems as obstacles during virtual classes, in line with what was documented by Dost and colleagues (50).

Among the emerging categories identified in the study population, the most prominent was “learning strategies for integrating theoretical and practical knowledge,” which is further divided into

several subcategories. The most relevant, based on narrative frequency, was "proactive approaches to improving the learning process," which includes the adoption of comprehensive strategies that combine theoretical and practical knowledge, facilitating its application in diverse learning environments. However, this category revealed difficulties such as reading without feedback and the transfer of theoretical knowledge to real-world clinical practice, which posed a challenge to competency development and the acquisition of the required learning. These factors generated uncertainty among students due to the increased theoretical component and the limited practical experience in hospital settings and clinical training centers, where clinical rotations are essential. In this sense, one particularly affected competence was the ability to establish a doctor-patient relationship, identified as a disadvantage in medical training (51), since its development depends on communication skills, trust, respect and the interpersonal climate between doctor and patient (52).

Secondly, the category "teaching strategies for the development of practical skills" was identified, linked to the subcategory "proactive and intentional approaches to improve the teaching process." This subcategory integrates various didactic approaches implemented by clinical instructors, tailored to the planned clinical content. Within this category, the strategy most valued by students was "clinical cases for the development of clinical reasoning." This strategy allowed participants to analyze and discuss clinical cases based on scientific literature, case reports, and virtual scenarios, with or without direct guidance from the instructor. This strategy fostered diagnostic differentiation, clinical decision-making, and treatment planning, significantly strengthening clinical reasoning, a core competency for both their medical training and their future professional practice. The study and resolution of cases is widely recognized in medical education as an active and collaborative learning strategy that enhances deep learning, critical thinking, and the generalization of knowledge to new clinical contexts (53-55).

Finally, the category "motivation to learn" was identified, with significant differences among its components. The subcategory "intrinsic motivation" relates to students' persistence in continuing their studies during the pandemic, taking advantage of the opportunities offered by the university to maintain academic continuity through the virtualization of teaching and learning strategies and the optimization of the virtual campus. Despite the limitations, students demonstrated a high degree of motivation to adapt to the virtual modality and maintain their pace of learning. A meta-center study showed that 95.41% (n=1505) of students perceived a negative impact on the quality of their education due to their limited prior experience in virtual environments and the accelerated implementation of remote strategies during the educational emergency, as well as the lack of technological resources such as computers, microphones, or cameras (56). On the other hand, online teaching offered flexibility, time and cost savings, although students reported connectivity problems, family distractions and space limitations for concentration, factors that directly influence the motivation to learn (50).

Secondly, the subcategory "extrinsic motivation" was identified, which is primarily related to two components. The first corresponds to the "social recognition of healthcare personnel for their work during the pandemic," given that these professionals were universally valued as "heroes," which encouraged students to persevere in their studies. Lipworth (57) points out that both the hero narrative and the calls for mutual protection reflect the central themes of bioethical discourse on patient care during infectious disease outbreaks. This approach emphasizes the moral foundations of the so-called "duty of care" of healthcare workers, which includes general duties and virtues such as altruism, beneficence, non-desertion, justice, and solidarity (57). The second component is related to "family support," as students reported that the commitment and support of their families provided them with an additional incentive to fulfill their academic obligations.

Likewise, during the pandemic, the category “effects of the pandemic on personal change” was analyzed, which generated several positive subcategories, such as empathy, character strengthening, sensitivity to humanism, resilience in the face of challenges, adaptability, and the strengthening of family ties. Among these, the most recurrent in the narratives was sensitivity to humanism, followed by empathy. These aspects are fundamental for medical training, given that the construction of professional identity involves a socialization process that transforms existing identities into personal and professional identities, influenced by factors such as role models, experiential learning, teaching professionalism, and the educational environment (58). The essential principles for developing professionalism include excellence, responsibility, altruism, humanism, ethics, integrity, and knowledge of healthcare systems, which should be fostered through meaningful learning experiences during the preclinical and clinical years, given their direct impact on students' personal development (59, 60). International literature in medical education emphasizes the promotion of empathy, not only to improve the doctor-patient relationship, but also because of its correlation with students' academic and clinical performance. However, during the pandemic, the implementation of strategies to develop empathy was limited by the restriction of direct contact with patients and faculty, although the use of recordings and virtual resources allowed students to access experiences that fostered the strengthening of clinical communication.

Subsequently, in the phase known as post-pandemic or gradual return to in-person learning, this research identified the category “appreciations of clinical practice learning,” which demonstrates students' motivation to return to the university and clinical practice sites. This category includes subcategories related to independent time management, the application of practical skills, the adoption of new study methods, and adaptation to the challenges of the transition from online to in-person instruction. Previous studies reported that 27.63% of students were not interested in returning to university due to the benefits of online classes, such as reduced transportation and accommodation expenses, while 17.94% expressed interest in resuming in-person classes to access practical experiences and avoid connectivity issues, lack of electronic devices, and insufficient feedback (61). These factors were recognized as structural barriers, although a greater willingness toward digital self-directed learning was observed (62).

Similarly, studies indicate concerns regarding biosafety protocols and physical interactions between teachers and students in closed learning environments (63). In response, the return to clinical practice included medical simulation, identified as an effective strategy for developing clinical skills in a controlled environment that offered safety to students and allowed for improved clinical assessment (62).

It has been shown that the social restrictions imposed during the Covid-19 pandemic presented significant barriers to the development of professionalism and other competencies in medical students. As the epidemiological situation improved, in-person clinical sessions resumed with strict safety measures to protect students, faculty, and patients. However, these sessions were limited in duration and in the diversity of available clinical cases, hindering direct interaction with patients and the consolidation of skills related to professionalism (64,65). This situation generated concerns, uncertainty, and anxiety among students, as well as a loss of confidence in their own abilities (66,67). According to socialization theory, direct interaction with patients through clinical experiences is the most influential factor in the development of professionalism in medical students (67).

Globally, during this period, the development of hybrid courses in various clinical rotations was observed (62, 68-71), which combine online instruction and face-to-face practice. These courses are considered to constitute a balanced educational experience, although how the synchronization between virtual teaching and clinical rotation impacts student outcomes is still unknown (68). Hybrid courses have shown positive effects on both basic and higher cognitive aspects—fundamental for

knowledge construction, skills development, executive functions, and problem-solving—as well as on psychosocial aspects, which were negatively affected during lockdown and social isolation. Face-to-face interaction allowed, for example, the expression of emotions, direct interaction with instructors and peers, affective exchange, and the development of indicators of empathy and social responsibility. However, curriculum design faced limitations related to the planning of objectives, methods, content, and assessments, which made it difficult to guarantee the continuity of practical learning inherent in clinical training.

Within this context, a robust category called “Emotional Reactions to the Return to In-Person Learning” was identified, which includes subcategories corresponding to positive emotions (satisfaction, achievement of goals, joy, euphoria), negative emotions (fear, sadness, stress, anxiety, frustration), and the reactivation of previous emotions, such as nostalgia. These emotional experiences had a significant impact on students' adaptation to in-person activities. Recent studies have also addressed this topic, particularly in relation to stress and anxiety. For example, a study published in April 2022, at the end of the health emergency, reported that students who perceived stress associated with academic life, interpersonal relationships, and isolation were at risk of anxiety, somatization, and sleep disorders. Likewise, those who experienced fear of infection showed a risk of depression and obsessive-compulsive symptoms. Although overall levels of Covid-19-related stressors decreased after the end of the emergency, the findings showed an acute and sustained increase in psychophysical suffering, manifested mainly in somatization, interpersonal sensitivity, paranoid ideation and psychoticism (72).

However, unlike the negative findings reported in the literature, this study identified that positive emotions were the most frequently reported by clinical students. Participants expressed joy, euphoria, and satisfaction upon returning to the university and clinical placement sites, highlighting the interaction with professors, colleagues, and, in particular, direct contact with patients, which generated significant learning experiences and emotional well-being.

Conceptions and types of learning approaches

A pre-Covid-19 pandemic study investigated undergraduate medical students' conceptions of exam learning using interviews and a phenomenographic methodology. The results indicated that holistic learning was the most common approach, regardless of whether exams were integrated or separated by subject. However, rote memorization was perceived by participants as a tedious approach to assimilating extensive material. Similar changes in learning approaches were observed among students, both qualitatively (change of category) and quantitatively (number of students), with no significant differences in the conceptions of learning between the two environments evaluated: one with separate written exams for each subject and the other with an integrated final written exam. In holistic learning, students show willingness and motivation to learn, although they sometimes apply a superficial approach by memorizing disconnected data without seeking to understand the deeper relationships between them (73).

In this research, the quantitative phase revealed that 97.9% of participants adopted a deep learning (DL) approach, which is partially related to concept 6, “Learning is changing as a person,” located at a middle level of the hierarchy. This finding suggests that the experience of the Covid-19 pandemic had an impact not only on the students' clinical-medical education but also on their personal development. Influential factors include: the recognition of the importance of empathy toward the patient and responsibility from a humanistic perspective, the appreciation of continuous learning and clinical judgment, and the strengthening of resilience in the face of the changes imposed by the pandemic, balancing potential obstacles with positive coping strategies. These factors correspond to the characteristics of DL, reflecting the students' intention to approach their academic activities in a meaningful way.

Additionally, several studies have shown that students' withdrawal from the clinical setting affected their career aspirations by limiting opportunities to explore areas of interest, interact with specialized professors, and receive career guidance (74-75). On the other hand, experiences of recognition for the work of physicians and participation as volunteers during the pandemic reinforced some students' intention to pursue clinical careers, reaffirming their professional aspirations (76). These findings are consistent with the results of the present research, as the shift to remote and virtual education during the pandemic represented a drastic adjustment. Students demonstrated resourcefulness and personal and social adaptation strategies to continue their studies, despite restrictions on clinical placements in hospitals. However, the difficulty in applying the knowledge acquired in virtual modalities limited, in some cases, their current or future academic and professional interests.

5. Conclusions

- The study confirms the SAL theory, showing that students combine motives and strategies that influence their approach to learning, with a high prevalence of deep focus (DA) in 97.9% of participants.
- The analyses indicate that deep motivation is stronger than deep strategy, and that learning approaches alone do not predict academic performance without considering their intensity.
- The qualitative phase, from a phenomenographic perspective, revealed variations in the “clinical learning experiences” between the pandemic period and the return to face-to-face interaction.
- The mixed design allowed for the integration of quantitative and qualitative results, providing a more complete understanding of the phenomenon and meeting credibility criteria.
- The study has limitations due to being single-center and conducted during the pandemic; longitudinal and multicenter research is recommended to improve the understanding of clinical learning and its contextual variation.

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Table 2. Stable system of significant categories and subcategories surrounding the studied phenomenon of clinical learning experiences, within the dimension of the pandemic period.

Deductive Categories	Inductive Categories	Inductive Subcategories
1. Learning in times of Pandemic	1. Time without patients	
	2. Techniques for studying and learning during a pandemic	1. Group study
		2. Synthesis using graphic organizers
		3. Videos to enhance studying
		4. Reading to study
	5. Virtual class	
2. Learning strategies for the integration of theoretical and practical knowledge	3. Proactive approaches to improve the learning process	6. Practice with family members to acquire clinical skills
		7. Redistribution of clinical practices
		8. Theoretical and practical correlation with prerequisite subjects
	4. Difficulties	9. Reading without feedback
		10. Application of theoretical knowledge to real practice
3. Motivation to learn	5. Extrinsic	11. Social recognition of healthcare personnel for their work during the pandemic
		12. Family effort
	6. Intrinsic	13. Academic effort
		14. Continue the linearity of academic time
7. Lack of motivation to learn		
4. Impact on Academic Performance	8. Positive	15. Strengthening study time in the virtual environment
		16. Relationship between academic performance and grade
		17. Reinforcement of study and knowledge for practice
	9. Negative	18. Family obligations
		19. Linearity of clinical subjects in the implemented curriculum
		20. Reduction of academic demands in virtual learning
		21. Challenges associated with the virtual learning environment
		22. Change in study methods
		23. Perception of high academic workload
		24. Lack of organization in study time
		25. Commitment to completing assignments rather than to learning
		26. Lack of meaningful learning
		27. Relationship between academic performance and grade
		28. Training limited to theory
29. Lack of supervision in practical activities carried out at home		
5. Teaching Strategies for the Development of Practical Skills	10. Proactive and intentional approaches to improve the teaching process	30. Clinical practice with a real patient from a virtual environment
		31. Clinical cases for the advancement of clinical reasoning
	11. Student feedback	32. Teacher's academic effort for student learning
		33. Teacher availability
		34. Sufficient tools for theoretical learning

		35. Limited tools needed for clinical practice
6. Positive aspects of clinical learning	12. Personal management for learning	36. Adaptation for autonomous learning
		37. Sufficient study time for theoretical learning
		38. Increased reading
		39. Use of diverse technological tools
	13. Coping well with adversity	40. Family support
		41. Learning in pandemic situations
		42. Learn about Covid-19
7. Effects of the pandemic on personal change	14. Favorable	43. Readaptation process through resilience
		44. Empathy
		45. Character Strengthening
		46. Sensitivity towards humanism
		47. Resilience in the face of challenges
		48. Preparation by vocation
	15. Unfavorable	49. Ability to adapt to changes due to the pandemic
		50. Strengthening family ties
		51. Mental health problems
		52. Uncertainty during the pandemic

Table 3. Stable system of significant categories and subcategories surrounding the studied phenomenon of clinical learning experiences within the dimension of the progressive return to face-to-face learning period.

Categories Deductive	Categories Inductive	Subcategories
1. Clinical Learning Assessments	1. Autonomous time management to take advantage of experiential learning clinical scenarios (Clinical Simulation and others)	
	2. Implications of academic work in the return to clinical practice centers	1. New study methods
		2. Memorization of the theory
		3. Theoretical and practical correlation with a real patient
		4. Activate previously unused study tools
		5. Progressive development of practical skills
6. Teacher interaction that fosters knowledge		
3. Feeling of difficulty in the transition from the pandemic to in-person learning		
2. Changes in future professional practice	4. Expectations regarding another pandemic	
	5. The reality of the risk to healthcare professionals	
	6. Interaction with the patient	
	7. No perception of changes	
3. Emotional reactions to the return to in-person	8. Positive Emotions	7. Satisfaction
		8. Goal achievement
		9. Joy

learning	9. Negative Emotions	10. Euphoria
		11. Fear
		12. Sadness
		13. Stress
		14. Anxiety
	15. Frustration	
	10. Ambiguous Emotions	16. Nostalgia

Table 4. Results space according to the phenomenographic perspective and sequential triangulation.

Hierarchy in the levels of evaluation of opinions on the participants' experience	Referential (what) according to the description of the six conceptions (C1-C6) by Marton F, Dall'Alba G, Beaty E (19)	Structural (how) According to the perspective of the type of approach (DA, SA)	
		DS	DP
Very Low	Learning is Memorization C2 (14 quotes)	X	
	Learning is about understanding or extracting meaning from the content C4 (19 quotes)		X
Low	Learning is the quantitative acquisition of knowledge C1 (22 citations)	X	
Half	Learning is changing as a person C6 (47 quotes)		X
High	Learning is a process of interpretation with the goal of understanding reality C5 (55 quotes)		X
Very High	Learning is the acquisition of data, methods, and procedures for when C3s are needed (59 appointments)	X	



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