At the heart of the classroom: student perspective on teaching methods in Cardiology

En el corazón del aula: perspectiva estudiantil sobre métodos docentes en Cardiología

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Summary: Medical education has evolved to a focus on competencies and practical skills. In response to changing demands, medical schools have adopted methodologies that promote active and participatory learning, improving student motivation and performance. Tools such as Miller's Pyramid and Bloom's Taxonomy guide planning and assessment, integrating knowledge levels with practical skills and clinical competence. The aim of this research was to delve into the student perspective on teaching methods applied in the subject "Diseases of the Circulatory System". To do so, a questionnaire was designed to assess the evaluation of teaching methods in Cardiovascular Medicine and identify statistical differences between variables. This was distributed online to students at the University of Malaga and included sections on sociodemographic variables, perception of acquired competencies, preferred teaching methods and new teaching assumptions. Finally, the study involved 121 students (32.2% men and 67.8% women), with a median grade point average of 7.8. Most of them were in sixth year (57%), followed by fifth year (24.8%) and fourth year (18.2%). Knowledge of cardiovascular risk factors was acquired by 99.2% of students, while cardiopulmonary auscultation was acquired by only 43.8%. The most valued teaching methods were clinical practice, seminars and workshops and problem-based learning. The overall acceptance of master classes with a more dynamic approach is noteworthy. In conclusion, integrative teaching in Cardiology enhances learning; students perceive the need to implement dynamic and practical methods that reflect real clinical scenarios.

Keywords: Teaching methods, medical education, active learning, practical skills, cardiovascular system.

Resumen: La formación médica ha evolucionado a un enfoque en competencias y habilidades prácticas. En respuesta a las demandas cambiantes, las facultades de medicina han adoptado metodologías que promueven un aprendizaje activo y participativo, mejorando la motivación y el rendimiento de los estudiantes. Herramientas como la Pirámide de Miller y la Taxonomía de Bloom orientan la planificación y evaluación, integrando niveles de conocimiento con habilidades prácticas y competencia clínica. El objetivo de esta investigación era ahondar en la perspectiva estudiantil sobre los métodos docentes aplicados en la asignatura "Enfermedades del Sistema Circulatorio". Para ello, se diseñó un cuestionario para evaluar la valoración de métodos docentes en Medicina Cardiovascular e identificar diferencias estadísticas entre variables. Este fue distribuido de forma online a estudiantes de la Universidad de Málaga e incluyó secciones sobre variables sociodemográficas, percepción de competencias adquiridas, métodos docentes preferidos y nuevos supuestos de enseñanza. Finalmente, el estudio involucró a 121 estudiantes (32,2% hombres y 67,8% mujeres), con una mediana de 7,8 como nota media del expediente. La mayoría cursaba sexto (57%), seguido de quinto (24,8%) y cuarto (18,2%). El conocimiento de los

factores de riesgo cardiovascular fue adquirido por el 99,2% de los estudiantes, mientras que la auscultación cardiopulmonar solo por el 43,8%. Los métodos docentes más valorados fueron las prácticas clínicas, los seminarios y talleres y el aprendizaje basado en problemas. Destaca la acogida global por clases magistrales con un enfoque más dinámico. En conclusión, la enseñanza integradora en Cardiología potencia el aprendizaje; percibiendo los estudiantes la necesidad de implementar métodos dinámicos y prácticos que reflejen escenarios clínicos reales.

1. Introduction

The intrinsic complexity of medical training makes its learning a challenging process. In this context, the teaching methodology implemented by medical schools becomes of capital importance to promote the comprehensive development of its students and effectively prepare them for the practice of the profession (1). Traditionally, education in general, and training in health sciences in particular, focused on theoretical teaching and the memorization of concepts. Currently, there has been a shift towards training that is not limited to the mere accumulation of knowledge, but rather it is essential to develop skills for its correct interpretation and application (2). Likewise, clinical practice is not limited to the application of technical knowledge and skills. To provide quality health care, medical professionals must also possess competencies in values, communication, collaboration and efficiency. Medical students themselves recognize that medical training goes beyond the mere transmission of theoretical and clinical knowledge (3).

A paradigmatic case of this evolution is the Bologna process, which involves the transition to an education oriented towards results or professional competences, with a more focused approach on the student and his or her ability to apply the knowledge acquired in practice (2). The imminent transformation of the educational scenario and the increasing demands of learning demand a proactive response from medical schools with respect to their pedagogical strategies and teaching methodologies. In the current era, where information is abundant and access to it is instantaneous, education cannot remain stuck in the traditional paradigm of lectures (4). Multiple investigations agree that this method, characterized by unidirectionality, does not promote effective learning. In fact, it has been shown that only one week after a lecture, the memory of theoretical information is reduced to 20% (4-5), and the attention of students decreases considerably after just 20 minutes of session. Furthermore, their familiarity with technologies and the speed with which they process information make it difficult for them to keep up with the slow pace of these lectures (5). To encourage student participation, critical thinking, knowledge integration and the acquisition of skills for professional practice, medical schools have implemented various innovative teaching strategies in recent years. These have been shown to improve student performance, motivation and holistic development. Among the most notable are: problem-based learning (PBL), case-based learning (CBL), participatory learning, flipped classrooms and simulation-based education (1).

In this context, Miller's Pyramid and Bloom's Taxonomy are fundamental tools for planning and evaluating medical training. These graphic structures are interconnected, showing how different levels of knowledge are translated into practical skills and, finally, into the ability to act as a competent physician, reflected in Figure 1. Theoretical knowledge (knows) becomes the basis for practical application (knows how) and demonstration of skills (shows how), culminating in autonomous and competent action in the clinical setting (does) (2,6). In turn, the different cognitive levels of Bloom's Taxonomy (remember, understand, apply, analyze, evaluate and create) are integrated into each of the levels of Miller's Pyramid, providing a complete structure for learning (6). The correlation between the two provides a solid framework for the implementation of active methodologies, ensuring that students reach the necessary levels of knowledge and competence, overcoming one of the most significant weaknesses of medical education: the excessive theoretical approach (7). By covering not only theoretical knowledge, but also its practical application, they

prepare students for real care, ensuring a comprehensive and balanced preparation. Based on the aforementioned conceptual framework, this research arises, which proposes to examine the perception of the pedagogical approaches and teaching methods applied in the subject "Diseases of the Circulatory System" ("ESC").

The purpose of this research is to investigate the perspective of students at the Faculty of Medicine of Malaga on teaching methods in the cardiovascular area. The aim is to determine whether these methods have been useful in achieving the learning objectives of the subject, to identify strengths and weaknesses of teaching, as well as to explore the receptivity of students towards new teaching models.
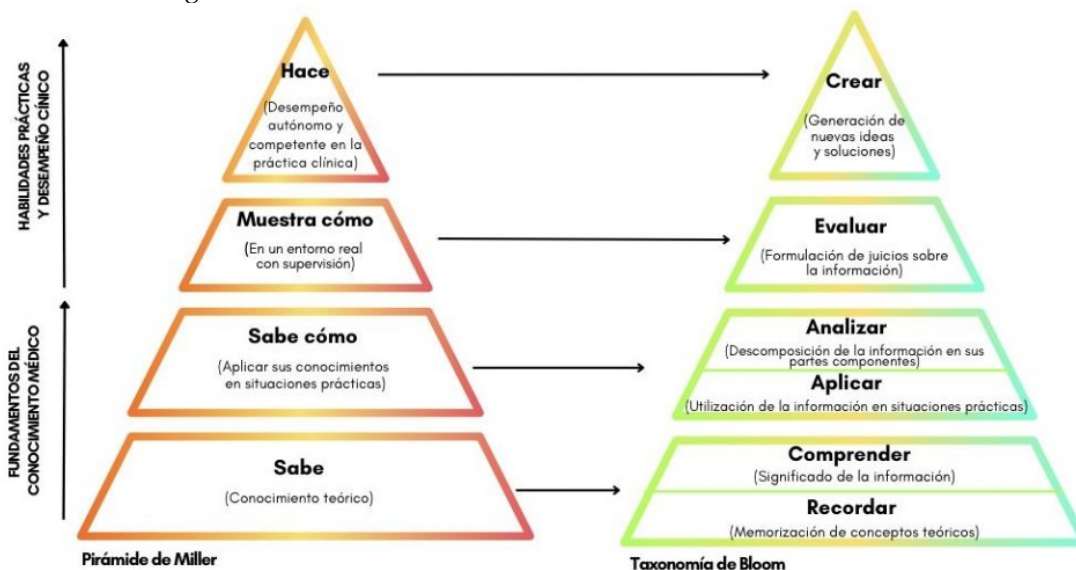

Figure 1. Correlation between Miller's Pyramid and Bloom's Taxonomy.

2. Methods

To achieve the proposed objective, a bibliographic search was carried out in some of the most relevant databases of scientific articles, including Scopus, Scielo and Google Scholar. Articles were specifically selected that addressed teaching methods applicable to Medical Teaching, the evolution of teaching models, the implementation of innovative methodologies, learning theories and the acquisition of skills. Once the search was completed, a detailed analysis of the teaching methods referred to in the different selected articles was carried out. The objective was to associate them with those used in the "ESC" subject, taking into account the skills of the teaching guide. This analysis served as the basis for the creation of a self-developed questionnaire designed specifically to investigate the assessment by medical students in Malaga of the different teaching methods in the cardiovascular area, which is shown in the appendix.

The population of this study was comprised of students of the Degree in Medicine at the University of Malaga. The criteria for participation included having passed the "ESC" subject or being currently enrolled in it, referring to fourth-year students, who had already received all the scheduled teaching at the time of completing the survey and were close to the final evaluation.

The questionnaire was structured in four parts. The first collected sociodemographic variables of the population, where the only non-mandatory questions were those related to the numerical grade of the subject and the average of the record. The second part addressed questions about the acquisition of competences and the assessment of the subject with respect to obtaining them. The third part consisted of the selection and evaluation of different teaching methods used in the subject, considering the importance assigned to each method in the learning process, the acquisition of theoretical knowledge and the development of practical skills. Finally, questions were included to inquire about the perception of the students about the impact on their learning in the face of new

teaching assumptions with an emphasis on self-directed theoretical learning, in relation to master classes and debates (CMyD), PBL; clinical rotations and practices (RyPC), seminars and skills workshops (SyTH), as well as total and partial exams (EPyT). To evaluate each of these situations, multiple choice, single choice, and Likert scale responses were used. In addition, questions were introduced about which learning methods, among those proposed, they would select and in what percentage in the context of an ideal teaching model. Likewise, participants were given the opportunity to express their opinions on the proposed topic in a free text space. The survey, created in Google Forms, was distributed online, resulting in the participation of a total of 121 students, who chose to respond voluntarily, making up the study sample. After obtaining the results of the survey, the data were exported and statistically analyzed using the Jamovi 2.3.28 program. Likewise, for the multiple choice questions, the SPSS 21.0 software was used to obtain cross tables.

The statistical method addressed the creation of a database, the coding of qualitative variables and the adjustment of quantitative variables to allow statistical calculation. Additionally, an analysis of the opinions expressed in the free text section was carried out. Subsequently, descriptive and comparative analyses were carried out to look for statistically significant differences between the qualitative variables: academic year (sixth/non-sixth), gender (male/female) and average grade of the transcript (it was converted into a dichotomous variable dividing it based on the value of the median (7.8) into categories greater than or equal to (≥ 7.8) and less than (<7.8) to the same). For this, non-parametric statistical tests such as Chi Square and Fisher's exact test were used. In contrast, for quantitative variables the parametric Student t test was used. Statistical significance was considered from $p \leq 0.05$.

This study adheres to the guidelines set out in the World Medical Association's 1975 Declaration of Helsinki, which was updated in 2013 during the 64th General Assembly in Fortaleza. All study subjects received detailed information about the voluntary nature of their participation, the guarantee of anonymity and confidentiality of the data collected, as well as the certainty that the results obtained would have no academic impact on their qualifications or give rise to actions derived from them. All of this was carried out in compliance with Regulation (EU) 2016/679 and the Organic Law on Data Protection 3/2018.

3. Results

3.1. Sociodemographic characteristics

The sample size consists of 121 students, between 21 and 48 years old, of whom 39 were male (32.2%) and 82 were female (67.8%). Regarding the main academic year, 69 were in sixth (57%), 30 in fifth (24.8%) and 22 in fourth (18.2%), data that correspond approximately with the year in which they passed the "ESC" subject: 6 (4.9%) passed in the academic year prior to 2021, 57 (47.1%) in the 2021/2022 academic year, 32 (26.4%) in 2022/2023. The 26 (21.5%) corresponding to the 2023/2024 academic year were currently taking the subject and had not yet taken the exam. Regarding class attendance, the following results were obtained: 58 of the respondents (47.9%) indicated that they had attended all the classes of the subject, 28 (23.1%) most of them, 13 (10.7%) approximately half, 16 (13.2%) attended few classes and 6 (5%) did not attend any class throughout the course. The average grades of the academic record and the final grade of the specific subject were also recorded. It is important to highlight that the questions assigned to collect this data were not compulsory, obtaining 10 and 35 losses respectively. Regarding the record, the average grade of the respondents was 7.83 (median 7.80), with a standard deviation (SD) of 0.65. The minimum grade recorded was 6.49 and the maximum 9.21. As for the final grade obtained in the subject, the average was 7.98 (± 1 SD) and the median was 8.05. The minimum grade recorded was 5 and the maximum was 10.

Table 1. Descriptive statistical analysis of students' perceptions regarding the acquisition of skills and learning outcomes of the subject.

COMPETENCES	ACQUISITION	FREQUENCIES	% TOTAL
CLINICAL HISTORY	Yes	67	55.4%
	No	54	44.6%
INITIAL DIAGNOSTIC JUDGMENT	Yes	120	99.2%
	No	1	0.8%
CARDIOPULMONARY AUSCULTATION	Yes	112	92.6%
	No	9	7.4%
DIAGNOSTIC TOOLS	Yes	110	90.9%
	No	11	9.1%
CRITICAL POINT OF VIEW	Yes	53	43.8%
	No	68	56.2%
INTERPRETATION OF ELECTROCARDIOGRAMS	Yes	85	70.2%
	No	36	29.8%
TOOLS DIAGNOSIS	Yes	85	70.2%
	No	36	29.8%
EXPERIENCE CLINIC	Yes	58	47.9%
	No	63	52.1%
POINT OF VIEW CRITICAL	Yes	63	52.1%
	No	58	47.9%

3.2. Analysis of self-perception of acquired skills

As can be seen in Table 1, among the learning outcomes analysed, the competence considered to have been acquired by the largest number of students was knowledge of cardiovascular risk factors, with 99.2% of affirmative responses. At the other extreme is cardiopulmonary auscultation, learned by 43.8%. On the other hand, the average grade given to the subject by the students with respect to the perception of the acquired competences was 7.44 (±1.33 SD). A comparative study of these perceptions and grades was also carried out in relation to the dichotomous variables of course, gender and average grade of the transcript to examine their possible statistical association, as shown in Table 2.

Table 2. Comparative statistical analysis of the perception of acquired skills and the grade assigned to the subject for them, with respect to the variables: course, gender and average grade of the record.

COMPETENCES	COURSE (N=121)	GENDER (N=121)	RECORD (N=111)
CLINICAL HISTORY	2.41* (p= 0.12)	1.03* (p=0.31)	0.41* (p=0.52)
CARDIOVASCULAR RISK FACTORS	(p= 0.43) "	(p=0.32) "	(p=0.49) "
INITIAL DIAGNOSTIC JUDGMENT	**4.81*** **(p=0.03)**	0.66* (p=0.42)	(p=1) "
TREATMENT	0.03* (p=0.86)	1.09* (p=0.30)	(p=1) "
CARDIOPULMONARY AUSCULTATION	1.06* (p=0.30)	1.31* (p=0.25)	0.40* (p=0.53)
INTERPRETATION OF ELECTROCARDIOGRAMS	**4.83*** **(p=0.03)**	2.35* (p=0.13)	2.69* (p=0.10)
DIAGNOSTIC TOOLS	3.23* (p=0.07)	**3.84*** **(p=0.05)**	0.36* (p=0.55)
CLINICAL EXPERIENCE	3.48* (p=0.06)	1.66* (p=0.20)	1.08* (p=0.30)
CRITICAL POINT OF VIEW	**6.48*** **(p=0.01)**	**4.92*** **(p=0.03)**	0.25* (p=0.62)
SUBJECT GRADE FOR ACQUISITION OF COMPETENCES	0.11 [i] (p=0.92)	**2.85 [i]** **(p=0.01)**	**2.01 [i]** **(p=0.05)**

Expressed as Chi square value (*), Fisher's exact test (") or Student's T test ([i]), together with the significance value (p).

A. Academic year: SIXTH VS NON-SIXTH

Statistically significant differences were found in the development of an initial diagnostic judgment (97.10% vs 86.54%, p = 0.03), interpretation of electrocardiograms (62.32% vs 80.8%, p = 0.03) and problem solving from a critical point of view (42.03% vs 65.38, p = 0.01), between sixth grade students and those of other courses respectively. Regarding the grade assigned to the subject for the acquisition of skills, no statistically significant differences have been observed (p = 0.92), finding very similar means in both groups 7.45 (± 1.13 SD) vs 7.42 (± 1.56 SD).

B. Gender: MALE VS FEMALE

Statistically significant differences were found in the use of diagnostic tools (82.1% vs 64.6%, p=0.05) and problem solving from a critical point of view (66.66% vs 45.12%, p=0.03), between male and female students respectively. Regarding the grade given to the subject for the acquisition of skills, statistically significant differences were observed (p=0.01), assigning as means 7.92 (±1.31 SD) and 7.21 (±1.28 SD) respectively.

C. Average grade of the record: HIGHER OR EQUAL VS BELOW THE MEDIAN

No statistically significant differences (p>0.05) were observed with respect to the average grade of the transcript and the perception of acquisition of skills. Regarding the grade attributed to the

subject, statistically significant differences were observed between both groups (p=0.05), averages 7.7 (±1.16 SD) and 7.20 (±1.43 SD) respectively.

3.3. Multi-choice teaching methods

The three methods selected as most important for the overall learning process were, firstly, the RyPC, followed by the SyTH and the PBL. Regarding the methods selected as most important for acquiring theoretical knowledge, the CMyD, the SyTH and the PBL were the CMyD, the SyTH and the PBL, and for the development of practical and clinical skills necessary in the cardiovascular area, the PyRC, the SyTH and the PBL were the most important. To determine the relationship between the variables course, gender and grade of the record with the multiple methods selected, cross tables were made, presented in Table 3.

3.4. Analysis of self-perception of new teaching assumptions

Figure 2 contains a visual summary of descriptive statistics related to students' assessment of the new teaching assumptions with respect to improved participation, information retention, increased interest in the topics covered, fostering critical thinking, a more comprehensive and motivating learning process, and practical application of knowledge.
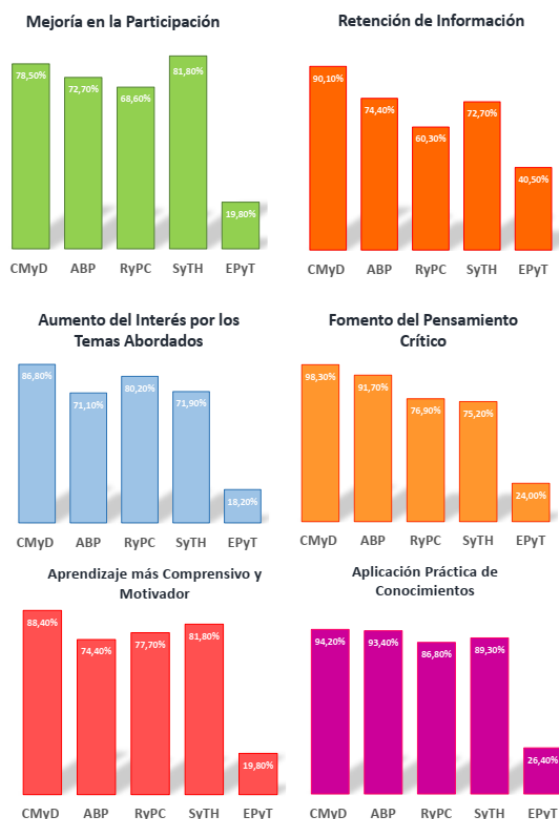
Figure 2. Descriptive analysis of the perception of the new teaching assumptions. Legend: CMyD: Master Classes and Debates, PBL: Problem-Based Learning, RyPC: Clinical Rotations and Practices, SyTH: Seminars and Skills Workshops, EPyT: Partial and Total Exams,

A. Dynamic master classes and debates

In the context of master classes with more interaction between teachers and students, according to the comparative statistics of this teaching model with respect to the course, gender and average grade, no significant results were found (p>0.05).

B. Learning based on real cases

Assuming that learning was based on an ABC or PBL-directed model, taking into account the comparative statistics of this teaching model, significant results were found with respect to the course and the facilitation of information retention by applying this methodology (81.2% sixth grade vs. 65.4% non-sixth grade, p=0.05).

C. Rotations and clinical practices

Proposing the scenario in which learning was based on a model supported by rotations and clinical practices, according to comparative statistics, significant results were found with respect to gender and improvement in participation by applying this methodology (51.28% male vs. 76.83% female, p = 0.01), as well as with respect to the grade of the record and the promotion of critical thinking (66.7% grade higher than or equal to the median vs. 83.33% grade lower than the median, p = 0.04).

D. Skills seminars and workshops

In the hypothesis of a model supported by seminars and skills workshops, taking into account comparative statistics, significant results were found with respect to the grade of the record and the increase in interest in the topics addressed (64.91% grade higher than or equal to the median vs. 81.5% grade lower than the median, p=0.05).

E. Total and partial exams

In the case of learning based on a model supported by partial and total exams, the general assessment by the students has been more negative. Considering the comparative statistics of this teaching model, significant results were found with respect to the course and the improvement in participation (13% sixth vs. 28.8% non-sixth, p = 0.03), as well as in the more comprehensive and motivating learning process (13% vs. 28.8%, p = 0.03). In addition, significant results were also found with respect to gender and the increase in interest in the topics addressed (7.09% male vs. 14.91% female, p = 0.01) and the more comprehensive and motivating learning process (7.74% vs. 16.26%, p = 0.04).

3.5. Multi-response new teaching models

Among the new teaching models proposed, 30.1% of students selected the one based on RyPC, 22.6% SyTH, 20.2% CMyD, 20.2% PBL and 6.8% EtyP. To determine the relationship between the variables course, gender and grade of the record with the selected teaching models, a cross-tabulation was made, as shown in Table 4.

3.6. Percentages assigned to each teaching method

In an ideal teaching model, students would assign the following percentages to each method: CMyD 25%, as well as to RyPC (25%), to SyTH 18%, to PBL 17% and to EPyT 15%, represented in a circular diagram in Figure 3. With respect to the comparative statistics, significant results were obtained between the course and the percentage assigned to lectures (p = 0.01), with respect to sixth grade students and those of the other courses: 23% (± 14%) and 30% (± 16%) respectively.

Table 3. Multi-choice Cross-tabs for Teaching Methods.

TEACHING METHODS	LEARNING								
	COURSE			GENDER			RECORD		
	6th	≠ 6°	Count TOTAL	♂	♀	Count TOTAL	≥	<	Count TOTAL
CMyD	33 (47.8%)	34 (65.4%)	67	23 (59.0%)	44 (53.7%)	67	33 (57.9%)	29 (53.7%)	62
ABP	41 (59.4%)	30 (57.7%)	71	23 (59.0%)	48 (58.5%)	71	33 (57.9%)	31 (57.4%)	64
RyPC	60 (87.0%)	39 (75.0%)	99	31 (79.5%)	68 (82.9%)	99	43 (75.4%)	47 (87.0%)	90
SyTH	54 (78.3%)	38 (73.1%)	92	26 (66.7%)	66 (80.5%)	92	41 (71.9%)	42 (77.8%)	83
EPyT	19 (27.5%)	13 (25.0%)	32	11 (28.2%)	21 (25.6%)	32	17 (29.8%)	15 (27.8%)	32
Students	69	52	121	39	82	121	57	54	111
THEORETICAL KNOWLEDGE									
TEACHING METHODS	COURSE *			GENDER "			RECORD i		
	6th	≠ 6°	Count TOTAL	♂	♀	Count TOTAL	≥	<	Count TOTAL
CMyD	50 (72.5%)	39 (75.0%)	89	31 (79.5%)	58 (70.7%)	89	46 (80.7%)	37 (68.5%)	83
ABP	40 (58.0%)	28 (53.8%)	68	22 (56.4%)	46 (56.1%)	68	27 (47.4%)	34 (63.0%)	61
RyPC	37 (53.6%)	25 (48.1%)	62	20 (51.3%)	42 (51.2%)	62	26 (45.6%)	28 (51.9%)	54
SyTH	45 (65.2%)	41 (78.8%)	86	27 (69.2%)	59 (72.0%)	86	41 (71.9%)	37 (68.5%)	78
EPyT	34 (49.3%)	17 (32.7%)	51	15 (38.5%)	36 (43.9%)	51	29 (50.9%)	21 (38.9%)	50
Students	69	52	121	39	82	121	57	54	111
PRACTICAL SKILLS									
TEACHING METHODS	COURSE *			GENDER "			RECORD i		
	6th	≠ 6°	Count TOTAL	♂	♀	Count TOTAL	≥	<	Count TOTAL
CMyD	10 (14.5%)	17 (32.7%)	27	11 (28.2%)	16 (19.5%)	27	9 (15.8%)	15 (27.8%)	24
ABP	54 (78.3%)	38 (73.1%)	92	30 (76.9%)	62 (75.6%)	92	46 (80.7%)	39 (72.2%)	85
RyPC	69 (100%)	48 (92.3%)	117	37 (94.9%)	80 (97.6%)	117	56 (98.2%)	51 (94.4%)	107
SyTH	67 (97.1%)	44 (84.6%)	111	35 (89.7%)	76 (92.7%)	111	54 (94.7%)	47 (87%)	101
EPyT	5 (7.2%)	4 (7.7%)	9	2 (5.1%)	7 (8.5%)	9	3 (5.3%)	6 (11.1%)	9
Students	69	52	121	39	82	121	57	54	111

Values expressed as individual count and (%) within course, gender and record with respect to the median, respectively.

Table 4. Multi-response Cross Table for New Teaching Models.

MODELS TEACHERS	FAVORITE								
	COURSE			GENDER			RECORD		
	6th	≠ 6°	Count TOTAL	♂	♀	Count TOTAL	≥	<	Count TOTAL
CMyD	29 (42%)	30 (57.7%)	59	23 (59.0%)	36 (43.9%)	59	32 (56.1%)	22 (40.7%)	54
ABP	35 (50.7%)	24 (46.2%)	59	21 (53.8%)	38 (46.3%)	59	28 (49.1%)	26 (48.1%)	54
RyPC	52 (75.4%)	36 (69.2%)	88	28 (71.8%)	60 (73.2%)	88	37 (64.9%)	42 (77.8%)	79
SyTH	37 (53.6%)	29 (55.8%)	66	16 (41%)	50 (61%)	66	26 (45.6%)	34 (63%)	60
EPyT	11 (15.9%)	9 (17.3%)	20	9 (23.1%)	11 (13.4%)	20	12 (21.1%)	8 (14.8%)	20
Students	69	52	121	39	82	121	57	54	111

Values expressed as individual count and (%) within course, gender and record with respect to the median, respectively.

4. Discussion

The results show that PBL and STH are valued as important methods for learning and acquiring theoretical knowledge and practical skills in Cardiology. In an ideal teaching model, of the total proposed methods, 18% have been attributed to STH and 17% to PBL, while in the subject at present, STH represents 25.31% and PBL only 2.66%. Regarding the latter method, the results of the present study show that sixth-grade students perceive PBL as a method that facilitates the retention of information. The proximity of these students to the end of the degree gives them a complete and critical view of which methods work best due to their complete immersion in the educational program and, therefore, they can offer valuable feedback on which educational approaches are most beneficial from their personal experience.

In light of this, one article indicates that, according to recent systematic reviews, PBL improves academic performance in Medicine as it is a method that integrates practice and theory through clinical scenarios. By giving students the opportunity to actively investigate and solve medical problems similar to those in real clinical practice, their theoretical knowledge is reinforced, offering a potentially integrative approach8. Therefore, it would be advisable to dedicate more time to the implementation of this methodology in the "ESC" subject and thus reinforce theoretical learning and the development of the critical point of view.

On the other hand, it is observed that students perceive a lower acquisition of practical skills, such as the preparation of a correct clinical history, interpretation of electrocardiograms and adequate cardiopulmonary auscultation, compared to theoretical skills, a trend that has also been found in other previous studies (2, 9). This evidence underlines the importance of addressing this challenge in education and highlights the need to develop strategies to improve the acquisition of practical skills, important in Cardiology and in clinical practice in general. Regarding the electrocardiogram, a study developed a proposal through the "HEARTS ECG" workshop, for the systematized practice of electrocardiogram interpretation (9).

Although the subject assigns a representative percentage to seminars, as described above, the need for a new approach more focused on the development of practical skills, which essentially require training, is highlighted. Among some of the possible proposals is to orient these seminars with activities such as role play, practice of skills supported by audiovisual media and simulation of different clinical scenarios, among others, thus promoting a more integrative learning and with greater participation of the students in their learning process. Regarding this approach, significant

perspectives have been found in the results of the study by students with an average grade of the record below the median and the increase in interest in the topics addressed.

Considering the teaching model based on dynamic lectures with self-directed theoretical learning, it has been perceived, as reflected in Figure 2, as the method with the greatest representation in five of the six study variables. In addition, students have assigned to CMyD with this active approach a slightly higher percentage (25%) than with respect to the one currently attributed to the subject (23.33%). In relation to this, a study proposes the following question: "What would happen if we recorded all our classes in advance, students watched the video as "homework", and then we used the entire class to help students with concepts they do not understand?" (10). This active method, known as the flipped classroom, has been valued by a large number of researchers as a teaching method that has demonstrated great effectiveness in the learning process. In addition, today, advances in technology have enhanced educational experiences through the implementation of learning platforms, further strengthening the flipped classroom proposal. This is why its implementation in the subject could strengthen its teaching.

Regarding the RyPC, the percentage proposed by the students (25%) and the one attributed to the subject (28.66%) do not differ greatly, as has been seen with the PBL. The importance of this method has been attributed both for learning in general and in the acquisition of practical skills. In addition, there is a significant increase in participation among the female gender, and among students with a grade below the median, a significant increase in the critical point of view. As a suggestion proposed in the free text of the survey, a practice guide is proposed to increase the fulfillment of objectives during the RyPC by the different hospital services of the specialty and thus strengthen clinical experience.

Finally, with regard to the EPyT, it should be noted that there has not been a positive reception with regard to the study variables, due to their evaluative nature. However, some comments in the free text propose an increase in eliminatory partial exams, as well as the suggestion of a post-assessment correction class, so that once the exam has been taken, the mistakes made and their justification can be known. Regarding the percentage assigned by the students to this method, the difference is 5% with respect to that assigned to the subject, these being 15% and 20% respectively.

An aspect not studied in this work is the possible influence of factors external to these teaching methods, such as the available resources or the quality of the instructors, which could provide additional information to that obtained in this study and could be of interest for future research. Among the limitations present in this research is, firstly, the study population, since it is a small sample of students, belonging only to the Faculty of Medicine of the University of Malaga. This could limit the generalization of the results to the general population of medical students, without being able to obtain extrapolable conclusions. Added to this, another limitation is the heterogeneous distribution of the students, since more than half of them are in the 6th year, which must be taken into account when interpreting the results. In addition, the study sample has been influenced by factors such as the modality of the subject (English or Spanish).

On the other hand, there is a self-selection bias due to the voluntary nature of participation, influenced by the volunteer effect, probably excluding the opinion of less committed students and biasing the result. Similarly, there is also a possible response bias, since the academic data have been obtained in a self-declared manner, which may or may not be in line with reality and according to the respondents' own perceptions and experiences. Likewise, another limitation of the study is the lack of a control group, given the absence of another teaching method for comparison, which limits the ability to establish causal relationships.

5. Conclusions

- The implementation of teaching methods with an integrative approach to theoretical and practical knowledge, as well as the promotion of active student participation in the

development of these, has proven to be essential to enhance learning in Cardiology from the student perspective.

- Students' perceptions highlight the importance of intensifying practical teaching and considering dynamic methods during their preparation, highlighting the reception of CMyD with this participatory approach, together with that of learning focused on problematized cases.
- Although SyTH and PBL are teaching methods currently used in the subject, their representation and application differ from the expectations of students, who underline the need to strengthen practical teaching and to consider dynamic methods during their preparation, which are more similar to the real challenges and scenarios they will face in their future clinical practice.

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