



Meaningful Learning in Medical Education

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ABSTRACT

This scoping review examined the theoretical and conceptual foundations of meaningful learning in medical education. Google Scholar and PubMed were searched for publications from 2020 to 2025, with earlier works also considered. Twenty-two works were selected. The synthesis addressed three themes: meaningful learning in medical education, teaching strategies, and learning strategies. The literature described problem-based learning, flipped classrooms, practical sessions, case studies, collaborative work, and digital resources. Meaningful learning requires connections between prior knowledge and new content, opportunities for application, and student participation. Teachers should adapt instruction to students' needs, while students should select learning strategies suited to the task and educational setting

INTRODUCTION

Education in general, and higher education in particular, has faced changes and challenges throughout its history in response to social needs and demands that require adaptation to the realities of the twenty-first century. According to Cushpa Guamán et al. (2024), medical education has undergone changes associated with the development of society, advances in science and technology, the introduction of new pedagogical resources, and increased enrollment in medical schools. These developments have prompted the adoption of new teaching and learning strategies.

In 1963, David Ausubel began to explain a cognitive theory of meaningful verbal learning that differed from the approaches then in use and challenged educational practice. He argued that most learning occurred through the verbal reception of information presented by teachers, while learners incorporated that information into their cognitive structures. Learners required intrinsic motivation, and meaningfulness was possible only when they connected new knowledge with what they already knew. Different pedagogical models have interpreted meaningful learning in different ways. Matienzo (2020) describes knowledge as a progressive construction that develops in stages, comparable to the construction of a house designed around specific preferences and needs.

From an epistemological standpoint, medicine is conceived as a science composed of theoretical concepts, skills, and procedures that require proficiency in specific medical technologies for diagnosis, treatment, and disease prevention. Medicine is a multidisciplinary field that draws on different areas as students acquire knowledge. First-year students begin a transition from general foundational education to the demands of integrated study that connects theory with practice. They must analyze knowledge through innovative models that help them develop learning they can apply throughout life.

Higher education institutions worldwide are committed to comprehensive professional preparation and academic quality. Educational practices should support an interdisciplinary approach to meaningful learning through the principles of learning to do, learning to know, learning to be, and learning to live together. Latin America has also adopted this educational model, which emphasizes student-centered, problem-based, integrated and integrative education and community medicine alongside hospital practice. Efforts to improve educational quality include teacher preparation, methodological strategies, research, and continued support for learners. Educational materials and technological resources are incorporated into teaching to help achieve meaningful learning.

Meaningful learning is an approach to medical education that supports a deep and lasting understanding of the concepts and skills students require. Understanding its contribution can help improve academic preparation and subsequent professional performance. This review aimed to examine the theoretical and conceptual foundations that support the promotion of meaningful learning among medical students.

LITERATURE REVIEW

Education has evolved, and students are now expected to become conscious, responsible learners who construct their own knowledge. The expectation extends beyond the exact retention or storage of information. Teachers are also expected to facilitate opportunities for students to generate new knowledge and to assume responsibilities beyond the transmission of information (Roa Rocha, 2021).

METHODOLOGY

This study adopted a scoping review methodology. Fernández-Sánchez et al. (2020) describe this approach as a means of answering research questions and summarizing and disseminating existing evidence. To synthesize information on meaningful learning in the education of health professionals, the review addressed three questions: Why should meaningful learning be promoted in health sciences education? Which teaching strategies foster meaningful learning? Which learning strategies are most commonly used for this purpose?

The literature search covered publications from 2020 to 2025, although four earlier works were also considered for their contribution to the topic. Google Scholar and PubMed were the information sources. The Spanish search terms were aprendizaje significativo AND formación médica AND estrategias de enseñanza AND estrategias de aprendizaje; the English terms were meaningful learning AND medical education AND teaching strategies AND learning strategies. Priority was given to articles retrieved from PubMed.

The search retrieved 166 articles. After duplicate removal, 152 remained for assessment of their correspondence with the topic on the basis of abstracts and keywords. Inclusion criteria covered publications within the specified period that addressed the selected Spanish and English keywords and appeared in journals indexed in PubMed. A total of 22 works were selected for their correspondence with the topic. Figure 1 presents the selection process.

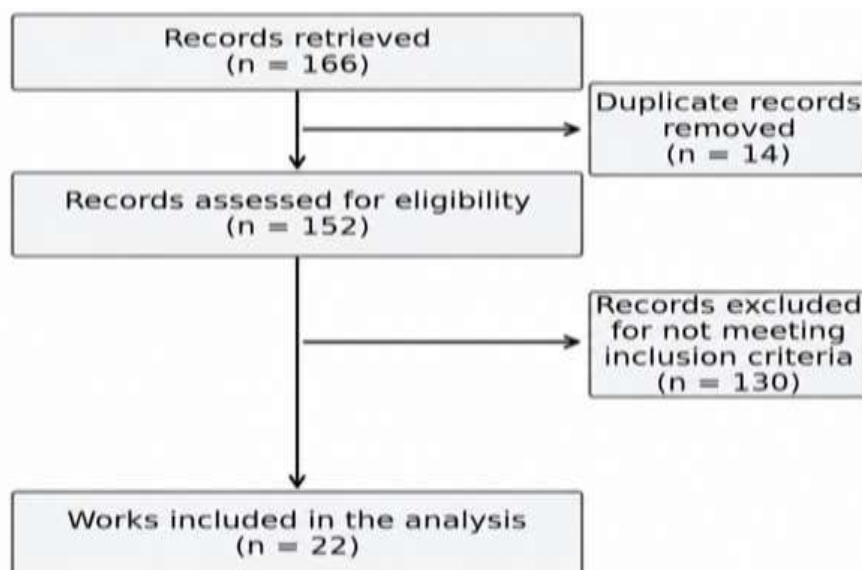


Figure 1. Selection of Works for the Review
Source: Authors' Compilation

RESULTS

Characteristics of the selected works

The 22 selected works represented 13.25% of the 166 retrieved articles. The review considered publications from the specified period and earlier works that contributed to its theoretical foundations.

Table 1 presents the distribution of the 22 selected works across 10 countries. Twenty were from Latin America: Ecuador (n = 8), Venezuela (n = 4), Cuba (n = 3), Mexico, Argentina, Panama, Chile, and Costa Rica (n = 1 each). China and Spain contributed one article each. Ecuador had the largest representation, followed by Venezuela and Cuba. Although the review primarily drew on regional literature, works from other countries were included to support the theoretical discussion.

Table 1. Distribution of Selected Works by Country

Country	Number of works
Venezuela	n = 4
Mexico	n = 1
Cuba	n = 3
Argentina	n = 1
Ecuador	n = 8
Panama	n = 1
Chile	n = 1
China	n = 1
Spain	n = 1
Costa Rica	n = 1

Source: Authors' Compilation

Figure 2 shows the distribution by publication year. Table 2 provides the authors, publication years, languages, and main topics of the selected works. Spanish-language publications predominated in the table.

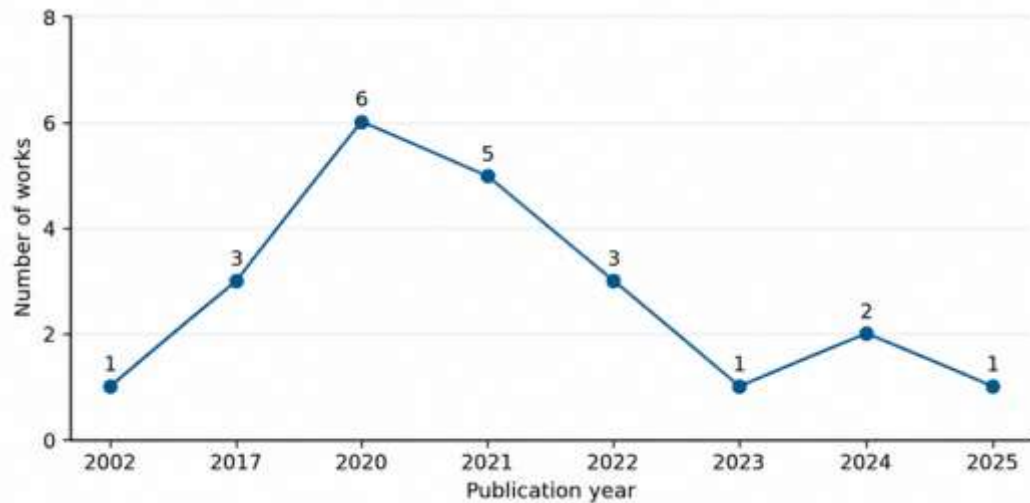


Figure 2. Distribution of Selected Works by Publication Year
Source: Authors' Compilation; Values Reproduced from the Original Chart

Table 2. Works Included in the Review

#	Authors (year)	Language	Main topic
1	Ormaza-Ulloa et al. (2020)	Spanish	University teaching and active methods to promote meaningful learning.
2	Sánchez Díaz et al. (2021)	Spanish	Meaningful learning and social responsibility in health sciences.
3	Cervantes López et al. (2020)	Spanish	Strategies to improve learning and academic performance among university students.
4	Zárate Bahena (2020)	Spanish	Proposed instructional strategies for meaningful learning among medical students.
5	Moreira (2017)	Spanish	Meaningful learning as a framework for organizing instruction.
6	Moreira Choez et al. (2021)	Spanish	Meaningful learning as an alternative for educational change.
7	Baque-Reyes & Portilla-Faican (2021)	Spanish	Meaningful learning as a teaching strategy.
8	Salazar Béjar & Cáceres Mesa (2022)	Spanish	Metacognitive strategies for meaningful learning.
9	Cushpa Guamán et al. (2024)	Spanish	Teaching methods for meaningful learning in physiology.
10	Zapata Mora (2022)	Spanish	Active methods for meaningful learning in physiology.

#	Authors (year)	Language	Main topic
11	Heredia Cabrera et al. (2022)	Spanish	Flashcards as an instructional strategy for meaningful learning among university students.
12	Vera Velázquez et al. (2020)	Spanish	Constructivist teaching and learning methods in higher education.
13	Castillo-Montes & Ramírez-Santana (2020)	Spanish	Active methods and information and communication technologies in medical education.
14	Herrera Enríquez et al. (2021)	Spanish	The role of teaching methods in administrative sciences programs.
15	Zhao et al. (2020)	English	Effectiveness of virtual reality-based technology in anatomy teaching.
16	Teneda & Espinoza (2024)	Spanish	Educational strategies for human anatomy courses in medical schools.
17	Hidalgo Cajo et al. (2017)	Spanish	Instructional strategies to enhance clinical pharmacology learning.
18	Díaz Barriga Arceo & Hernández Rojas (2002)	Spanish	Teaching strategies for meaningful learning.
19	Quesada Pallares et al. (2017)	Spanish	Understanding the use of learning strategies.
20	Richard & Culcay Delgado (2025)	Spanish	Scientific posters as a teaching strategy to promote meaningful learning.
21	Olivo Franco (2021)	Spanish	Concept maps to assess meaningful learning.
22	Armijos León & Ávalos Florez (2023)	Spanish	Moodle and meaningful learning during a general surgery rotation in the medical internship.

Source: Authors' Compilation

Content analysis identified three themes that guided the responses to the research questions: meaningful learning as a requirement of medical education, teaching strategies, and learning strategies that foster meaningful learning.

DISCUSSION

Meaningful Learning as a Requirement of Medical Education

Learning is part of human development and involves the acquisition of knowledge, skills, attitudes, and values throughout life. It entails interaction between individuals and their environment, together with the integration of prior experience and new knowledge. The capacity to reflect, analyze, synthesize, and apply knowledge in different settings is also part of learning. This complex activity influences cognitive, emotional, social, and professional development. Cervantes López et al. (2020) define learning as a relatively permanent change in a person's behavior that arises from experience and as a by-product of thought whose quality depends on the quality of that thought.

Throughout the history of education, thinkers such as Ausubel, Vygotsky, Piaget, and Montessori have emphasized students' active participation in learning, creativity, and autonomy, with teachers as facilitators of teaching and learning. This approach continues to shape educational practice. Ormaza-Ulloa et al. (2020) describe an innovative constructivist approach in which university students construct knowledge through interaction with teachers, their environment, and their working group. Sánchez Díaz et al. (2021) add that students must be interested in learning what they are taught.

Meaningful learning, as described in Ausubel's theory, involves the substantive integration of new knowledge into an individual's existing cognitive structure, through which new meanings emerge. Zárate Bahena (2020) associates this approach with instructional environments that help students understand what they learn. The approach promotes the application of that knowledge to new situations and different settings, with understanding as an educational objective beyond memorization.

This approach recognizes the value of connections between new information, prior knowledge, and students' experience for deep understanding and long-term retention. The information must have meaning and applicability for learners. Its cognitive orientation promotes a deeper and more lasting understanding of concepts and supports higher-order cognitive skills, such as critical thinking and problem-solving. Future health professionals require these skills to interpret and apply what they learn. The approach emphasizes the relationships students establish with information rather than the isolated memorization of facts and data.

Meaningful learning focuses on how students construct new knowledge through connections with what they already know. In rote learning, information is acquired in isolation, without connections to prior knowledge. Meaningful learning promotes understanding and long-term retention through the coherent and substantive integration of new information into the learner's existing cognitive structure (Ausubel et al., 1983). Moreira (2017) describes it as the acquisition of knowledge with meaning, understanding, and critical reflection, together with the possibility of using that knowledge in explanations, arguments, and solutions to problems, including unfamiliar situations.

Over time, students have required different ways to learn. A challenge for twenty-first-century higher education is to introduce strategies that support the necessary changes in institutional organization and teaching methods, facilitate learning, and encourage metacognition. Meaningful learning depends on two conditions: the materials must be potentially meaningful, and students must be interested in learning (Moreira Choez et al., 2021).

Baque-Reyes and Portilla-Faican (2021) emphasize participation in meaningful learning. Students express their own ideas and use them to formulate new understanding with teachers or classmates before they review that understanding. The activity is interactive and integrative because it connects students with the different topics developed in class.

Meaningful learning has particular implications for medical students because of the complexity and demands of their discipline. It involves the deep and contextualized integration of knowledge into students' cognitive structures so that they can understand and apply it in real clinical situations. Medical practice requires the assimilation of information and the ability to use it effectively in diagnosis and treatment. Meaningful learning thus supports clinical skills and informed decision-making. It also promotes a reflective and critical attitude toward learning, which contributes to continued professional development and improvements in patient care.

Meaningful learning is an educational need for higher education institutions, particularly medical schools, because students must make knowledge their own and understand where and how to use it through an accessible approach suited to their surroundings. The literature connects meaningful learning with metacognitive strategies. Salazar Béjar and Cáceres Mesa (2022) describe these strategies as knowledge of one's own cognitive activities and the ability to monitor and regulate them. They allow students to take responsibility for their learning, understand how they learn, and apply suitable techniques to process and retain information effectively.

Strategies and practices to foster meaningful learning include attention to prior knowledge and instruction that connects content with its use and context. They also include opportunities to develop understanding, ask questions, analyze and synthesize information, participate actively, receive individualized instruction, and obtain constructive feedback.

Teaching Strategies

Teaching strategies involve more than a plan that sets out guidelines. Teachers must consider the ways students use digital media to read and interpret the world and to approach academic content and tasks. Schools and teachers need to recognize these forms of engagement. Cushpa Guamán et al. (2024) describe developments in pedagogical resources from an initial emphasis on oral presentation, through which knowledge and experience were transmitted directly and verbally. Current teaching draws on new instructional techniques and educational technologies that offer varied opportunities to support students' construction of knowledge.

Twenty-first-century universities should adopt curricular and instructional models that create conditions for meaningful learning. These models should correspond to the general and specific competencies that future health professionals require for appropriate professional practice (Zapata Mora, 2022).

Problem-based learning is among the strategies discussed by several authors for meaningful learning in medical education. This approach places students at the center of the educational activity and presents real or simulated clinical situations that require analysis, reflection, and decisions. Connections between theoretical knowledge and contextualized problems support active knowledge construction, critical thinking, autonomy, and collaboration, all of which are required in medical practice. Links with practical experiences can also foster long-term retention and strengthen future professionals' capacity to respond to clinical challenges. Implementation requires teachers to have extensive subject knowledge and command of the methodology. Without adequate preparation, the approach may become counterproductive or be rejected by students.

Heredia-Cabrera et al. (2022) and Teneda and Espinoza (2024) discuss the flipped classroom as a teaching method that uses videos, infographics, flashcards, and other resources with which students interact during independent study. In medical education, students prepare in advance through readings, videos, or clinical cases and use classroom time to deepen their understanding, resolve questions, apply knowledge, and develop clinical skills collaboratively. This approach encourages active and responsible participation in learning and connects theory with practice, clinical reasoning, and decision-making. Teachers facilitate learning, while students take an active role in their education. The flipped classroom supports the internalization of knowledge, autonomy, and the capacity for self-directed learning.

Vera Velazquez et al. (2020) describe lectures as a method centered on the teacher's oral presentation of course content. They also note that lectures have evolved through the use of additional instructional resources and active student participation, which support reception and understanding of the material. Carefully designed and directed lectures remain useful in medical education, particularly to introduce complex concepts, organize large amounts of information, and connect different areas of knowledge. Their effectiveness depends on the teacher's ability to contextualize content and engage students through clear, coherent explanations. Participatory strategies, including guiding questions, clinical examples, and connections with other active learning methods, can support deep understanding, cognitive organization, and motivation for further independent study.

Vera Velazquez et al. (2020) also describe practical classes as activities through which students apply knowledge to specific situations and acquire foundational and procedural skills associated with the subject. Students undertake controlled activities that require the application of existing knowledge and support meaningful learning. Real or simulated settings allow theoretical knowledge to connect with direct experience and consolidate understanding.

This form of instruction supports clinical and technical skills, diagnostic reasoning, and decision-making within a controlled environment that allows errors as part of training. Cushpa Guamán et al. (2024) describe seminars and workshops as methods characterized by interaction, exchange of experiences, criticism, experimentation, dialogue, discussion, and reflection. Seminars provide more opportunities to debate a specific topic, while workshops focus on the acquisition of manual and instrumental skills. Advance preparation and active participation in the exchange of ideas allow students to examine specific content in greater depth. These activities also support communication, argumentation, and critical thinking skills required in professional practice.

Castillo-Montes and Ramírez-Santana (2020) describe case studies as a method based on in-depth analysis that connects theory and practice through reflection. Students examine how experts have solved or could solve problems. The authors also discuss problem-based learning, in which students have opportunities to experiment, try out approaches, and investigate everyday phenomena and activities. Group study and group work organize classroom interaction so that students learn from one another, their teachers, and the environment. This method provides opportunities to develop social competencies, including communication.

Independent study places responsibility for the organization of work and acquisition of competencies on students, who progress at their own pace. This approach promotes meaningful learning of curricular content (Castillo-Montes & Ramírez-Santana, 2020). In cooperative learning, students share responsibility for their own and their peers' learning in pursuit of group goals and incentives (Herrera Enríquez et al., 2021). Richard and Culcay Delgado (2025) emphasize that every teaching strategy depends on multiple conditions that support meaningful learning and competency development.

Zhao et al. (2020) discuss the use of technology in anatomy teaching. Information and communication technologies offer resources such as computers, educational software, projectors, and videos through which content can be presented interactively and visually. Their planned integration can support individualized teaching, adaptation to different learning preferences, and student autonomy. Students can assume a more active role in the construction of knowledge. Digital resources also support clinical simulation, telemedicine, and collaborative distance learning, which extend educational opportunities beyond the traditional classroom.

These approaches raise the question of whether teaching supports students' construction of knowledge or continues to rely predominantly on rote learning.

Medical education is generally delivered by physicians who are experts in their disciplines but may have gaps in pedagogical preparation. This situation occurs in universities in different countries. Hidalgo Cajo et al. (2017) describe the continued use of traditional teaching strategies in clinical pharmacology, even when teachers have specialist expertise in the field.

Gaps in pedagogical preparation can restrict the development of meaningful learning that students can apply in professional practice. Instructional strategies in higher education should correspond to educational objectives and the competencies required in medicine. Clinical case-based teaching, rotations across different specialties, and supervised clinical practice provide opportunities to integrate theoretical knowledge with practical experience.

Learning Strategies

Individuals have their own approaches to learning and use different methods that may vary in speed and effectiveness, alongside differences in motivation, age, and the similarity of the topics studied. Learning styles influence how students assimilate information and are presented as a factor in academic success.

Díaz Barriga Arceo and Hernández Rojas (2002) describe learning strategies as procedures that may include specific techniques or activities and aim to support learning and solve academic problems. Their flexible use distinguishes them from study habits. To develop meaningful learning, students need to apply a range of strategies. Quesada Pallares et al. (2017) discuss strategies to retrieve prior knowledge and organize or structure content, including mind maps, concept maps, summaries, essays, and collages. Table 3 summarizes strategies described by Cervantes López et al. (2020) and other cited authors.

Table 3. Learning Strategies

Strategy	Description
Mind map	Helps generate, organize, and express learning and connect ideas.
Concept map	Organizes concepts hierarchically, with more general concepts above more specific ones (Olivo Franco, 2021). Provides a schematic summary of learning through graphical structures.
Summary	A new text that briefly presents the main ideas of an original text.
Study notes	Reconstruct knowledge obtained from bibliographic sources and organize information from readings by topic and subtopic.
Essay	A short prose text that presents the author's personal interpretation of a philosophical, scientific, historical, or literary topic.
Synoptic chart	Classifies information and orders concepts from general to specific, from left to right, through hierarchical brackets.
Comparison chart	Identifies similarities and differences between two or more objects or events and presents the resulting conclusion.
Flowchart	A hierarchical diagram that represents a sequence through specific symbols that facilitate interpretation.

Two-way table	Records, organizes, and systematizes information through rows and columns that connect data obtained from reading.
Collage	An artistic technique that assembles different elements into a unified composition.
Debate	An intellectual exchange conducted with freedom, tolerance, and discipline, guided by a moderator who introduces the topic and discussion points.
Case study	A pedagogical strategy based on knowledge, in-depth analysis, understanding, and assessment of possible solutions. It connects theory with practice and the application of concepts and principles to support meaningful learning.
Flashcards	Small cards used for independent study that help students understand and review academic content and prepare for examinations. Repeated review supports retention or memorization (Heredia-Cabrera et al., 2022).
Instructional tasks	Activities directed toward meaningful and developmental learning that orient students toward the thematic and general objectives of a subject. Content follows the internal logic of the discipline and provides the categories, laws, principles, and concepts needed to understand phenomena, construct knowledge, and progress through stages of assimilation.

Source: Authors' Compilation Based on Cervantes López Et Al. (2020) and the Cited Authors

The development of learning strategies aims to help students become reflective learners who can acquire knowledge that continues to change within society. These strategies help students establish relationships between what they already know and new information, including the objectives and characteristics of the task they must complete.

The use of learning environments to support meaningful learning has expanded alongside socioeconomic and political changes and the development of web-based educational alternatives. Digital platforms and other information and communication technologies offer opportunities for interaction between teachers and students through programs and content developed with digital tools. These resources can support knowledge acquisition, creativity, and motivation within an approach to meaningful learning and the progressive development of students' knowledge (Armijos León & Ávalos Florez, 2023). Learning strategies should remain flexible and adaptable to the demands of the educational situation. They involve decisions through which students select and retrieve, in a coordinated way, the knowledge needed to meet a particular demand or objective. These decisions depend on the conditions in which students must act.

CONCLUSIONS AND RECOMMENDATIONS

Meaningful learning is a requirement of medical education because students must construct knowledge they can apply effectively in real situations in everyday professional practice. Teachers should provide effective, individualized instruction that addresses the particular needs of their students through timely and well-structured teaching strategies. Students should adapt their learning strategies to their own requirements and the tasks they face. These complementary responsibilities support the construction of knowledge and the meaningful learning that health professionals require.

FURTHER STUDY

This review was limited to Google Scholar and PubMed and to publications in Spanish and English, which may have excluded work available through other sources or in other languages. The selected works addressed different educational levels and disciplines; their applicability to medical education therefore requires consideration of each setting. The conceptual synthesis does not establish the comparative effectiveness of the teaching and learning strategies described. Future research should compare these strategies in medical students and assess knowledge retention and the application of learning to clinical tasks over time.

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