

Estrategia de aprendizaje basado en problemas en la asignatura de Anatomía de la licenciatura en Medicina

Problem – Based Learning strategy in Anatomy subject of the degree in Medicine

*Estratégia de aprendizagem baseada em problemas no assunto de Anatomia do
Bacharel em Medicina*

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Resumen

El aprendizaje basado en problemas (ABP) ha sido utilizado como método en escuelas de medicina de diferentes universidades. Sin embargo, en algunas ocasiones se ha puesto en duda su utilidad para construir conocimientos en anatomía, lo cual sucede porque al momento de realizar la evaluación, esta se enfoca en corroborar aprendizajes mediante exámenes con preguntas que son incongruentes con el ABP. En tal sentido, el **objetivo** de esta investigación fue diseñar, aplicar y evaluar una estrategia de ABP para fomentar el desarrollo del aprendizaje significativo crítico en estudiantes que cursan la asignatura de anatomía. El eje principal de la estrategia fue un problema común en la vida real de los estudiantes. Se utilizaron organizadores de información y preguntas formuladas por los propios estudiantes para orientar el aprendizaje, de modo que se evitó la transmisión verbal de información por parte del experto para darle paso a la comunicación entre estudiantes. El estudio se realizó en la Benemérita Universidad Autónoma de Puebla (BUAP), mediante una **metodología** que se aplicó en cuatro fases: la primera se centró en el diseño de la estrategia y en la elaboración y validación de los instrumentos de evaluación; la segunda consistió en un diagnóstico situacional; en la tercera se implementó la estrategia, y en la cuarta se realizó la evaluación final. La comparación de los **resultados** entre la evaluación inicial y final de los conocimientos declarativos, procedimentales y actitudinales valorales, así como la evaluación de la efectividad de la estrategia muestran que esta impactó de forma positiva en la mayoría de los estudiantes, quienes reconocieron la importancia de la anatomía en las lesiones de cuello. De hecho, solo una minoría de alumnos no logró construir el aprendizaje de la misma forma que sus compañeros, por lo que corresponde al maestro, como profesional de la educación, proponer nuevas metodologías de enseñanza y aprendizaje. En concreto, 98.6 % de los estudiantes evaluaron la estrategia como efectiva o muy efectiva para aprender de manera autónoma, es decir, sin que el maestro declare la información, y solo un estudiante (que representa 1.2 % de los participantes) evaluó la estrategia como poco efectiva. **Conclusiones:** Aunque no existe una estrategia universal

para promover la construcción del conocimiento de todos los estudiantes, el ABP logró fomentar el aprendizaje significativo crítico en la mayoría de los alumnos inscritos en una asignatura de anatomía en la Facultad de Medicina de la Benemérita Universidad Autónoma de Puebla.

Palabras clave: anatomía, aprendizaje basado en problemas, aprendizaje significativo crítico.

Abstract

Problem-Based Learning (PBL) has been used as a method in medical schools of different universities. However, in some cases it has been questioned its usefulness to build knowledge in Anatomy, which happens because, at the time of the evaluation, this is aimed at corroborating learning through tests with questions that are incongruent with the PBL. The **objective** of this research was to design, apply and evaluate a Problem Based Learning (PBL) strategy to encourage the development of critical meaningful learning in students taking the Anatomy course. The main axis of the strategy was a common problem in the real life of the students.

Information organizers and questions asked by the students themselves were used to guide learning, the verbal transmission of information by the expert was avoided and communication between students was encouraged instead.

The study was carried out at the Autonomous University of Puebla (BUAP by its name in Spanish), the **methodology** consisted of four phases: the first was the design of the strategy and the evaluation instruments together with the validation of the same, the second phase was an initial evaluation, the third phase was implementation of the strategy and the fourth phase consisted of the final evaluation. The comparison of the **results** of the initial evaluation and the final evaluation of the declarative knowledge, procedural knowledge and attitudinal, as well as the effectiveness of the strategy, show that the strategy allowed to improve the achievement of knowledge in a meaningful critical way and that the majority of the students recognized the importance of the anatomy in the neck injuries and in the exploration of the same. A minority of students failed to construct learning in the same way as their peers, so it is up to the teacher as a professional person to propose new teaching and learning methodologies. 98.6% of the students evaluated the strategy as *effective* or *very effective* to learn autonomously without the teacher declaring the information, in this same criterion one student evaluated the strategy as *not very effective*, which represents 1.2% of the total population.

Conclusions: There is no universal strategy to carry out the educational process that allows the construction of knowledge in all students. With the ABP strategy, significant critical learning was achieved in most of the students in an anatomy subject at the Faculty of Medicine of the Benemérita Autonomous University of Puebla, however, there was a minority that presented difficulties in the construction of knowledge.

Keywords: anatomy, problem-based learning, critical meaningful learning

Resumo

A aprendizagem baseada em problemas (PBL) tem sido usada como método em escolas médicas de diferentes universidades. Entretanto, algumas vezes tem sido questionada sua utilidade em construir conhecimentos em anatomia, o que acontece porque no momento da avaliação, ela se concentra em corroborar a aprendizagem por meio de exames com questões que são incongruentes com a ABP. Nesse sentido, o objetivo desta pesquisa foi projetar, aplicar e avaliar uma estratégia de PAF para incentivar o desenvolvimento de aprendizagens significativas e críticas em alunos que fazem o curso de anatomia. O eixo principal da estratégia era um problema comum na vida real dos estudantes. Os organizadores da informação e as perguntas formuladas pelos próprios alunos foram usados para orientar a aprendizagem, de modo que a transmissão verbal de informações pelo especialista foi evitada para abrir caminho para a comunicação entre os alunos. O estudo foi realizado na Universidade Autônoma de Benemérita de Puebla (BUAP), através de uma metodologia aplicada em quatro fases: a primeira focada no desenho da estratégia e no desenvolvimento e validação de instrumentos de avaliação; o segundo consistiu em um diagnóstico situacional; no terceiro, a estratégia foi implementada e, no quarto, a avaliação final foi realizada. A comparação dos resultados entre a avaliação inicial e final da declarativa, processual e valorais atitudinais conhecimento, bem como a avaliação da eficácia da estratégia mostra que este impacto positivo sobre a maioria dos estudantes que reconheceram a importância de anatomia em lesões no pescoço. De facto, apenas uma minoria de alunos não conseguiu construir a aprendizagem da mesma forma que os seus pares, pelo que cabe ao professor, como formação profissional, propor novas metodologias de ensino e aprendizagem. Especificamente, 98,6% dos alunos avaliaram a estratégia como eficaz ou muito eficaz para aprender de forma autônoma, ou seja, sem que o professor declarasse as informações, e apenas um aluno (representando 1,2% dos participantes)

avaliou a estratégia como ineficaz Conclusões: Embora não existe uma estratégia universal para promover a construção do conhecimento de todos os estudantes, a ABP foi capaz de promover a aprendizagem significativa crítica na maioria dos alunos matriculados em um curso de anatomia da Faculdade de Medicina da Universidade Autônoma de Puebla

Palavras-chave: anatomia, aprendizagem baseada em problemas, aprendizagem significativa crítica.

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Introduction

Throughout time, the formal way of teaching and learning has been influenced by various theories and paradigms that try to facilitate the process of understanding and learning. The knowledge of these paradigms allows us to adopt their successes, prevent their errors and, at a given moment, reconstruct the educational approach.

An example of this are the pedagogical principles of Moreira (2012), who - reworking Ausubel's perspectives on meaningful learning, the humanist vision of Novak, the postulates of Gowin's social interaction, the subversive teaching of Postman and Weingartner, pedagogy of Freire's autonomy and the conceptual fields of Vergnaud- proposes critical meaningful learning. This is an approach that opposes conceptions of absolute truths and correct answers, which prevent individuals from considering options, participating, deciding, tolerating, understanding differences and recognizing reality.

For this reason, Moreira (2005) defines critical meaningful learning as "the ability to perceive the relativity of the answers and of the truths, the diffuse differences, the probabilities of the states, the complexities of the causes, the information that is not necessary , consumerism, technology and technophilia "(page 6). Among the principles that Moreira (2012) offers as a reference to organize teaching and favor meaningful critical learning are the following:

- Consider the students' prior knowledge.
- Teach from questions instead of just providing answers.
- Use definitions and metaphors as instruments to think.
- Use various resources to learn.
- Learn to detect and correct errors.
- Become aware that the meaning of things is in people and not in words.
- To consider that the error is characteristic of the human being and that it is learned by correcting errors.
- Learn to unlearn when previous knowledge prevents grasping the meanings of new learning or when concepts are irrelevant.

For Moreira (2017) These principles are not rules to which the teacher must submit, since it is he who, maintaining his autonomy, must organize the teaching. From this approach, teaching can not be improvised in any way, but must be supported in strategies developed in an educational environment that favors learning.

The educational environment, according to Duarte (2003), is not only the physical space, but also the human relationships that are established, the communication and the activities that are carried out, which must be designed around the needs of education . For this author, some of the demands of education are the posing of problems, the design and execution of solutions, the development of investigative analytical capacity, teamwork, decision-making, planning of work and the ability to analyze of the social context.

But at the time of planning the teaching should also consider the motivation of students to learn, then, according to Elizondo, Rodriguez and Rodriguez (2018), this is related to the emotions that predispose individuals to avoid or approach situations, what may or may not promote learning.

Now, trying to respond to the current needs of medical education, the Mexican Association of Faculties and Schools of Medicine (AMFEM), supported by socioconstructivism and the competency approach, promotes a quality medical education with which future physicians can respond to environmental problems with knowledge, professionalism and ethics (Parra, García y Alomía, 2015). To this end, the AMFEM makes several recommendations, among which the following stand out: mediate learning through the integration of knowledge, skills and attitudes and use problems as teaching materials; promote the interaction of students with their peers and the

teacher; use real or simulated situations to make sense of learning, and avoid focusing learning on the verbal transmission of information.

One of the concepts mentioned above that stands out is the orientation of the educational process towards the achievement of skills, as this allows students to know problems and propose solutions in a scientific, professional and ethical manner. In accordance with this, and according to Pérez and Pozo (2010), the best way to get students to learn is by confronting them with problematic situations through which they are forced to think and make decisions.

Pillsbury (1957) attributes to John Dewey the initiative to pose problems to the students at the beginning of the 20th century because he considered that when man confronts them he stimulates his thinking process. Dewey's contributions were undoubtedly a good start because the educators of the time already questioned the effectiveness of school education separated from the context.

Several authors have pointed out characteristics of the problematic situations that are useful in the educational process; for example, for Saiz and Fernández (2012) they are "life simulators" that help to think critically; for Perez (2010) they are novel and they arouse a particular interest in finding a solution, while for Toulmin (cited by Pérez, 2010) the solution of problems leads to the evolution of scientific knowledge.

Problem-based learning (PBL) as a formal didactic technique begins in Canada in the medical career (Mendoza, Méndez and Torruco, 2012). According to Walsh (2015), the ABP emerges as an educational project of John Evans that consisted of forming groups of students that analyzed the problems raised and would direct their own learning, with which the importance of the memorization of concepts from the beginning of the race.

The PBL used as a didactic strategy allows the student to integrate conceptual, procedural, attitudinal and value knowledge while learning cooperatively and collaboratively, which forces him to develop critical thinking (Hernández and Hernández, 2014). According to Savery and Duffy (2001), problem analysis allows identification with the situation and the adoption of a positive attitude during its analysis.

Within the educational process, the teacher designs the problem considering the relevant concepts and principles of the content corresponding to the subject, while the students propose a solution, which implies that they discuss and identify which is the problem that is being solved;

This forces them to determine what information they know, what they do not know and what they need to find a solution.

For this reason, the present work links the current needs of medical education, critical meaningful learning and ABP strategy with the area of anatomy. This decision has been taken because the teaching of this discipline in various schools is based on the definition and memorization of concepts that are not related to the reality of the students (Torres, 2013). In fact, according to García, Avendaño and Martínez (2013), in the teaching of anatomy not only there is little clinical relationship of the concepts analyzed in class, but also the contents are extensive, which is usually attributed to a "decadence" in his teaching. Therefore, for Elizondo et al. (2008) there is a need to relate the basic sciences with the clinical sciences through what they call "anatomical diagnosis".

The teaching strategies in anatomy, as in any other area, should not only encourage the use of language and personal interaction, but should also be planned considering the way of associating previous knowledge with the new one. In this process, students should ask and graphically organize the information they have and the information they do not have in order to plan the procedure to know what is missing. In this regard, some authors propose using information organizers to promote the construction of knowledge; For example, Pérez (2010) uses a heuristic diagram in which students organize the language, representation techniques and necessary procedures for the application of science to solve problems.

About the use of questions during learning, Moreira (2005) believes that these constitute the main intellectual instrument available to human beings. For Márquez and Roca (2006) learning from questions allows students not only to have contact with finished knowledge, but also to face questions that must be solved to solve problems and allow scientific development. The fact that the students identify the problems through questions that they themselves have written serves to make them feel involved, eager and interested in finding a solution, which, according to Pérez and Chamizo (2011), sets in motion the conceptual knowledge and procedural to answer the question.

The methodology used to carry out the teaching and learning process must be adapted to the time and moment in which it arises. At present, where the availability of information is not an obstacle to building knowledge, the culture of learning has changed over time and has transcended the simple transfer of data by an expert.

For all of the above, in the present research an ABP strategy has been designed, applied and evaluated to encourage meaningful critical learning in students who take the subject of Anatomy in the Faculty of Medicine of the Benemérita Autonomous University of Puebla.

Methodology

A unicentric, homodynamic, prospective, longitudinal study was carried out, with a mixed approach and an explanatory scope that included exploratory, descriptive and correlational elements. The research was developed with a sample of 78 students of the basic level of the Bachelor of Medicine who were studying the subject of Anatomy for the first time.

In correspondence with the research problem and the proposed objectives, adjustment variables were selected to determine the extent to which the declarative, procedural and attitudinal valuation knowledge had been constructed, and in which way the PBL strategy was effective to propitiate situations that contributed to the construction of critical meaningful learning.

The strategy was designed to be implemented when addressing the topic The neck region in the aforementioned subject. A situational diagnosis was made prior to the implementation of the strategy to assess the declarative, procedural and attitudinal valuation knowledge individually by means of documentary measurement instruments.

Based on the contributions of Pérez (2010) about the fact that scientific concepts are complex and that knowledge can be represented through diagrams, printed "information organizers" were used to relate previous knowledge with the new one, as well as to establish forms of information search and use the information in the argumentation of answers to questions posed. In this regard, this author also suggests the use of open questions during problem-based learning, which was taken into account in the present investigation.

However, in the first session the students read the first part of the problematic situation provided in print. In an information organizer for the PBL (first part) they recorded data, facts and relevant concepts extracted from the reading and identified those that were unknown, as well as those anatomy concepts associated with the problem. After the data organization, the students proceeded to state the problem they had detected by means of an open question, and then they issued the answers they considered pertinent.

From the possible responses thought and proposed by the students, each one of the members of the team was assigned a research topic so that the following day they would describe the results of their search. The investigations were carried out during off-class hours and developed in the graphic organizer for the research report.

Likewise, a second graphic organizer was used for the research report with the intention of guiding the students in the considerations that should have been made when conducting a documentary investigation. Therefore, it was emphasized that they should not lose sight of the research question, since during the search they ran the risk of becoming disoriented and giving an answer that did not correspond to the main question.

In the second session, the students shared the research done orally and individually in a lapse of one minute each. Because the problem was the same for the whole group, but the investigations and reports were different for each student, when sharing their findings, an individual and group enrichment was sought. In this way, if a student was attentive to the narration of their colleagues' reports, they could obtain information that they might not have found in their search, which could be retaken in the next moment of analysis and team organization.

After the narrative of the investigations, the students read the second part of the problematic situation, identified data that were still relevant, new information, concepts of anatomy linked to the problem and concepts that needed to be investigated, which was noted in the second organizer of information for the PBL.

The students formulated the problem again with an open question and proposed answers. Research topics were assigned to each of the team members, but this time from the possible responses to the problem formulated and from the concepts that they considered should be investigated.

In the third session the narration of the investigations was carried out; Later, counting with both organizers, the students processed the data obtained through a poster that they presented to the group the following day. The poster should explain the conclusion, the final answer to the question asked and the reflection about the usefulness of the concepts learned, as well as the situations in which the knowledge could be applied. At this time the students organized all the information they had, so they had to work under pressure, which served to manifest their attitudes

and values clearly. This forced the students who still did not understand the subject to find a way to appropriate knowledge.

In the fourth session each team had 10 minutes to explain their poster to the group. Finally, in the fifth session, the post-test was carried out to evaluate the declarative, procedural and attitudinal valoral knowledge with the same instruments used in the beginning of the strategy. In addition, a weighting scale was added to measure the way in which students had perceived the effectiveness of the ABP teaching strategy.

The evaluation instruments were designed and validated for the present investigation through a pilot test applied to students different from those who participated in the proposal, and validation was also carried out by consensus of experts.

The weighting scale for declarative knowledge consisted of 15 items focused on both the general anatomical characteristics of the neck region and the relationship that could exist between the neck injury and the brachial plexus injury. The interpretation was given on a scale ranging from 0 to 4 to determine the level of student understanding¹. The format was taken from the instrument to evaluate Campos strategies (2005), although the statements were redesigned and the qualitative value assigned to each number of the scale was modified.

On the other hand, the Measurement Knowledge Measurement Rubric was made up of four dimensions:

1. Use of reliable sources of information for obtaining data.
2. Assessment of data when analyzing situations or conducting research.
3. Processing of information.
4. Use of information to solve problems.

For the design of the rubric, the profile by competences of the Mexican general practitioner of the AMFEM (2008) was taken into account, specifically the generic competence number 3, called "methodological and instrumental capacity in sciences and humanities" of its unit 3.1 referring to the method scientific, which highlights the importance of finding and locating reliable information when addressing professional problems and research in the area of health.

¹ 0 = no conocen o no comprenden el enunciado del reactivo; 1 = tienen una ligera idea acerca del enunciado formulado; 2 = conocen el tema parcialmente; 3 = conocen bien la idea, y 4 = lo pueden explicar a otra persona.

Likewise, the observation list to measure valuational attitudinal knowledge was structured by a series of 9 statements that each student should evaluate about the attitudes and values shown by one of his colleagues during the development of the PBL strategy (ie, each student evaluated a partner). For the design of the affirmations, the generic competency number 1 of the competency profile of the Mexican general practitioner of the AMFEM was taken into account, called "domain of general medical care", especially the section referring to verbal and non-verbal communication, respect, commitment, trust and empathy, all these indispensable skills in the training of the general practitioner.

For its part, the weighting scale to measure the effectiveness of the ABP strategy in the construction of knowledge consisted of 16 statements, which were evaluated with a value ranging from 0 (not effective) to 3 (very effective). This instrument allowed us to measure the degree to which students perceived the effectiveness of the strategy for constructing declarative, procedural and attitudinal valuation knowledge, but above all to know if the strategy promoted situations that, according to Moreira (2012), were useful for construction. of significant critical learning, including the selection of valuable and relevant knowledge, communication in class, the appreciation of prior knowledge, the use of information to solve real-life problems, and the detection, correction and use of errors to achieve new learnings

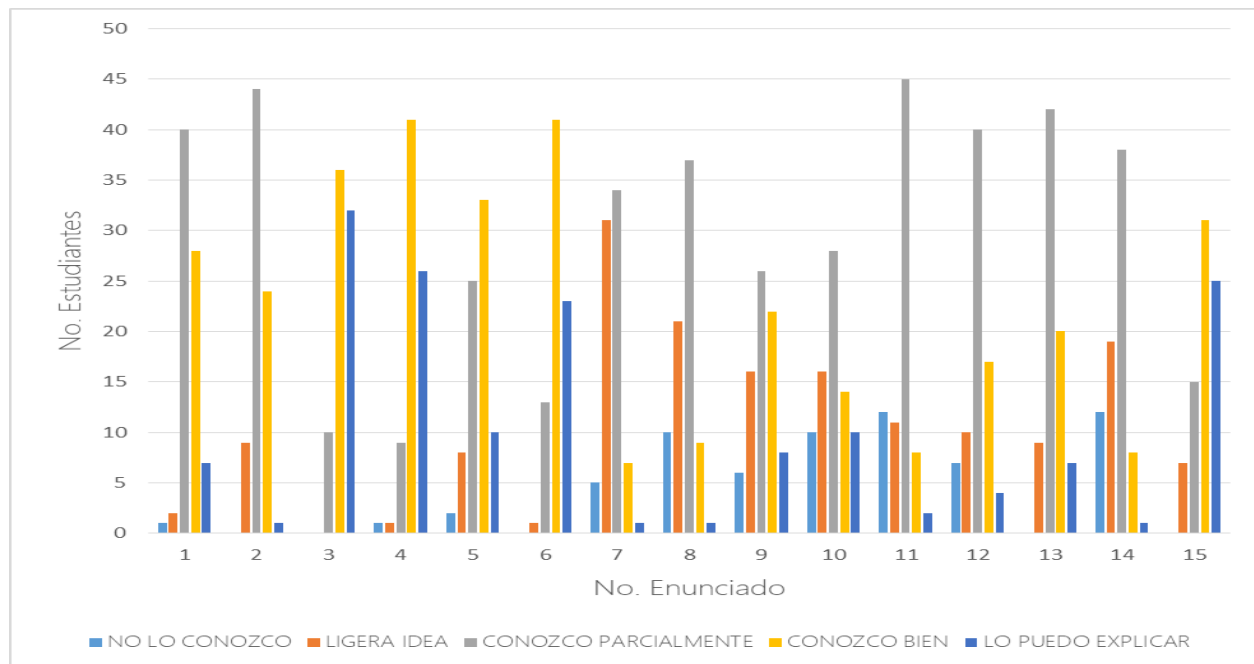
The statistical methods were descriptive to organize and classify the quantitative indicators, by filling tables and obtaining graphics in Minitab Statistical Software v.17. Inferential statistical methods were also used to interpret and draw conclusions about the learning obtained with the ABP strategy.

Results

The comparison of the results obtained in the pre-test and the post-test is given below. Figure 1 shows the figures of the self-assessment in the pretest for declarative knowledge; in this figure it is seen that 57% of the students had partial knowledge about the relationship of the prevertebral muscles with the vertebral bodies and their function, while 39.7% had a slight idea that a trauma by stretching in the lateral region of the The neck could affect the scalene muscles and the brachial plexus. Likewise, 26.9% of students had a slight idea that traumatic damage to the brachial plexus could result in sensory and motor alterations in the upper limb of the affected side. Likewise, in the

last two statements, the valued statements show the importance of anatomical knowledge when recognizing and assessing neck injuries.

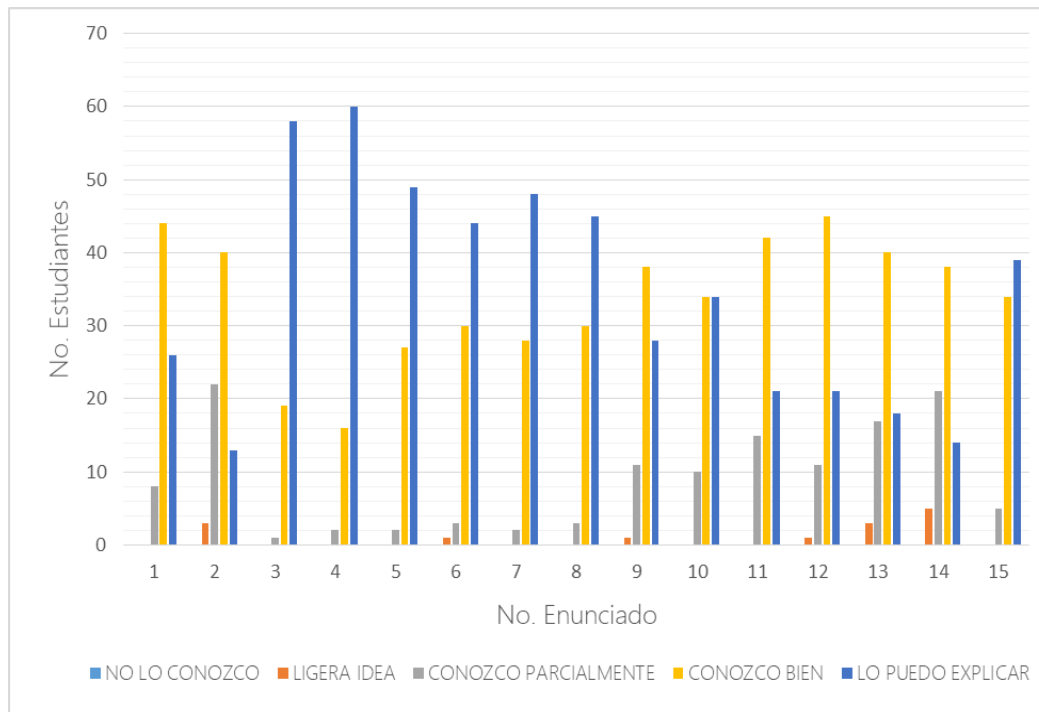
Figura 1. Autoevaluación para conocimiento declarativo antes de la estrategia



Fuente: Elaboración propia

In the post-test, however, 53.8% of the students explained that they knew well the relationship of the prevertebral muscles with the vertebral bodies and their function, while 61.5% considered that they could explain to another person why a stretch trauma in the region The lateral neck may affect the scalene muscles and the brachial plexus. In fact, 57.6% thought they could explain to another person why traumatic damage to the brachial plexus could result in motor and sensory disturbances in the upper limb of the affected side. The assessment of these statements in the post-test shows that more than 50% of the students had the knowledge to explain what is related to the bone system, muscular system, as well as the importance of anatomy in the assessment of neck injuries (Figure 2).

Figura 2. Autoevaluación para conocimiento declarativo posterior a la estrategia ABP



Fuente: Elaboración propia

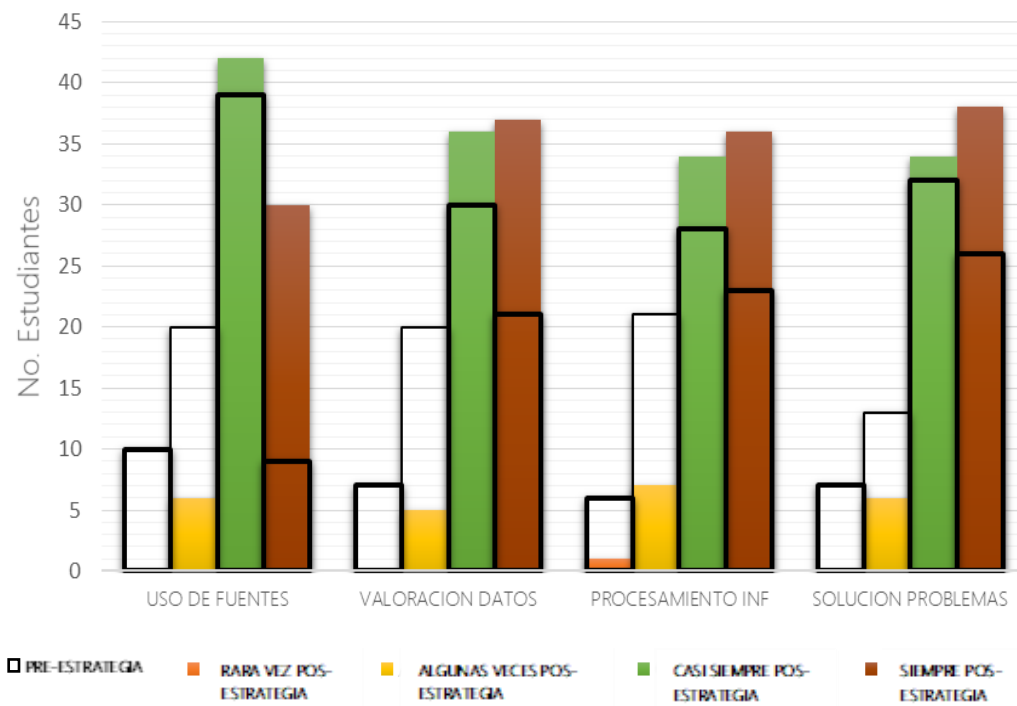
In relation to the assessment of procedural knowledge, specifically for the reactive Use reliable sources of information for obtaining data, the results were: rarely, 12.8% in the pretest and 0% in the posttest; sometimes: 25.6% in the pretest and 7.6% in the posttest; always: 11.5% in the pretest and 38.4% in the posttest (figure 3).

For the item I value the data during the investigations or analysis of situations, the answers were the following: always, 26.9% in the pretest and 47.4% in the posttest; rarely: 8.9% in the pretest and 0% in the posttest; sometimes: 25.6% in the pretest and 6.4% in the posttest; almost always: 38% in the pretest and 46% in the posttest (figure 3).

On the other hand, for the Reagent Process the information through descriptive analysis, summaries, tables or graphs, the results were the following: rarely, 7.6% in the pretest and 1.2% in the posttest; sometimes: 27% in the pretest and 8.9% in the posttest; almost always: 35.8% in the pretest and 43.5% in the posttest; always: 29.4% in the pretest and 46.1% in the posttest (figure3)

In the item Sort data, identify missing information to propose solutions and promote dialogue in the solution of problems, the results obtained were: rarely, 8.9% in the pre-test and 0% in the post-test; always: 33.3% in the pre-test and 48.7% in the post-test; sometimes: 16.7% in the pretest and 7.6% in the posttest (figure3)

Figura 3. Comparativo global del conocimiento procedimental



Fuente: Elaboración propia

On the other hand, in terms of attitude value, it could be determined that in the pretest 35% of the students did show enthusiasm and initiative to solve the situations raised, a figure that increased to 90% in the posttest (figure 4).

Likewise, in the pre-test it was known that 63% of the students did not show tolerance capacity during work under pressure, a figure that decreased to 8% in the post-test (figure 4).

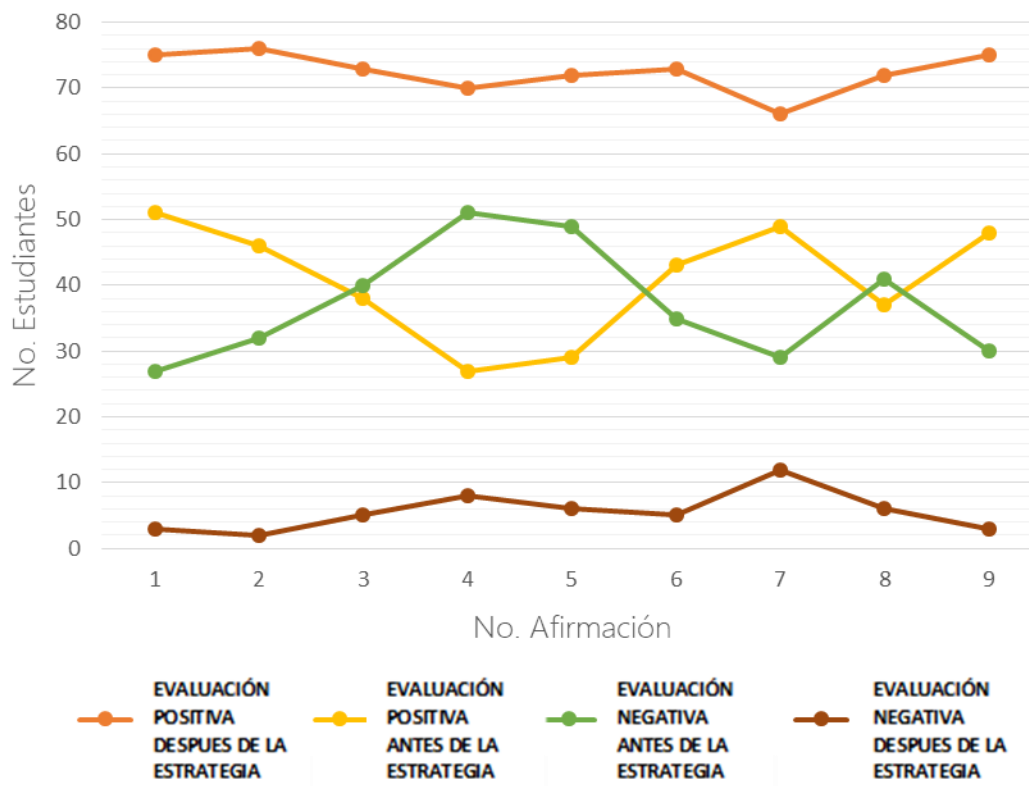
Likewise, it was found that in the pretest 63% of the students did manage to integrate into team work, promoting the execution of all the proposed activities, a percentage that increased to 85% in the post-test (figure 4).

The results, on the other hand, show that in the pretest 48.7% of the students did identify the problematic situations raised, a number that increased to 93.5% in the post-test (figure 4).

In the pre-test it was also perceived that 47.4% of the students recognized the limitations of the knowledge they possessed and identified what was needed to evaluate and treat a health problem, a percentage that increased to 92.3% in the post-test (figure 4).

In the pre-test, in fact, it was found that 35% of the students did not establish through verbal and non-verbal communication a climate of respect, commitment, trust and empathy, a value that was reduced to 3.8% in the post-test (figure 4).

Figura 4. Comparativo global del conocimiento actitudinal valoral



Fuente: Elaboración propia

Finally, regarding the assessment of the strategy, the results were the following: 100% of the students considered that it was effective or very effective to motivate the interest; 83.3% thought it was very effective to promote research and the use of reliable sources of information; 74.3% and 2.5% indicated that it was very effective and ineffective, respectively, to compare the knowledge that was already available with the new knowledge that was built (figures 5 and 6).

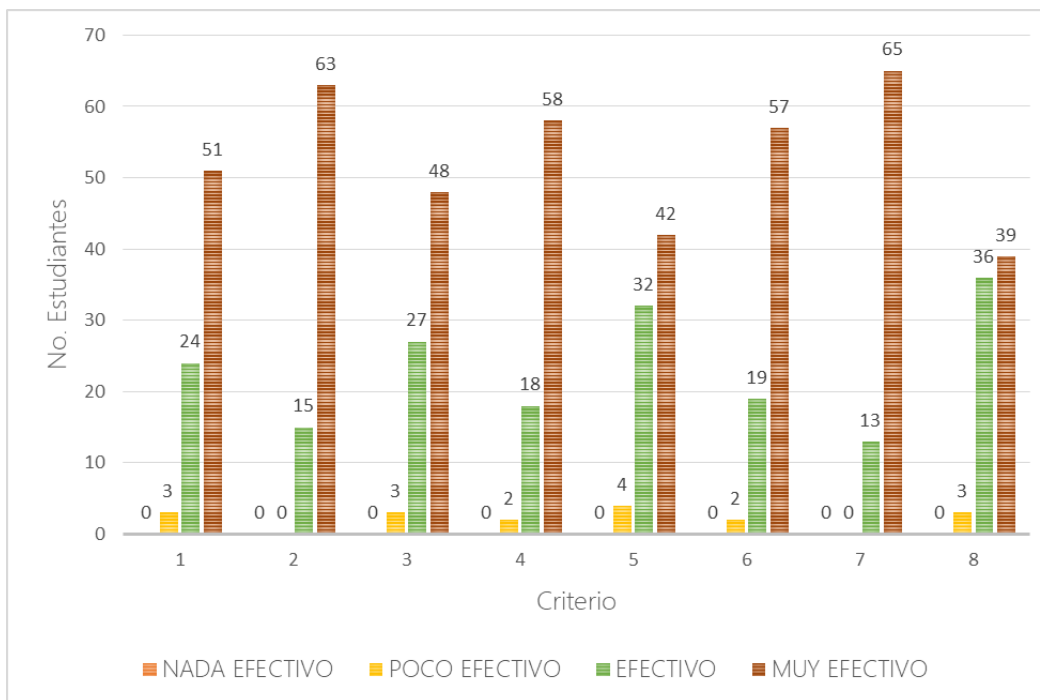
Also, 73.1% and 2.5% indicated that it was very effective and ineffective, respectively, to encourage teamwork and socialization, while 65.3%, 30.7% and 3.8% said that the strategy was very effective, effective and ineffective. , respectively, to understand and apply knowledge in anatomy (figures 5 and 6).

About the effectiveness of the strategy to promote communication in class, 53.8% considered it to be very effective, 41% that was effective and 5.1% ineffective. Regarding the effectiveness of the strategy to facilitate the selection of new, valuable and relevant knowledge, 61.5% evaluated it as very effective, 34.6% as effective and 3.8% as not very effective (figures 5 and 6).

In contrast, to analyze and organize information, 50% said that the strategy was very effective, 46.1% rated it as effective and 3.8% as ineffective. Likewise, 83.3% considered that the strategy was very effective to connect anatomy concepts with real-life situations, 73.1% thought that the strategy allowed them to take responsibility for their knowledge in a very effective way, and 71.8% explained that the strategy fostered In a very effective way, the critical reflection and argumentation of real life situations (figures 5 and 6).

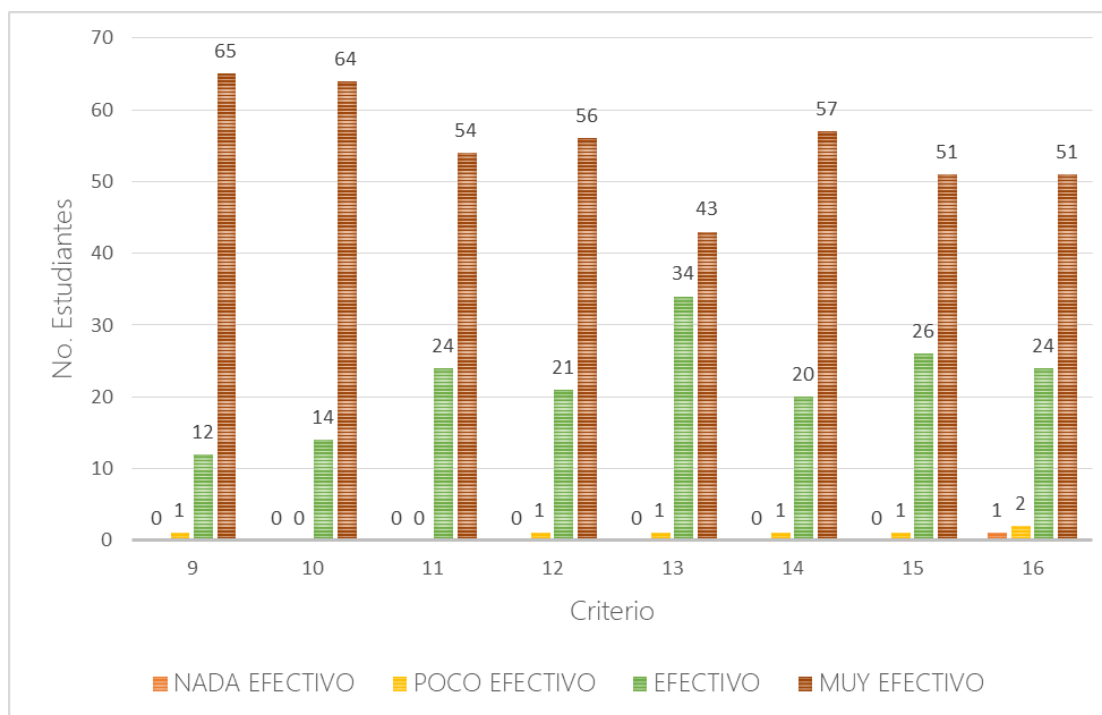
Finally, 33.3% of the students estimated the strategy as effective to learn autonomously, while 65.3% found it to be very effective for that purpose. However, 2.6% said that the strategy was not very effective in detecting errors, correcting them and using them for new learning, and 1.3% stated that in this sense the strategy was not effective (figures 5 and 6).

Figura 5. Resultados de la evaluación realizada por los estudiantes de la estrategia ABP (enunciados 1-8)



Fuente: Elaboración propia

Figura 6. Resultados de evaluación realizada por los estudiantes de la estrategia ABP (enunciados 9-16)



Fuente: Elaboración propia

Discussion

The comparison and analysis of the results obtained in the present study allow us to affirm that the use of problems related to the context motivates students to approach anatomy topics, since it modifies the passive role that they usually adopt with the educational approach traditional.

In fact, once involved in the planned activities, students were able to identify the problem, formulate questions, organize data, facts and unknown concepts and investigate using reliable sources of information. This helped them build new and relevant knowledge of a subject that they not only memorized, but also reflected and argued.

Through the graphic organization of the information they developed during the PBL sessions, students were able to assess the level of knowledge they possessed, going from a partial apprenticeship - of which they had a slight idea - to one that allowed them to explain it to another person. During this recognition the importance of knowledge of the human body from an anatomical point of view was highlighted, when exploring and assessing neck injuries in order to understand and argue their function, diagnose the patient's clinical status and understand invasive intervention procedures and non-invasive.

In this sense, it can be said that the use of tools that facilitate the analysis of the process of knowledge production and the organization of information, as well as the formulation of open questions by students and cooperative and collaborative work, gathered in a A problem-based and communication-based learning strategy and the integration of skills and attitudes helped to achieve learning outcomes different from those achieved with a traditional approach. The most significant findings, therefore, show that with this strategy, prior knowledge is related to the new one, language, personal interaction and questioning are encouraged.

Based on the principles of Moreira (2012), and based on the results obtained, it can be pointed out that the planning and execution of a problem-based strategy favors the construction of meaningful critical learning in a large percentage of the participants.

In other words, this way of planning the teaching of anatomy allows modifying the behavioral approach, which, according to Díaz (2014), currently predominates in the classes of that discipline.

Conclusions

This research has served to demonstrate that, if real situations are used and related to the context of the students, they can motivate in them a positive attitude towards the achievement of the learning objectives.

However, it should also be noted that the area where students had more difficulties with this strategy was during the integration of teamwork, especially when showing respect, commitment, trust and empathy. Even so, with adequate planning and timely intervention by the teacher, this situation was overcome and the students were guided to encourage their self-learning.

Likewise, it must be borne in mind that strategies focused on the promotion of meaningful critical learning should not evaluate knowledge by verifying irrelevant information for professional life; in fact, the evaluation should not consist of verifying the memorization of concepts, since this does not serve to demonstrate the level of understanding.

It is true, on the other hand, that there is no universal strategy to carry out the educational process with total success; However, with the ABP strategy in anatomy, most of the participants achieved a better critical meaningful learning. For this reason, it is necessary to continue proposing new methodologies that allow the construction of valoral attitudinal knowledge at the level of the degree in the area of medicine.

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