



ORIGINAL ARTICLE

Affective response of medical university students towards the active methodologies

Respuesta afectiva de estudiantes universitarios de medicina frente a metodologías activas de aprendizajes

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ABSTRACT

Introduction: students positively valued the learning centered on active and situated methodology in their professional work, which allowed the development of competencies that provide the student with greater autonomy and self-direction for the achievement of significant learning that contribute to enhance their cognitive and attitudinal processes.

Objective: to determine the affective response of medical students to the application of active methodologies such as PBL, PBL and CE for the achievement of learning.

Methods: quasi-experimental longitudinal design with a control group and three experimental groups, conducted in 2019. Sample of 84 students from a Chilean university of Medicine. Active methodologies were applied to three experimental groups and traditional expository class to the control group. The Semantic Differential Scale (SDS) measured the affective reaction of the students in three phases (pre-test, post-test and delayed post-test).

Results: the application of active methodologies (ABP, ABPO and EC) determined a positive affective response of the medical students. There were statistically significant differences ($p < .05$) between pre-test and post-test and between post-test and deferred post-test.

Conclusions: the learners assigned a positive rating to the three active methodologies of ABP, ABPO and CE in terms of learning achievement. The ABP methodology was statistically significant ($p < ,05$) in all dimensions of ESD. The student perceives a greater concern for their learning, and establishes a greater value commitment, which was strengthened over time.

Keywords: Learning; Workplace; Methodologies; Problem-Based Learning.

RESUMEN

Introducción: los estudiantes valoraron positivamente el aprendizaje centrado en metodología activa y situadas en su quehacer profesional, que les permitió desarrollar competencias que proporcionan al discente mayor autonomía y autodirección para el logro de aprendizajes significativos que contribuyen a potenciar sus procesos cognitivos y actitudinales.

Objetivo: determinar la respuesta afectiva de los estudiantes de la carrera de Medicina a la aplicación de metodologías activas como el ABP, ABPO y EC para el logro de aprendizajes.

Métodos: diseño cuasi-experimental de corte longitudinal con un grupo control y tres grupos experimentales, realizado en 2019. Muestra de 84 alumnos de la carrera de Medicina de una universidad chilena. Se aplicó metodologías activas a tres grupos experimentales y clase expositiva tradicional al grupo control. La Escala de Diferencial Semántico (EDS), midió la reacción afectiva de los estudiantes en tres fases (pre-test, post-test y post-test diferido).

Resultados: la aplicación de las metodologías activas (ABP, ABPO y EC) determinó una respuesta afectiva positiva de los estudiantes de la carrera de Medicina. Hubo diferencias estadísticamente significativas ($p < ,05$) entre el pre-test y post-test y entre el post-test y post-test diferido.

Conclusiones: los discentes asignaron una valoración positiva a las tres metodologías activas de ABP, ABPO y EC en función del logro del aprendizaje. La metodología de ABP fue estadísticamente significativa ($p < ,05$) en todas las dimensiones de EDS. El estudiante percibe una mayor preocupación por su aprendizaje, y establece un compromiso valorativo mayor, lo que se fortaleció a través del tiempo.

Palabras claves: Aprendizaje; Trabajo Colaborativo; Metodologías; Aprendizaje Basado en Problemas.

INTRODUCTION

Academic and professional training by competencies obeys the training model that higher education institutions have incorporated and that is aligned with the strategic precepts of the European Higher Education Area,⁽¹⁾ where the central axis of the learning process is the students who build knowledge from a dynamic, autonomous, self-directed perspective and with a high level of commitment. In this sense, and particularly in the Faculty of Medicine, considered in this research, it stands out for contributing to the training of health professionals with solid scientific knowledge and moral principles, based on the anthropological conception, at the service of the defense of life, research and the search for truth for the progress of health and its integrative extension to the widest possible scope.

The competency-based training model for university professionals implies a cultural change in the teaching and learning model, since this process is centered on learning and, consequently, on the student, who assumes a more active and autonomous role. This implies a constructivist approach to learning that should include knowing, knowing how to do and knowing how to be, which as competencies should accompany the student throughout his or her formative process and even transcend the classroom to become part of life itself. This has led to the generation of innovative curricular proposals, including active methodologies such as Problem Based Learning (PBL), Project Based Learning (PBL) and Case Studies (CS), which are part of this research. These methodologies have been widely supported in the literature as promoters of meaningful learning for the academic and professional development of students from different disciplines.^(2,3,4,5,6)

In the present research, the methodological intervention was carried out in first and second year students of the medical career of a recognized higher education institution of the Bío-Bío Region. Particularly, in the medical career, the development of professional competencies should be focused on learning to learn or on know-how. This is because the potential challenges at the professional level are to contribute to improving the quality of life or health of the community. This implies not only to know clearly the pathology of the person who consults or user, but also to establish the appropriate diagnosis, necessary to achieve a successful treatment and recovery of health. In this sense, it is important to implement active methodologies, as previously mentioned, that favor a more active role of the student and a greater commitment to learning.

In this regard, the positive assessment made by students in the implementation of active methodologies, since it responds to the expectations outlined, by promoting learning to learn or practical learning of the student from a perspective close to the concrete reality of the training process, so that through the approach of a clinical problem or the formulation of a project focused on an emerging need or the narrative presentation of the history of a clinical contingency situation, the development of competencies and skills that make the student can develop autonomy or self-directed learning is encouraged: knowing how to work collaboratively, strengthening respect and tolerance for the contributions or proposals of each team member, valuing decision making through solid arguments, supported by formal and specialized sources for obtaining relevant information. In addition, when the student is able to appropriate meaningful learning or learning close to his needs and interests, he experiences a transformation of his cognitive and attitudinal processes.⁽⁷⁾

Social or collaborative interaction plays an important role in the realization of knowledge, its application and transfer to other learning and professional development scenarios. This leads, then, to the student identifying himself favorably or showing a positive affective response to those methodologies that motivate him to achieve complex learning; something that academic and professional training imposes on him in order to develop the competences and skills that will successfully link him to the emerging challenges of his future professional reality.^(8,9,10,11)

Alsina et al,⁽¹²⁾ emphasize that when the methodological approach to learning is centered on an active or dynamic process, which contributes to generate participation (through a permanent flow of information among students who make up a work team), reflective thinking is favored when a challenging task is posed, related to the disciplinary seal of the student's formative process. This has as an effect a positive valuation of the students with respect to the dynamics of the methodological process. In this sense, it is important to highlight what was expressed by Meroño et al,⁽¹³⁾ regarding the fact that students perceive a better satisfaction or affective response when the learning experience involves a successful response, which is reflected not only in the evaluation, but also in the process that involves the development of tasks (and, in

turn, in the dynamics that involves collaborative work, with respect to active methodologies that lead to the development of competences).

By virtue of the above, in order to know the affective response of the students in relation to each intervention methodology, such as ABP, ABPO and CE, within the context of the present research, an instrument of our own elaboration was used, which took as a theoretical basis the Semantic Differential Scale, proposed by Sánchez SS,⁽⁸⁾ with the purpose of knowing the meaning that a person attributes to a word. Here, those components that are not so evident and therefore are not clearly expressed are transcendent.

In the present research, the objective was to identify the affective reaction to active learning methodologies such as ABP, ABPO and CE by second year students of the Medicine career of a Higher Institution of the Eighth Region, Chile.

METHODS

A quantitative quasi-experimental research of longitudinal cut with a control group and three experimental groups was carried out. In a quasi-experimental study, according to Hernández et al,⁽¹⁴⁾ the manipulation of an independent variable may affect one or more dependent variables and there is no randomization of the study groups. That is to say, in quasi-experimental designs there is no manipulation by the researcher to form the research groups, they are "intact" groups.⁽¹⁵⁾

A total of 84 students participated in the present research study, corresponding to the intact cohorts 2018 and 2019 of the first two levels of the Medicine degree. Thus, the control group (cohort 2019) consisted of 20 students and the intervention group (cohort 2018) consisted of 64 students, who were distributed in three groups of 20 students for each of the three intervention methodologies previously mentioned, such as ABP, ABPO and EC. The type of sampling was non-probabilistic by convenience, since the groups were previously formed according to the convenience of the researcher.

These students met the following:

Inclusion criteria

1. Only first and second year undergraduate students of the Medical School of a higher education institution in the Bio Bio region, Chile. This is because the first two years of medical school represent a fundamental stage to develop relevant competencies for the clinical training of medical students, especially in the area of basic sciences.
2. With an average age between 18-24 years.
3. who have signed the informed consent form.

Exclusion criteria

Students from other careers of the Faculty of Medicine and those who have not signed the informed consent form. The other careers of the Faculty of Medicine were not considered because they have different curricula or training itineraries.

Instrument

For data collection, the Semantic Differential Scale was used to identify the affective reaction of the students to the different active methodologies. The Semantic Differential Scale, developed by Sánchez SS,⁽⁸⁾ is a technique used to measure the meaning of words. In the scale, the valuational factor is the most relevant factor, as it considers the valence of the different components of an attitude.⁽¹⁶⁾

The Semantic Differential Scale consists of a series of adjectives or contrary events, represented between two opposite poles within a continuum of numbers, in such a way that, with certain dimensions or categories, the student must grade the level of closeness or affectivity towards the corresponding active methodology (ABP, ABPO and EC). To do so, the student selects the most appropriate position. The scale presented six dimensions with a series of 5 adjectives or opposite situations (opposite poles) each, where a score between +3 and -3 was considered and the student had to mark towards any of the two poles or towards an intermediate situation. In relation to the reliability or internal consistency of this instrument, an acceptable level was achieved (Cronbach's alpha: 0,724) according to García and Arrieta.⁽¹⁷⁾

The dimensions corresponding to the Semantic Differential Scale considered: characteristics of the methodology (dimension that alludes to the attributes that may characterize each intervention methodology, alluding to its dynamism and innovation), characteristics of the learning associated with the methodology (the degree of flexibility and depth with which each methodology contributes to the development of learning is valued), commitment to learning (emphasizes how involved the student is and how responsible he/she is for the challenges of his/her own learning), relationship between collaborative work and learning (the level of participation and closeness that the student demonstrates for the achievement of learning in his/her collaborative team is noted), analysis and discussion of clinical situations (the level of competence, critical and participative disposition necessary for decision making is considered), acquisition and application of new concepts (the contribution of the methodology to promote and encourage openness to the incorporation and use of new concepts within an explicit context is valued).

Procedure

The present research was developed in the academic period 2019 with first and second year students of the Medicine career of the Faculty of Medicine corresponding to a Higher Education Institution of the Bío Bío Region, Chile. The stages considered were the following:

Once the participating first and second year medical students were informed about the objective of the research, they proceeded to sign the corresponding informed consent form. After selecting the sample, a control group was designated, composed of twenty first-year medical students, who received a traditional expository class methodology that considered the curricular activity of chemistry. The experimental or methodological intervention group was composed of second-year medical students, who were subdivided into three groups of 20 students each, so that each group received one of the three active methodologies considered, i.e., Problem-Based Learning (PBL), Project-Based Learning (PBL) and Case Studies (CS), and involved the Physiology curricular activity. The subjects or curricular activities of Chemistry and Physiology belong to the basic sciences and constitute an important pillar in the formative process of medical students, and there were no modifications in the thematic contents of each subject program during the duration of the research.

It is important to mention that for both the control group and the experimental or methodological intervention group, the Semantic Differential Scale was applied in the pre-test phase, then a post-test was applied after the intervention and finally, to determine the response over time, a delayed post-test was applied (after one month).

The methodological intervention work was developed during five months with two hours per week and with the corresponding specifications for each experimental or intervention group in terms of the active methodology they received and, as already mentioned, the control group only received traditional expository class.

Variables and data analysis

The variables considered in the research work were active methodologies (independent variable) of Problem-Based Learning (PBL), Project-Based Learning (PBL) and Case Studies (CS), and the affective response of the students was the dependent variable.

For the analysis of the data, once the normality distribution was determined, inferential statistics were used, which considered the Wilcoxon Signed Ranks Test and the Friedman Signed Ranks Test for two or more related samples, that is, to determine between which phases of the methodological intervention (Pre-test, Post-test and Deferred Post-test) statistically significant differences were found. In the analysis of the quantitative data, the SPSS program corresponding to version 21 was used.

Ethical norms of the research

The students were informed of the scope and characteristics of the research, signed the informed consent form, and assumed absolute confidentiality of the data. The present research project was submitted to the Ethics, Bioethics and Biosafety Committee of the Vice-Rectorate of Research and Development of the Universidad de Concepción, Chile (internal registration number CEBB-245).

RESULTS

Sociodemographic distribution of the study sample

Table 1. Sociodemographic characterization of the students corresponding to the 2018 and 2019 cohorts.

Characteristics	Cohorts	
	2018	2019
Sex		
F	72 %	60 %
M	28 %	40 %
Average PSU		
F	722,34	711,98
M	696,33	711,90
Average NEM		
F	6,75	6,78
M	6,76	6,73
RANKING		
F	830,35	831,46
M	833,11	826,04

Table 1 shows the distribution of the 2018 and 2019 cohorts, considering gender, PSU average (University Selection Test that corresponds to a standardized written test required for admission to national universities, NEM average (it is a standard score assigned to those who apply to universities according to their high school average) and average Ranking score (it represents a selection factor that considers the academic performance of students in relation to their educational context). It is important to note that in the 2018 cohort the percentage of women was 72 % and men 28 % and in the 2019 cohort the percentage of women was 60 % and men 40 %. In addition, both 2018 and 2019 cohorts were equivalent with respect to their PSU average, that is 709 and 712, respectively. Similarly, the average NEM score was 6,76 (2018 cohort) and 6.76 (2019 cohort), and in turn, the Ranking score was 831 and 829, respectively, for the 2018 and 2019 cohorts.

Active intervention methodologies (ABP, ABPO and EC) and Semantic Differential Scale (EDS).

Table 2. Statistical analysis corresponding to the six dimensions of the Semantic Differential Scale (SDS) instrument, applied in the active methodologies of ABP, ABPO and EC.

EDS instrument dimensions	METODOLOGÍAS DE INTERVENCIÓN (grupo experimental)		
	ABP	ABPO	EC
Dimension 1 (characteristics of the methodology)	($X^2(14)=57,596, p < 0.05$)	($X^2(14)=56,597, p < 0.05$)	($X^2(14)=83,043, p < 0.05$)
Dimension 2 (learning characteristics associated with the methodology)	($X^2(14)=121,840, p < 0.05$)	($X^2(14)=59,697, p < 0.05$)	($X^2(14)=74,198, p < 0.05$)
Dimension 3 (commitment to learning)	($X^2(14)=119,638, p < 0.05$)	($X^2(14)=32,827, p < 0.05$)	($X^2(14)=33,654, p < 0.05$)
Dimension 4 (relationship between collaborative work and learning)	($X^2(14)=142,416, p < 0.05$)	($X^2(14)=32,105, p < 0.05$)	($X^2(14)=56,854, p < 0.05$)
Dimension 5 (analysis and discussion of clinical situations)	($X^2(14)=121,355, p < 0.05$)	($X^2(14)=36,418, p < 0.05$)	($X^2(14)=40,640, p < 0.05$)
Dimension 6 (acquisition and application of new concepts)	($X^2(14)=129,685, p < 0.05$)	($X^2(14)=44,564, p < 0.05$)	($X^2(14)=47,670, p < 0.05$)

Statistical significance $p < 0.05$.

Table 2 synthesizes the findings in relation to the affective reaction of students towards each active methodology (ABP, ABPO and EC). The statistical analysis revealed that the distribution of the data does not follow a normal distribution, which determined the selection of a non-parametric test: **Friedman's Rank Test**. The development of this test integrated the pre-test, post-test and delayed post-test phases of the corresponding methodological intervention (ABP, ABPO and EC) for the six dimensions that characterize the **Semantic Differential Scale**. In addition, it is highlighted that there is a statistically significant difference in the six dimensions of the Semantic Differential Scale instrument, applied in the three phases (pre-test, post-test and delayed post-test) of the intervention related to the three active methodologies.

PBL Methodology and Semantic Differential Scale (SDS)

Table 3. Statistical analysis for two related samples of the dimensions corresponding to the affective reaction of the students, measured through the Semantic Differential Scale, against the active PBL methodology

Student's affective reaction (experimental group)	Statistical test	Measuring instrument	Phases of the methodological intervention	Statistically significant results
Dimension 1 (characteristics of the methodology)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z= -2,758, $p < 0.05$) (Z= -2,524, $p < 0.05$)
			Pre-test and post-test deferred	(Z=-,089, $p > 0.05$)
			Post-test and post test deferred	
Dimension 2 (learning characteristics associated with the methodology)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z=-3,607, $p < 0.05$)*
			Pre-test and post-test deferred	(Z=-3,358, $p < 0.05$)*
			Post-test and post test deferred	(Z=-,109, $p > 0.05$)
Dimension 3 (commitment to learning)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z=-3,568, $p < 0.05$)*
			Pre-test and post-test deferred	(Z= -3,313, $p < 0.05$)*
			Post-test and post test deferred	(Z=-,343, $p > 0.05$)
Dimension 4 (relationship between collaborative work and learning)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z= -3,728, $p < 0.05$)* (Z=-3,400, $p < 0.05$)*
			Pre-test and post-test deferred	(Z=-,358, $p > 0.05$)
			Post-test and post test deferred	
Dimension 5 (analysis and discussion of clinical situations)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z= -3,754, $p < 0.05$)* (Z=-2,739, $p < 0.05$)*
			Pre-test and post-test deferred	
			Post-test and post test deferred	(Z=-2,553, $p < 0.05$)*
Dimension 6 (acquisition and application of new concepts)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test	(Z=-3,812, $p < 0.05$)*
			Pre-test and post-test deferred	(Z=-3,424, $p < 0.05$)*
			Post-test and post test deferred	(Z=-1,248, $p > 0.05$)

(*) Statistical significance $p < 0.05$.

Table 3 shows the six dimensions of the Semantic Differential Scale, corresponding to the PBL methodology. The Wilcoxon test revealed statistically significant differences ($p < .05$) between the pre-test and post-test phases, and between the pre-test and the delayed post-test. However,

there were no statistically significant differences between the post-test and the delayed post-test in any of the six dimensions.

ABPO and Semantic Differential Scale (SDS) Methodology

Table 4. Statistical analysis for two related samples of the dimensions corresponding to the students' affective reaction, measured through the Semantic Differential Scale, compared to the active ABPO methodology

Student's affective reaction (experimental group)	Statistical test	Measuring instrument	Phases of the methodological intervention	Resultados estadísticamente significativos
Dimension 1 (characteristics of the methodology)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-1,397, $p > 0.05$) (Z=-,805, $p > 0.05$) (Z=-,605, $p > 0.05$)
Dimension 2 (learning characteristics associated with the methodology)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-3,054, $p < 0.05$)* (Z= -2,883, $p < 0.05$)* (Z=-,456, $p > 0.05$)
Dimension 3 (commitment to learning)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-2,177, $p < 0.05$)* (Z=-1,848, $p < 0.05$)* (Z=-,057, $p > 0.05$)
Dimension 4 (relationship between collaborative work and learning)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-1,512, $p > 0.05$) (Z=-2,163, $p < 0.05$)* (Z= -,166, $p > 0.05$)
Dimension 5 (analysis and discussion of clinical situations)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-1,172, $p > 0.05$) (Z=-,867, $p > 0.05$) (Z=-,910, $p > 0.05$)
Dimension 6 (acquisition and application of new concepts)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	(Z=-2,969, $p < 0.05$)* (Z=-1,713, $p > 0.05$) (Z= -,568, $p > 0.05$)

(*) Statistical significance $p < 0.05$.

Table 4 shows the six dimensions of the Semantic Differential Scale, corresponding to the ABPO methodology. The Wilcoxon test revealed statistically significant differences ($p < .05$) between the phases of: Pre-test and post-test, equivalent to dimensions 2, 3, and 6 and between the pre-test and delayed post-test phases, corresponding to dimensions 2, 3, and 4. No statistically significant differences are verified between the post-test and delayed post-test in any of the six dimensions.

CE Methodology and Semantic Differential Scale (SDS)

Table 5. Statistical analysis for two related samples of the dimensions corresponding to the students' affective reaction, measured through the Semantic Differential Scale, in comparison to the active CE methodology

Student's affective reaction (experimental group)	Statistical test	Measuring instrument	Phases of the methodological intervention	Statistically significant results
Dimensión 1 (características de la metodología)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -2,489, p < 0.05$)* ($Z = -2,052, p < 0.05$)* ($Z = -1,234, p > 0.05$)
Dimensión 2 (características del aprendizaje asociado a la metodología)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -3,349, p < 0.05$)* ($Z = -2,684, p < 0.05$)* ($Z = -,917, p > 0.05$)
Dimensión 3 (compromiso con el aprendizaje)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -2,722, p < 0.05$)* ($Z = -2,226, p < 0.05$)* ($Z = -,285, p > 0.05$)
Dimensión 4 (Relación entre el trabajo colaborativo y el aprendizaje)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -2,280, p < 0.05$)* ($Z = -2,116, p < 0.05$)* ($Z = ,000, p > 0.05$)
Dimensión 5 (análisis y discusión de situaciones clínicas)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -1,846, p > 0.05$) ($Z = -1,794, p > 0.05$) ($Z = -,038, p > 0.05$)
Dimensión 6 (adquisición y aplicación de nuevos conceptos)	Wilcoxon Signed Ranges Test	EDS	Pre-test and post-test Pre-test and post-test deferred Post-test and post test deferred	($Z = -1,988, p < 0.05$)* ($Z = -2,471, p < 0.05$)* ($Z = -,403, p > 0.05$)

(*) Statistical significance $p < 0.05$.

Table 5 shows the six dimensions of the Semantic Differential Scale, corresponding to the CE methodology. Application of the Wilcoxon test revealed statistically significant differences ($p < .05$) between the pre-test and post-test phases and between the pre-test and delayed post-test for dimensions 1, 2, 3, 3, 4 and 6. However, there were no statistically significant differences between the post-test and delayed post-test in any of the six dimensions.

Control group

Table 6. Statistical analysis for two related samples of the dimensions corresponding to the students' affective reaction, measured through the Semantic Differential Scale, corresponding to the control group.

Student's affective reaction (control group)	Affective reaction of the control group to the intervention methodologies (ABP, ABPO, EC). (ABP, ABPO, EC)
Dimension 1 (characteristics of the methodology)	$(X^2(14) = 38,816, p < 0.05)$
Dimension 2 (learning characteristics associated with the methodology)	$(X^2(14) = 22,018, p > 0.05)$
Dimension 3 (commitment to learning)	$(X^2(14) = 17,608, p > 0.05)$
Dimension 4 (relationship between collaborative work and learning)	$(X^2(14) = 26,006, p < 0.05)$
Dimension 5 (analysis and discussion of clinical situations)	$(X^2(14) = 18,102, p > 0.05)$
Dimension 6 (acquisition and application of new concepts)	$(X^2(14) = 7,934, p > 0.05)$

(*) Statistical significance $p < 0.05$

Table 6 shows the affective response of the control group to the three active methodologies (ABP, ABPO and EC) with which they did not work, in accordance with the application of the Semantic Differential Scale. The application of Friedman's Rank Test revealed that dimensions 2, 3, 5 and 6 did not present statistically significant differences with respect to the six dimensions of the Semantic Differential Scale instrument, applied in the three phases (pre-test, post-test and delayed post-test).

As previously mentioned, the Friedman Rank Test only allows us to know if there are significant statistical differences for more than two related samples. However, it does not allow us to specify between which phases these differences are established. That is why the Wilcoxon Signed Ranks test was applied for two related samples, which revealed categorically that there are no statistically significant differences between any of the pre-test, post-test and delayed post-test phases.

DISCUSSION

The students' affective response or reaction to the respective intervention methodology (of ABP, ABPO and EC), in relation to the learning achieved, was measured through the Semantic Differential Scale instrument.⁽⁸⁾ This allowed noticing the student's affective reaction on a number interval rating scale at two opposite extremes regarding adjective disposition.

As a result of the application of the PBL methodology, the students manifested a prominently positive affective reaction. This means that the students highlighted relevant aspects of the PBL methodology, which are considered in the six dimensions of the EDS instrument. Statistically significant differences ($p < .05$) were found between the pre-test and post-test phases and between the pre-test and delayed post-test phases of the methodological intervention. However, there were no statistically significant differences between the post-test and delayed post-test phases.

Sanchez,⁽¹⁸⁾ in a research referred to the impact of PBL in the training of postgraduate students of obstetrics and gynecology, highlighted that the students submitted to the intervention of the PBL methodology evidenced greater development of critical reasoning, reflective development, motivation and autonomy. In addition, there was evidence of greater development of teamwork and the acquisition of new concepts through the development of concept maps. Although the instrument used was an observation script of a gynecology and obstetrics postgraduate class, centered on a Likert scale, this corresponds to what was found in the present research regarding the six dimensions alluded to by the ESD instrument used.

The affective response of the students, recorded through the EDS instrument, presented a clear positive orientation, with respect to the intervention of the ABPO methodology, which turned out to be statistically significant ($p < .05$) in the pre-test and post-test phases, and between the pre-test and deferred post-test phases, corresponding to Dimensions 2 and 3 of the EDS instrument. On the other hand, in Dimension 4, only the pre-test and delayed post-test phases showed statistical significance. As for Dimension 6, between the pre-test and post-test phase, significant statistical differences were evidenced ($p < .05$). However, there were no statistically significant differences in Dimensions 1 and 5 for any of the pre-test and post-test phases of the methodological intervention.

Regarding what was commented in the previous paragraph, it is interesting the work done by García-Varcácel & Basilotta,⁽⁹⁾ who designed an evaluation scale for project-based learning, obtaining as a result a positive assessment of the project-based learning methodology, giving a statistically significant score mainly to motivation, collaborative work or collaborative interaction among peers, which allowed the achievement of learning goals in a joint and responsible way, given the commitment to learning. The latter is particularly relevant if compared with the present study, where the dimensions associated with motivation (Dimension 3) and collaborative work (Dimension 4) were positively valued by the students: statistically significant ($p < .05$).

The affective reaction of the students, obtained through the ESD, with respect to the application of the CE methodology, as in the ABP and ABPO methodologies, evidenced a notoriously positive orientation, which turned out to be statistically significant ($p < .05$). The latter, was clearly established in Dimensions 1, 2, 3, 4 and 6 in the respective pre-test and post-test phases and between the pre-test and deferred post-test phases. However, Dimension 5 was not statistically significant for any of the pre-test, post-test and delayed post-test phases of the methodological intervention.

Manosalvas et al,⁽¹⁰⁾ in a research in which the CE methodology was used for the development of hermeneutic-pragmatic intelligence in university students, found that the students valued this methodology positively, in such a way that 67 % of the students stated that it was a highly motivating work strategy for the achievement of learning. In addition, 87 % of the students emphasized that CE positively favored collaborative work, which is related to Dimensions 3 and 4, respectively, of the present research. In this regard, Meléndez,⁽¹¹⁾ in a case study with university students, pointed out the positive perception of the students regarding the scope of the CE methodology to provide opportunities for participation in the development of collaborative work (representing 78 %). In addition, the students attribute to the CE methodology a better understanding of specific thematic contents (92.8 %). This is in line with Dimension 6 of this research, which involves the need to incorporate new concepts.

In the present investigation of the three intervention methodologies (PBL, PBL and CE), the Problem-Based Learning (PBL) methodology stood out for presenting statistically significant results in all the dimensions considered in the Semantic Differential Scale.

This implies that Dimension 1 (characteristics of the methodology), Dimension 2 (characteristics of learning associated with the methodology), Dimension 3 (commitment to learning), Dimension 4 (relationship between collaborative work and learning), Dimension 5 (analysis and discussion of clinical situations) and Dimension 6 (acquisition and application of new concepts) were positively evaluated.

All of the above was presented between the pre-test and post-test, delayed pre-test and post-test, and delayed post-test and post-test phases.

In the ABPO methodology, Dimension 1 was not statistically significant and this may be related to the difficulty presented by the students at the beginning of the development of this methodology, in the sense of not having previous knowledge to support the new learning.

In the CE methodology, Dimension 5 was not statistically significant. The students recognized that, at the beginning of the process, it was necessary to establish relationships of trust among the team members, which could affect the analysis and discussion of the clinical situation for the correct decision making in the working group.

CONCLUSION

From the perspective of the work performed, it can be stated that the student notices when there is concern and interest so that he can achieve or improve his learning, in the sense that the facilitator of the process, such as the teacher, manages to provide the methodological scenarios that allow an active and committed connection of the student. The latter will establish a greater value commitment, not only with his or her own learning process, but also giving greater meaning to collaborative work as a promoter of affective bonds relevant to the achievement of the process.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' Contribution

FA: participated in the original writing, literature review (state of the art), data analysis, results and discussion.

CH: participated in the methodology, discussion and conclusion.

JI: participated in the conceptualization and final revision of the paper.

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