

Quantitative and qualitative evaluation of satisfaction in the teaching of Pathology in medical students in a complex Chilean university

Evaluación cuantitativa y cualitativa de la satisfacción en la enseñanza de la Patología en estudiantes de medicina en una universidad compleja chilena

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Summary: The subjects of General Pathology and Pathological Anatomy are taught during the fifth and sixth semester of the Medicine degree at the University of Concepción. In these, an inverted classroom-type teaching style is used with a practical activity of "Design of Clinical - Pathological Cases" (DCCP), initiated in the surgical pathology room, where students experience the work of the pathologist in real life. groups of 3 to 4 people, carrying out everything from macroscopic dictation to microscopic diagnosis, with a final presentation of the case to students and teachers. A cross-sectional analytical observational study was carried out on a sample of 87 students who took both subjects. A quantitative descriptive analysis and a qualitative method of content analysis were carried out, coding and classifying the responses of 2 instruments. The general satisfaction of the DCCP activity was 82.4%, being perceived as innovative and useful for the development of skills and theoretical learning of pathology, which better prepares students to face real-world challenges as pathology professionals. The importance of considering students' preferences and needs when designing teaching strategies should not be forgotten. The qualitative evaluation of the DCCP activity and the subjects provided valuable information for continuous improvement; reaffirming the importance of incorporating these in the evaluations of teaching practices. It is concluded that the DCCP practical activity helps medical students better understand the macroscopic and microscopic aspects of Pathological Anatomy; even surpassing the flipped classroom. The combination of student-centred approaches, work in real-world environments, appropriate teaching support and quality study material can lead to a more effective and satisfying learning experience for students in these disciplines.

Keywords: Learning; Medical Education; Health Education; Students of the Health Area; Motivation; Pathology.

Resumen: Las asignaturas de Patología general y Anatomía patológica son impartidas durante el quinto y sexto semestre de la carrera de Medicina de la Universidad de Concepción. En estas se utiliza un estilo de enseñanza tipo aula invertida con una actividad práctica de "Diseño de casos Clínico-Patológicos" (DCCP), iniciada en sala de patología quirúrgica, donde los estudiantes vivencian en forma real el trabajo del anatomopatólogo en grupos de 3 a 4 personas, realizando desde el dictado macroscópico hasta el diagnóstico microscópico, con una presentación final del caso a estudiantes y docentes. Se realizó un estudio observacional analítico transversal a una muestra de 87 estudiantes que cursaron ambas asignaturas. Se efectuó un análisis descriptivo cuantitativo y un método cualitativo de análisis de contenido, codificándose y clasificándose las

respuestas de 2 instrumentos. La satisfacción general de la actividad DCCP fue del 82,4%, siendo percibida como innovadora y útil para el desarrollo de habilidades y aprendizajes teóricos de patología, que prepara a los alumnos de mejor manera para enfrentar los desafíos del mundo real como profesionales de la salud. No se debe olvidar la importancia de considerar las preferencias y necesidades de los estudiantes al diseñar estrategias de enseñanza. La evaluación cualitativa de la actividad DCCP y de las asignaturas entregó valiosa información para un mejoramiento continuo; reafirmando la importancia de incorporar éstas en las evaluaciones de prácticas docentes. Se concluye que la actividad práctica DCCP ayuda de mejor forma a los estudiantes de medicina a entender los aspectos macroscópicos y microscópicos de la Anatomía Patológica; superando incluso al aula invertida. La combinación de enfoques centrados en el alumno, trabajo en entornos reales, un apoyo docente adecuado y material de estudio de calidad puede conducir a una experiencia de aprendizaje más efectiva y satisfactoria para los estudiantes en estas disciplinas.

Palabras clave: Aprendizaje; Educación Médica; Educación en Salud; Estudiantes del Área de la Salud; Motivación; Patología.

1. Introduction

Medical education in pathology is a relevant area in the training of future health professionals, since its learning interprets the functional and structural changes caused by diseases, helping students to understand and interpret clinical signs and symptoms derived from these changes. In order to maximize learning and knowledge retention, it is essential that the pedagogical approaches used lead to meaningful learning (1).

One of the relevant aspects for deep learning is achieving intrinsic motivation, which refers to motivation that arises from within the individual and is not influenced by external factors, such as a reward or grade (2). This type of motivation can be fostered by creating learning environments that are meaningful, interesting and challenging, such as carrying out clinical cases and practical activities oriented to the field of medical function, which allows students to see the relevance of theoretical concepts when applying them in real situations (1). Associated with this is the concept of experience-based learning, which focuses on the active participation of students in the learning process, which allows them to acquire skills and knowledge through exploration and experimentation through a methodology of “do, reflect, think and apply” (3). At the University of Concepción, since 2017, an educational intervention based on experiencing the work of the pathologist has been implemented, called “Design of clinical-pathological cases” (DCCP), where the conceptual framework is “learning by doing”, with the in order to use learning based on experience as a pedagogical tool (4), with a high degree of satisfaction and intrinsic motivation (5). In this activity, students, in groups of 3 to 4 individuals, visit the surgical pathology room, where they select a biopsy from the work routine of a Pathological Anatomy Unit to later perform the macroscopic description, the section of the tissue, observe the histological processing in the laboratory and the histopathological review under the supervision of pathologist teachers, culminating the activity with a presentation of the project (4, 5).

The flipped classroom refers to a methodology that reverses the traditional order of the face-to-face class and individual work outside the classroom. Students receive the information before class. Then, in the face-to-face class, the tutor guides and supports the active learning of the students through practical activities and discussions, turning the class into an instance of interaction and application of previously acquired knowledge (6). During the last two decades at the University of Concepción, pathology has been taught using a flipped classroom model, with theoretical classes available in an online portal for independent prior study and weekly practical activities with discussion of 6 cases previously sent by the teacher and developed by students in groups of 3 to 4 individuals (4).

The DCCP and the flipped classroom methodology are forms of teaching focused on students that enhance greater intrinsic motivation, which according to self-determination theory is mediated by the satisfaction of the basic psychological needs of autonomy, competence and relatedness (7). Autonomy is satisfied through choice by the students of the biopsy with which they will design the clinical pathological case; competition through optimally challenging activities, that is, difficult enough to cause interest but at the same time embeddable by students; and relationship because the DCCP activity is carried out collaboratively together with the multidisciplinary team of the Pathological Anatomy Unit in a safe environment, of trust and respect (5).

In this work, the perception of undergraduate medical students will be analyzed in relation to their learning during the subjects of General Pathology and Pathological Anatomy during the year 2021, through 2 questionnaires, carrying out a quantitative-qualitative analysis of the information collected. The results of this study have the potential to inform more deeply about the perception of students in relation to their learning and enrich educational practices in the field of pathology, contributing to the training of more competent and prepared health professionals.

2. Methods

A cross-sectional analytical observational research was carried out, using a quantitative description and the qualitative research method of content analysis (8). The universe was made up of 117 third- year medical students from the University of Concepción who had taken the subjects of General Pathology (first semester of 2021, 100% online) and Pathological Anatomy (second semester of 2021, in-person modality). Due to the Covid 19 pandemic, only the visit to the histopathology laboratory was changed by explanatory videos of the processes and the interview with the patient and/or interview with treating physicians by reviewing the clinical history in an electronic file . The sample corresponded to 87 students who answered 2 printed questionnaires on a single occasion.

The first instrument corresponded to a modification of the “Student Experience Evaluation Scale” that evaluates the degree of satisfaction of the DCCP activity and general subject, and which was previously validated in the 2017 cohort (5) (Table 1). The second instrument corresponded to “Feedback Through Open Questions”, where participants were asked to respond to all or some of the questions described in items 1 to 4 in relation to the DCCP and the subject in general (table 1). Both instruments were subjected to an internal and external validation process by medical students and expert teachers. For data collection, the 2 instruments were applied along with informed consent; 9 months after the end of the Pathological Anatomy course.

For the *quantitative evaluation*, a descriptive analysis of the 13 items in the instrument “Student experience evaluation scale” was carried out. From item 1 to 7 (first part) the values could vary from 1 to 5, while from items 8 to 13 (second part) these ranged from 0 to 5. In addition, Cronbach's Alpha analysis was carried out for each part. of the survey and the total score of the scale was calculated, analyzing its distribution using values of asymmetry, kurtosis and p value for the Shapiro-Wilk normality test. For the *qualitative evaluation* , items numbers 12 and 13 of the “Student Experience Evaluation Scale” and the 4 items of the instrument “Feedback Through Open Questions” were analyzed.

Data preparation was carried out by transcribing them into the ATLAS.ti analytical program, preserving its content faithfully to the original surveys. Open coding of the responses was carried out, where text fragments of the participants' responses were labeled where each fragment corresponds to a code (therefore, a response can have more than one code). In this way, 17 codes (Cod) were identified, which were then classified into

6 code groups of related topics (GCod). In addition, the fragments corresponding to each code were subclassified into subgroups (SubCod), in order to analyze the patterns and key themes present in the responses. Additionally, statistical significance was analyzed according to Fisher's exact test with $p < 0.05$. The project was approved by the Research Ethics Committee of the Faculty of Medicine of the University of Concepción.

Table 1. Items included in the modified “ Student Experience Evaluation Scale ” instrument.

Item	Ask
1	Do you think that teaching medical pathology through the construction of clinico-pathological cases from a biopsy has been useful in the development of your practical skills in pathological anatomy?
2	Do you think that teaching medical pathology through the construction of clinical-pathological cases from a biopsy has been useful in your theoretical learning of pathological anatomy?
3	Do you think that teaching Medical Pathology through the Construction of clinico-pathological cases from a biopsy is more useful for understanding macroscopic changes than what is done through the presentation of cases used in weekly classes?
4	Do you think that teaching Medical Pathology through the Construction of clinico-pathological cases from a biopsy is more useful for understanding microscopic changes than what is done through the presentation of cases used in weekly classes?
5	Do you think that doctors who develop skills for anatomical-pathological diagnosis have an easier time obtaining a correct clinical diagnosis?
6	Do you think that the evaluation method of the activity Construction of clinical-pathological cases from a biopsy fits with what was learned during the activity?
7	Do you think that the evaluation method of the activity, Construction of clinical-pathological cases from a biopsy, adjusts to the contents of the subjects of General Pathology and Pathological Anatomy?
8	From 0 to 5, how much did the clinical-pathological case construction activity modify your ability to distinguish the need to use complementary techniques (immuno-histochemistry, molecular, etc.) in the diagnosis of some biopsies?
9	From 0 to 5, what score would you give to the teacher's support during the activity in the Surgical Pathology room (hospital) of the construction of clinical-pathological cases from a biopsy?
10	From 0 to 5, what score would you give to the teacher's support during the preparation of the clinicopathological case based on a biopsy, after its selection in the hospital?
eleven	From 0 to 5, how innovative did you find the activity “Construction of clinico-pathological cases from a biopsy”?
12	From 0 to 5, how many problems did you have with the methodology used in the activity Construction of clinico-pathological cases from a biopsy? If applicable, specify what problems
13	From 0 to 5, how many problems did you have with the teacher's tutoring during the activity “Construction of clinical-pathological cases from a biopsy”? If applicable, specify what problems

Table 2 . Items included in the instrument “Feedback Through Open Questions”.

First item : What would you like to change about the activity?
Second item: What would you like to add to the activity?
Third item: In your experience, what did you think about personally recruiting the case in the surgical pathology room in Pathological Anatomy (2nd semester), compared to the case sent and selected by the teacher in General Pathology (1st semester)?
Fourth item: Your personal comment on the subjects in general.

3. Results

Of the 88 surveys administered, 87 were analyzed, because one of the students subsequently revoked his informed consent.

3.1 Quantitative results

For the first part of the “Student Experience Evaluation Scale” a good reliability indicator is obtained, resulting in a Cronbach's Alpha of 0.804. The second part of the scale showed lower reliability, reaching 0.664, still within the acceptable range. For both parts combined, Cronbach's Alpha turned out to be 0.847, better than its parts separately.

In the descriptive analysis, when taking into account the sum of the scores 4 (partially agree) and 5 (totally agree), 76, 7 % and 80% of the students perceived that the DCCP activity was useful for develop their practical skills and theoretical learning in Pathology , respectively. 90.6% and 78.9% considered that the DCCP helped them understand the macroscopic and microscopic pathological changes of the biopsies they analyzed in a better way than with the cases sent weekly by teachers and worked on through a flipped classroom . 67.5% of students agree that developing skills for anatomical-pathological diagnosis means greater ease in obtaining accurate clinical diagnoses. They also estimated that the evaluation adjusted to the learning results and contents delivered by 79.1% and 82.6%. The majority (89.4%) declared themselves satisfied with the teaching explanations and had no problems with the methodology or tutoring. 47 % considered that DCP activity modified their ability to distinguish the need for complementary techniques in the analysis of a biopsy . Finally, 72.1 % of participants indicated that they found the activity innovative.

Table 3 . Descriptive analysis of the variables of the “Student experience evaluation scale”.

Items	Half	Half %	OF	% Answer						4+5
				0	1	2	3	4	5	
1	4,023	80.46	1,178		23	16.3	4.7	30.2	46.5	76.7
2	4,106	82.12	1,113		3.5	9.4	7.1	32.9	47.1	80.0
3	4,353	87.06	0.827		1.2	3.5	4.7	40.0	50.6	90.6
4	4,059	81.18	1,084		3.5	8.2	9.4	36.5	42.4	78.9
5	3,884	77.68	1,222		5.8	9.3	17.4	25.6	41.9	67.5
6	4,128	82.56	1,072		23	9.3	9.3	31.4	47.7	79.1
7	4,209	84.18	1,019		23	7.0	8.1	32.6	50.0	82.6
8	3,306	66.12	1,235	2.4	5.9	15.3	29.4	29.4	17.6	47.0
9	4,529	90.58	0.825	0.0	1.2	2.4	21.2	21.2	68.2	89.4
10	4,302	86.04	1,085	4.7	4.7	23	15.1	15.1	57.0	72.1
eleven	4,035	80.70	1,418	4.7	4.7	23	15.1	15.1	57.0	72.1
12*	4,138	82.76	1,432	23	8.0	5.7	11.5	11.5	65.5	77.0
13*	4,529	90.58	1,098	23	23	23	12.6	12.6	77.0	89.6
Half		82.4								77.1

*The values of the responses to items 12 and 13 were reversed so that higher values mean greater satisfaction like the rest of the items on the scale.

The total score of the scale was calculated and its distribution was analyzed. Adding the 13 items, the minimum theoretical score is 7 and the maximum theoretical score is 65. The analyzed sample showed that the minimum score obtained was 18 and the maximum 65, with the average being 53.39, with a standard deviation of 8.7, their satisfaction being an average of 82.4%. The median was 56, that is, half of the cases obtained scores above this value. Then, it was analyzed whether it corresponded to a normal distribution.

According to the values of asymmetry, kurtosis and p value for the Shapiro-Wilk normality test, it is interpreted that the variable does not have a normal distribution, but rather has a greater number of accumulated cases at the highest satisfaction values. These values are detailed in Table 3, and are represented in Figures 1 and 2. It is observed in Figure 2 that the average is less than the median.

Table 4. Total score of the “Student Experience Evaluation Scale” and analysis of its distribution.

Variable	Punctuation
N	82
Lost	5
Half	53,390
Median	56,000
Standard deviation	8,708
Minimum	18
Maximum	65
Asymmetry	-1,522
Std error asymmetry	0.266
Kurtosis	3,126
Std error kurtosis	0.526
Shapiro-Wilk W	0.881
Shapiro-Wilk p-value	< 0.01

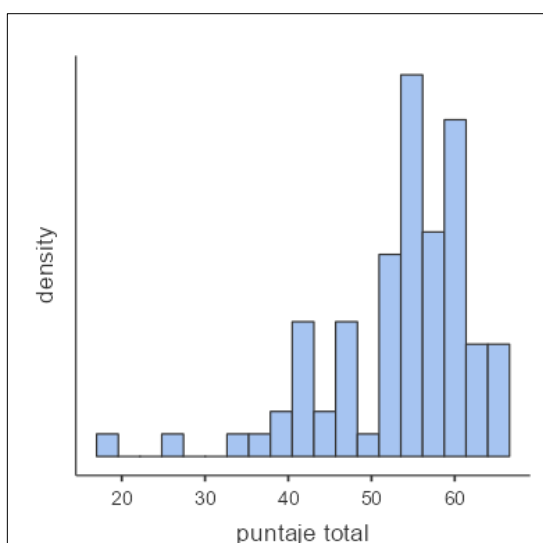


Figure 1. Total points in the “Scale of evaluation of student experience”.

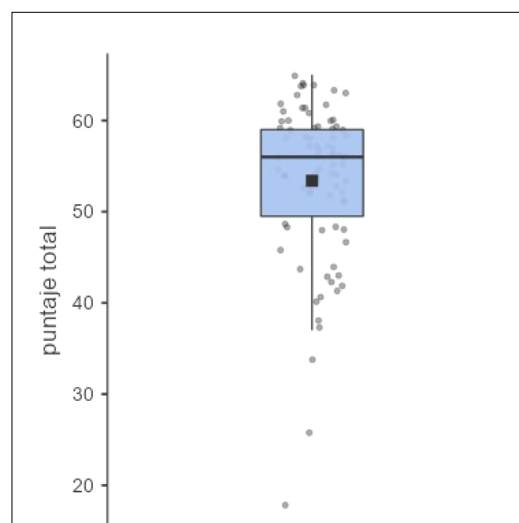


Figure 2. Distribution of points of the “Scale of evaluation of student experience”. * Horizontal line in the box is the median, black square being the mean of the student experience.

3.2 Qualitative results

3.2.1 Coding and code classification

The total number of responses for qualitative analysis was 285, out of a possible total of 516. Initially, 17 codes were identified, finally remaining 16 because the Cod “Collaborative work” included only one response. The selected codes are presented, along with their operational definition, in Table 4.

Table 5. Codes identified and their operational definitions.

Codes (Cod)	Operational definition
Cod 1 Aspects to improve in the subject	Suggestions provided by students regarding recognized problems regarding the subject, in relation to topics such as time, spaces, organization and activities.
Cod 2 Aspects to improve in the DCCP methodology	Suggestions provided by students regarding the problems recognized in the DCCP, in relation to topics such as time, spaces, organization and teaching support.
Cod 3 Experience-based learning	Student comments regarding how the DCCP practical activity affected their learning experience, in relation to "doing and experimenting".
Cod 4 Learning facilitators	Answers in relation to people, tools, strategies or environments that helped students acquire new knowledge, skills and attitudes more effectively.
Cod 5 Importance of the senses in learning	Comments regarding how the senses facilitated or enriched the experience during the DCCP activity and its relationship with learning.
Cod 6 Study material	Comments in relation to the available theoretical base and its contribution to learning, both negatively and positively.
Cod 7 Learning motivation	Responses regarding student motivation during the DCCP subjects and practical activity and factors related to it.
Cod 8 Obstacles to learning	Responses in relation to situations, conditions or factors that hindered or prevented the students' learning process.
Cod 9 Perception of autonomy in learning	How the feeling of being able to make decisions for themselves affected the students' experience and learning during the DCCP activity.
Cod 10 Negative perception of the subject	Responses that involve characteristics of the pathology subjects that indicate that they have been poorly planned, leaving a perception that they have not been useful and have not generated significant learning.
Cod 11 Negative perception of the DCCP methodology	Responses that involve characteristics of the DCCP activity that indicate that it was poorly planned, leaving a perception that it has not been useful and has not generated significant learning.
Cod 12 Negative perception of teaching	Answers that describe negative situations or factors in relation to teachers of pathology subjects.
Cod 13 Positive perception of the subject	Answers that involve characteristics of the pathology subjects that indicate that they have been well planned, which makes it a useful field that allowed significant learning.
Cod 14 Positive perception of the DCCP methodology	Responses that involve characteristics of the DCCP activity that indicate that the teaching method contributed to the learning objectives and was meaningful to student learning.
Cod 15 Positive perception of teaching	Answers that describe positive situations or factors in relation to teachers of pathology subjects.
Cod 16 Unargued preference	Simple one-word answer that does not guide a specific preference regarding the question.

3.2.2 Code frequency

When analyzing the frequency of the coded responses, it is observed that the most prevalent themes were **Cod 1 Aspects to improve in the subject**, **Cod 14 Positive perception of the DCCP methodology** and **Cod 2 Aspects to improve in the DCCP methodology**, while the least frequent topics were **Cod 11 Negative perception of the DCCP methodology**, **Cod 5 Importance of the senses in learning** and **Cod 12 and 15 Negative and positive perception of teaching**. It is highlighted that there were 73 fragments categorized under **Cod 14 Positive perception of the DCCP methodology**, versus its counterpart **Cod 11 Negative perception of the DCCP methodology** with only 7; which was statistically significant with a $p < 0.05$. In addition, there were 41 fragments under **Cod 13 Positive perception of the subject** and 27 under **Cod 10 Negative perception of the subject**; resulting in the difference in the number of fragments being statistically significant with a $p < 0.05$. Table 5 indicates the frequency of responses regarding the different codes worked on.

Table 6 . Frequency of codes (fragments of a response with an idea) and their percentage relative to the total codes.

Code	Number of fragments categorized	Percentage in relation to the total fragments
Cod 1 Aspects to improve in the subject	89	31.1%
Cod 14 Positive perception of the DCCP methodology	73	25.6%
Cod 2 Aspects to improve in the DCCP methodology	68	23.8%
Cod 4 Learning facilitators	Four. Five	15.7%
Cod 13 Positive perception of the subject	41	14.3%
Cod 8 Obstacles to learning	36	12.6%
Cod 3 Experience-based learning	29	10.1%
Cod 10 Negative perception of the subject	27	9.4%
Cod 7 Learning motivation	25	8.7%
Cod 16 Unargued preference	23	8.0%
Cod 6 Study material	17	5.9%
Cod 9 Perception of autonomy in learning	14	4.9%
Cod 15 Positive perception of teaching	12	4.2%
Cod 14 Negative perception of teaching	12	4.2%
Cod 5 Importance of the senses in learning	10	3.5%
Cod 11 Negative perception of the DCCP methodology	7	2.4%
	528	100%

3.2.3 Distribution of codes in Code Groups (GCod)

Theme codes with similar characteristics were grouped into 6 groups of codes, which are presented in Table 7.

Table 7. Code groups.

Code Groups (GCod)	Codes included in the group
GCod A Learning	Experience-based learning Learning facilitators Importance of the senses in learning Motivation to learn Learning Obstacles Perception of autonomy in learning
GCod B Perception of the subject	Positive perception of the subject Negative perception of the subject Study material
GCod C Perception of methodology	Positive perception of the methodology Negative perception of the methodology
GCod D Perception of teaching	Positive perception of teaching Negative perception of teaching
GCod E Recommendations	Aspects to improve in the subject Aspects to improve in the methodology
GCod F Unargued preference	Unargued preference

3.2.4 Code results (Cod) ordered by Code Groups (GCod)

3.2.4.1 GCod A: Learning (made up of 6 codes)

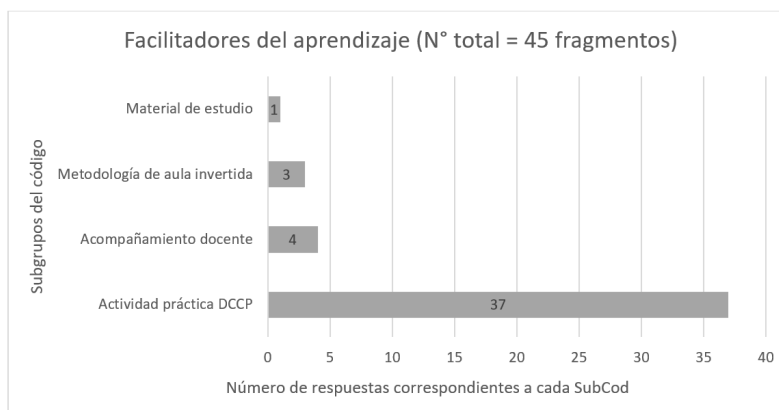
Cod 3 Experience-based learning, 29 total codes or fragments . 10 SubCod refer to the fact that the DCCP activity allowed them to better internalize the learning, and 6 that it left a greater impression on them and made it easier for them to remember better later. Students indicated that they learned a lot during the DCCP activity, and that during these moments they gained a deeper understanding of pathological anatomy. The distribution of the SubCods is presented in figure 3.



Figure 3. Learning based on experience.

Cod 4 Learning Facilitators, 45 total codes or fragments. Of these, 37 correspond to the DCCP practical activity. Learning was facilitated by several factors, including the possibility of personally recruiting the case and choosing the sample that was subsequently developed. Being in charge of choosing, sampling and searching for patient information made the information internalized more effectively. Regarding learning facilitators present in subjects in general, teachers are emphasized. Having teachers who will foster interest in the subject and who care that students learn was essential for learning, as indicated. Regarding the methodology of the subject, it is evident that the weekly case presentations allow for a constant study rhythm, and the fact that the subject is inverted helps to reaffirm the contents. The distribution of the SubCods is presented in figure 4.

Figure 4. Learning facilitators.



Cod 5 Importance of the senses in learning, 10 total codes or fragments. According to the students, the difference between seeing something live and in images is notable. The personal interaction with the object of study is more enriching, allowing the subsequent macroscopic and microscopic comparison of the sample in a more authentic way. The ability to feel the texture and observe the tissue from different angles allows for a better understanding of the pathology in question. The distribution of the SubCods is presented in figure 5.

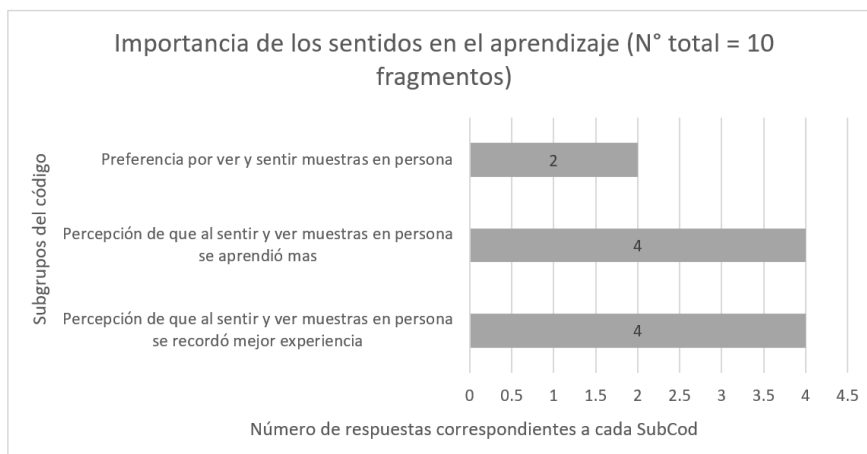


Figure 5. Importance of the senses in learning.

Cod 7 Motivation to learn, 25 total codes or fragments . The students expressed that the autonomy and responsibility of choosing and working on their own case fostered their interest and commitment to the learning process, corresponding to 13 of the SubCods . Furthermore, actively participating in the case selection and construction process was also an important factor that motivated their learning. However, it was observed that poor teaching support and very demanding evaluations decreased the motivation of 2 students. The distribution of the SubCods is presented in figure 6.

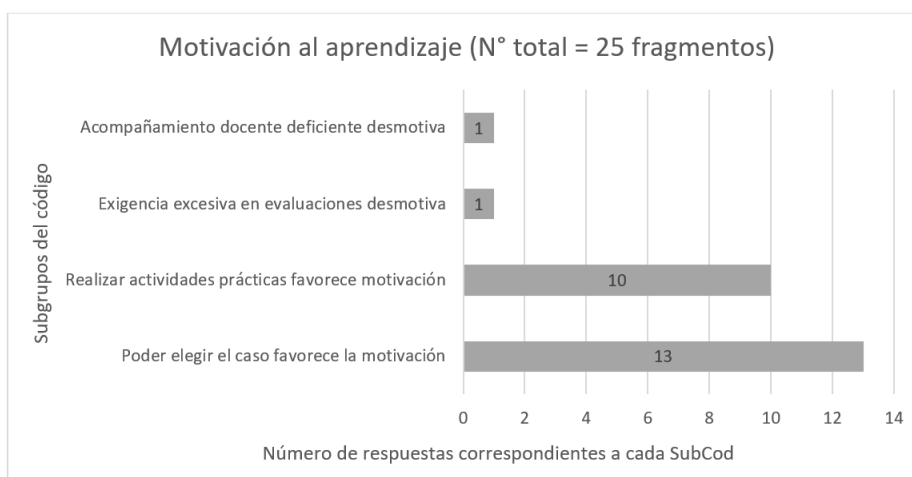


Figure 6. Motivation to learn.

Cod 8 Obstacles to learning, 36 total codes or fragments. 5 of these SubCod mention that their baseline knowledge of histology was insufficient, which made it difficult to identify pathological changes in the subjects of general pathology and pathological anatomy. The notes used in the subject also generated difficulties in learning, this being the greatest obstacle identified. Learning through the guides was difficult because the images did not always allow the identification of histopathological lesions, and on the other hand, some students considered that the study material was not clear or deep enough. A couple of students stated that they did not consider that self-study based on a guide with subsequent putting into practice, that is, the flipped classroom method, was a good methodology. As for "Others", difficulties with group work in the DCCP, an administrative error and a confusion regarding the contents of the syllabus are mentioned. The distribution of the SubCods is presented in figure 7.

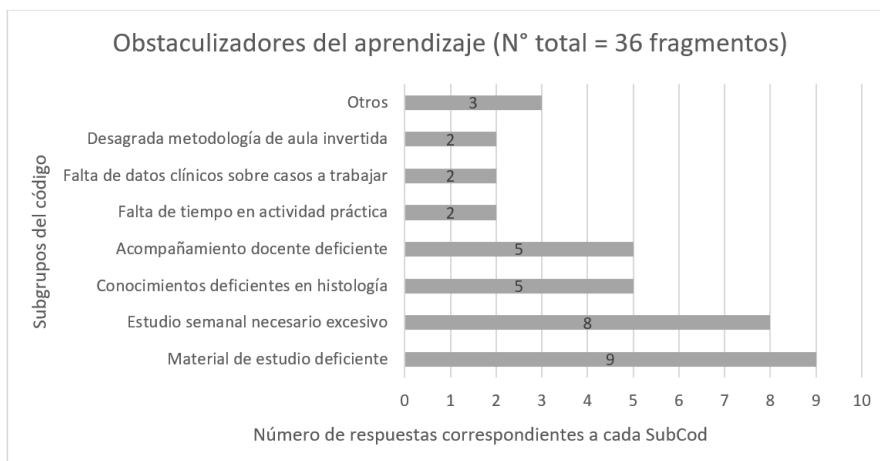


Figure 7. Obstacles to learning.

Code 9 Perception of autonomy in learning, 14 total codes or fragments . Most research participants indicated their preference for the option of choosing a case for themselves rather than receiving one assigned by teachers. This autonomy in the choice was perceived as a motivating factor for learning, since students feel more committed and interested in the case they selected on their own. However, one student stated that this autonomy also generated uncertainty and fear, possibly due to the lack of previous experience in selecting and constructing a clinical case. The distribution of the SubCods is presented in figure 8.

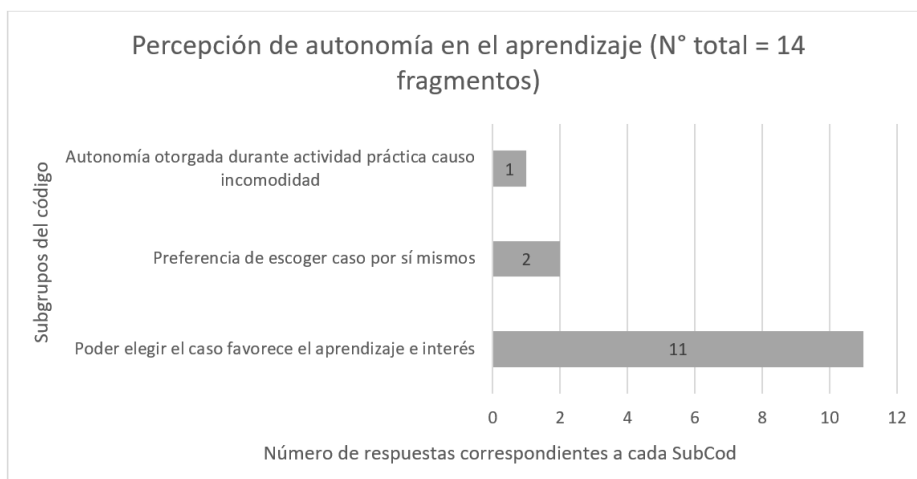


Figure 8. Perception of autonomy in learning.

3.2.4.2 GCod B: Perception of the subject (made up of 3 codes)

Code 13 Positive perception of the subject, 41 total codes or fragments . 15 of the fragments indicated feelings of pleasure about the subjects of General Pathology and Pathological Anatomy, and 9 perceived them as useful for their professional future. 8 of the students indicated that they liked the flipped classroom methodology, indicating that it was an effective strategy. Furthermore, the subjects were perceived as well organized and interesting. Among "Others" we found that the availability of theoretical material on the online platform from the beginning of the subjects was appreciated, the various instances for resolving doubts were appreciated, and that the weekly sessions were found to be entertaining. The distribution of the SubCods is presented in figure 9.

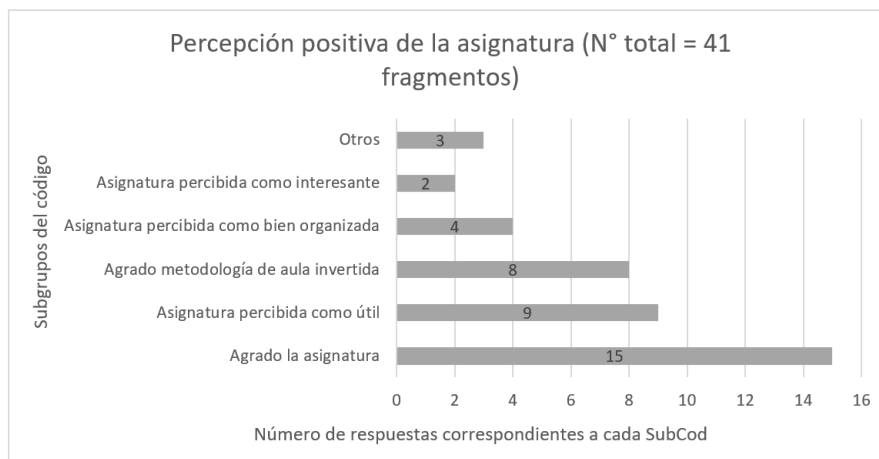


Figure 9. Positive perception of the subject.

Code 10 Negative perception of the subject, 27 total codes or fragments . Among these the most frequent idea was that the weekly study was excessive, with 8 of the fragments indicating this. Additionally, 5 mention a dislike for the flipped classroom methodology. 4 SubCod indicated that the contents in both subjects were very similar, and 3 that the evaluations were very demanding. Among “Others” are that the weekly sessions were repetitive, lack of time for the weekly sessions, very deep content, confusion with the syllabus, poor theoretical material and that the learning objectives set out in the syllabus were not met. The distribution of the SubCods is presented in figure 10.

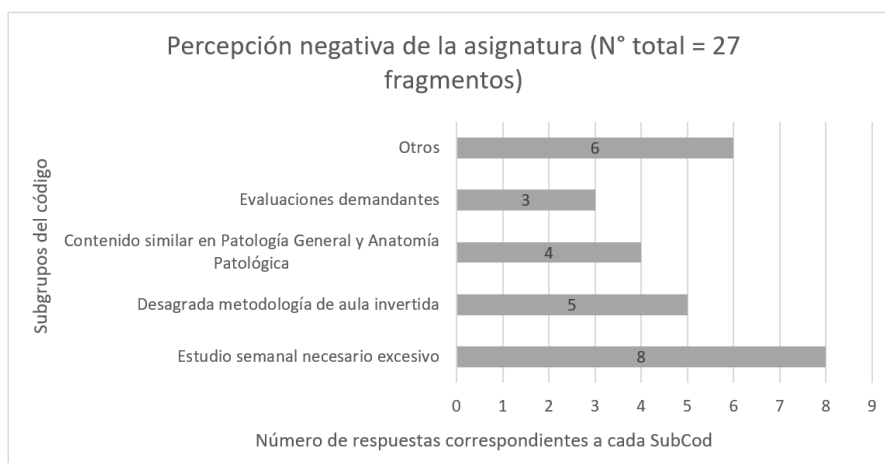


Figure 10. Negative perception of the subject.

Code 6 Study material, 17 total codes or fragments. Of these 4 fragments indicated that this one needed to be clearer, and the same number that this material was very complex, although on the other hand 2 SubCod mention that the material was not deep enough. 3 fragments indicated that it should have more images, and 2 that the histopathological lesions were difficult to identify in this one. Among “Others” it is mentioned that the clinical-pathological correlation of the different pathologies is well explained in the study material, and 1 student refers to some topics that were outdated. The distribution of the SubCods is presented in figure 11.

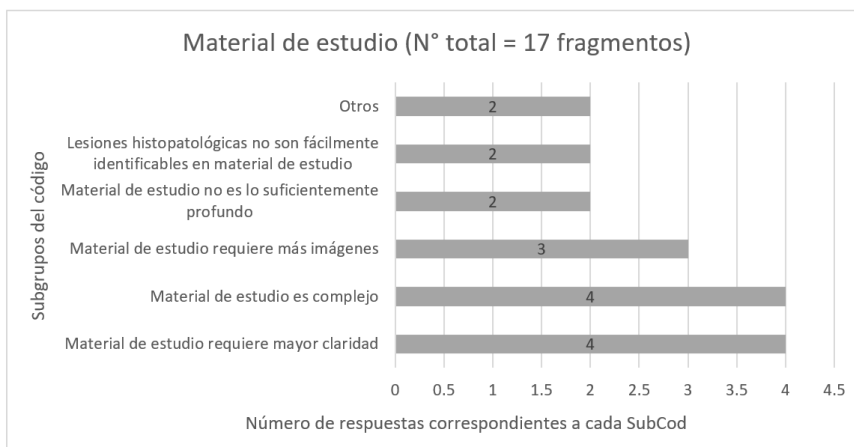


Figure 11. Study material.

3.2.4.3 GCod C: Perception of the DCCP methodology (made up of 2 codes)

Code 14 Positive perception of the DCCP methodology, 73 total codes or fragments . There was great variety within these responses, with the most frequent reasons being that the students liked being able to attend the hospital during this activity, in addition to the fact that they perceived they had learned more and been more motivated to learn because of the DCCP. 10 fragments indicated that the activity brought the subject of Pathology closer to the work reality of the anatomopathologist. Furthermore, it is described as entertaining, interesting and dynamic. The distribution of the SubCods is presented in figure 12.

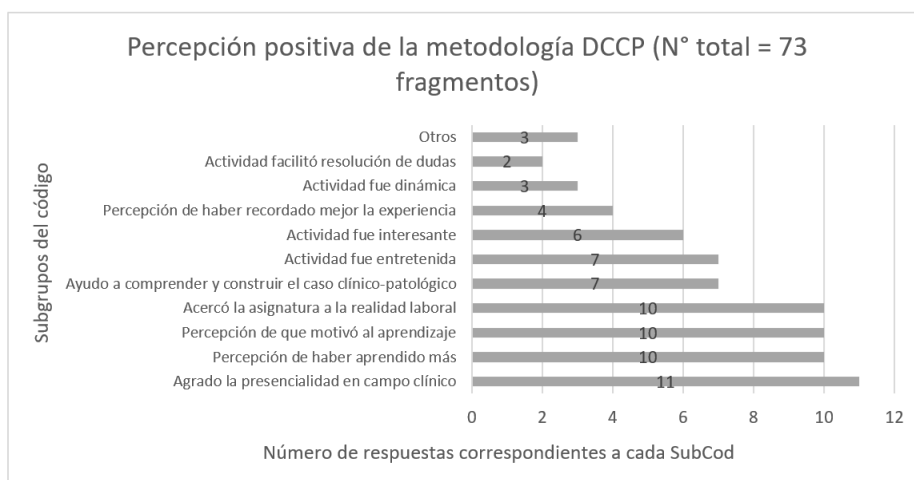


Figure 12. Positive perception of the DCCP methodology.

Code 11 Negative perception of the DCCP methodology 7 total codes or fragments. These fragments corresponded to 5 students. Within these, the perception of a lack of variety of biopsies available to choose from, insufficient clinical information provided to adequately contextualize the cases, uncertainty when selecting a case to develop, difficulties when analyzing the microscopy, perception that presence did not necessarily improve learning and lack of pleasure in making posters.

3.2.4.4 GCod D: Perception of teaching (made up of 2 codes)

The students have reported positive experiences in relation to their teachers in pathology subjects, this being reflected in 12 fragments. Terms used to describe these professionals include “motivated,” “pedagogical,” “passionate,” “providers of excellent support,” “committed to the educational process,” and “active promoters of interest in the

subject.” In addition, students have highlighted the teachers' notable concern for their students' learning, their constant willingness to resolve doubts and their ability to create pleasant and conducive teaching environments for the development of knowledge in the field of pathology.

However, not all students' experiences with their teachers were equally positive, according to 12 SubCod. Some students have indicated “little willingness to resolve doubts.” Furthermore, a “disparity during the evaluation” is noted. Likewise, one student expressed that some teachers can be “inappropriately critical,” which resulted in a less constructive learning experience. In one instance, “low familiarity with the syllabus” became known. Finally, a couple of students have pointed out that there is a “disparity in the quality of teachers between work groups.”

3.2.4.5 GCod E: Recommendations (made up of 2 codes)

Cod 1 Aspects to improve in the subject, 89 total codes or fragments. 23 fragments indicated that theoretical classes could be added. In addition, 20 suggested reducing the weekly load. 11 SubCod indicated that they would like to carry out more practical activities, and 10 that there should be more instances to resolve doubts. Also mentioned is improving the study material, adding new theoretical modules and increasing instances of clinico-pathological and histopathological correlation. In “Other” ideas are mentioned such as adding educational videos to the online platform, conducting weekly evaluations, increasing the time for weekly discussions, adding a practical activity on the different ways of sampling biopsies, reducing the demand for evaluations and increasing the number of cases to be discussed on a weekly basis. The distribution of the SubCods is presented in figure 13.

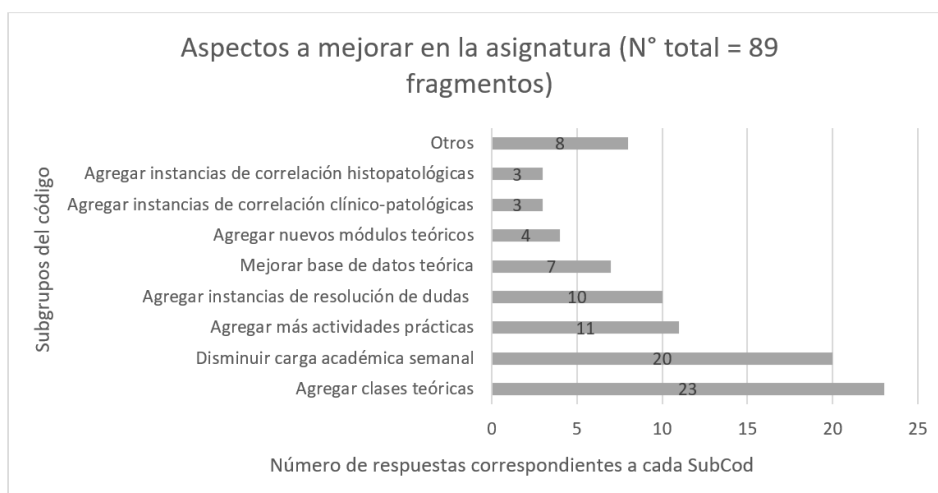


Figure 13. Aspects to improve in the subject.

Cod 2 Aspects to improve in the DCCP methodology, 68 total codes or fragments. Of these, 22 suggested performing the activity more times or that each DCCP would last longer, especially in relation to the first stage that is carried out in the hospital. 14 of the fragments requested an increase in teaching support, and 5 asked to reduce the requirement of the final presentation and increase the variety of biopsies to be selected. In addition, it is mentioned adding instances to resolve doubts, the possibility of accompanying medical technologists during the histological processing of the samples, monitoring the case and patient and ensuring clinical information about the case. Among “Others” there are suggestions about modifying the form of evaluation, preparing specific theoretical material for the processed biopsies, that the evaluation of the activity be formative, etc. The distribution of the SubCods is presented in figure 14.

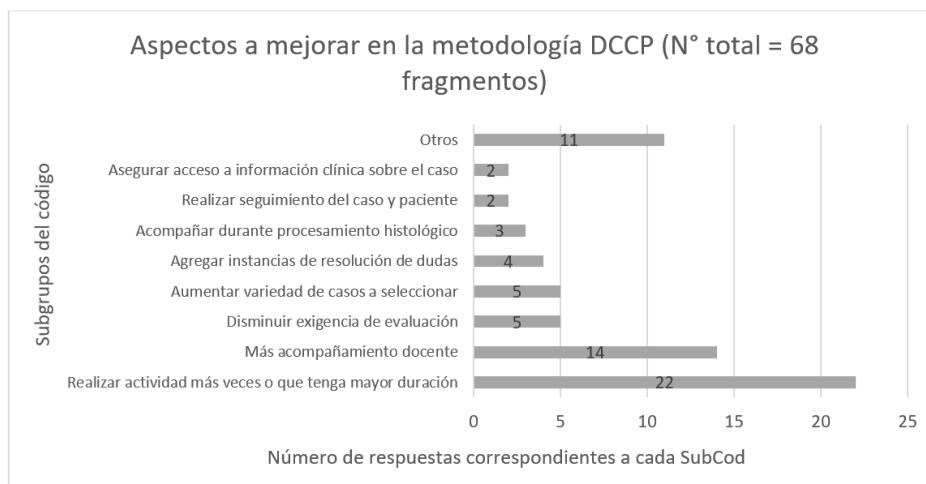


Figure 14. Aspects to improve in the DCCP methodology.

4. Discussion

Satisfaction was high, both for the general evaluation of the General Pathology and Pathological Anatomy subjects, and for the DCCP practical activity. This last activity had a satisfaction level of 82.4% in the quantitative analysis; figure 12 points lower than what was reported by our group for the 2017 cohort when the activity was implemented for the first time in the subject of General Pathology during a semester (5) and what was reported by Wegman et al (9), where it was implemented a practical surgical pathology activity for medical students, which included a visit to the surgical pathology room and individual support with a pathologist during their work, with an average score of 4.8/5. The difference observed with the 2017 pilot cohort can be attributed to the fact that in the pilot the students were volunteers, the entire activity was in person and carried out by a single guide teacher and two assistants. Furthermore, the evaluation was at the end of the activity and in this research the surveys were carried out 9 months later. Thus, despite being somewhat minor, it stands out that high satisfaction is maintained over time.

In the quantitative analysis, the majority of students found that the DCCP was a useful methodology for improving their practical skills and strengthening their theoretical learning in Pathological Anatomy. Furthermore, the vast majority of participants expressed that the activity was innovative. In the qualitative analysis, the high positive perception of DCCP was statistically significant versus the negative perception; which supports what was previously said.

Unfortunately, most medical and pathology teaching is still teacher-centered. Active and student-centered practices for Pathological Anatomy such as discussion of clinical cases (10-13), team-based teaching (14) or problem-solving methodology are less used, despite being highly valued by students (11).

There are few experiences of practical activities for teaching Pathological Anatomy in the surgical pathology room, and these are usually based on the observation of the work of anatomopathologists, with variable results, being in some cases not preferred by the students (11) and in others well valued by them (9). The big difference with the DCCP activity is the focus on “learning by doing”, where students have greater autonomy and direct participation in the processing of the biopsy and not acting only as passive observers. Supporting this idea, it has been observed that the majority of medical students use active experience as their main learning style, that is, the practical application of ideas (15). The following fragment is rescued:

“I think it is a good experience, especially to put into practice what I have learned.”

Furthermore, the students liked attending the clinical field, reporting having felt greater motivation and having learned more because of this.

The vast majority of students thought that the DCCP activity was the main facilitator of learning in the subjects, by achieving better internalization of learning. The activity generates greater intrinsic motivation by satisfying the basic psychological needs of autonomy, usefulness and relatedness. In relation to the perception of autonomy in learning, most of the responses allude to the fact that choosing the biopsy at the DCCP favored learning and interest, as seen in the following example:

"I liked the fact that we could choose the case according to our preferences, I think that encourages research with interest."

On the other hand, as obstacles to learning in the subjects, the most mentioned factors were: poor study material in the online portal, excessive weekly study for the presentation of cases in a flipped classroom, and deficient knowledge in histology. It was identified that the study material should be improved, asking for it to be clearer, have more images and for the pathologies to be more easily identifiable.

On the other hand, it has been shown that information perceived through several senses, as occurs in the DCCP activity, is better retained in memory (16), which translates into more meaningful and longer-term learning (17). This is exemplified in the following comment:

"...something that we were able to perceive with several senses in person remains much more in our memory..."

A relevant opinion of the students was that the DCCP activity managed to bring the subject of pathology closer to the working reality of the pathologist, a feeling that has been replicated in other studies with activities where students carried out accompaniment in surgical pathology (18).

The DCCP activity is carried out twice in each subject and therefore, they go to the surgical pathology room in 4 mornings to select the cases and carry out the macroscopic dictation and section of the tissues with their tutor teacher. Among the aspects to improve suggested by the students in the qualitative analysis are performing the activity more times or making it last longer. This was also suggested in the qualitative analysis by Madelyn Lew (letter 18) of a pathology rotation during the surgical internship, which included observation of autopsies and three days of work in surgical pathology over a week. The students indicated that the time of observation of pathologists' work should have been longer to achieve greater learning.

There were mixed responses regarding the perception of teaching. The need for teachers to be "active promoters of interest in the subject" and be willing to answer students' doubts was identified, being appropriately critical and fair at the time of evaluation, which agrees with the findings of Grover et al (10), where it was found that for there to be meaningful learning in group work, teachers must promote reflection and problem solving, stimulate interaction between group members, keep the group focused on the task and allow students to take ownership of their work. learning, all in a relaxed and non-threatening environment. However, other students estimated disparity in the work of teachers, which makes it necessary to standardize practices more, with greater teacher training.

Various research has shown that learning pathology through the presentation of clinical cases helps motivate students, through their preparation, active participation and

collaboration with other students (10, 13). Weekly clinical case presentations under the flipped classroom methodology as part of the teaching methodologies were perceived as useful for their professional future, which contributes to greater intrinsic motivation (5, 7). A high number of students indicate that they like this teaching modality, as reflected in the following fragment:

“...the preparation of cases week by week and the clinical-pathological case based on biopsy are very effective strategies...”.

Among the suggestions given by the students, 25.8% indicated that they would like to add theoretical classes and 22.4% would like to reduce the weekly load in the subjects of General Pathology and Pathological Anatomy. In an article about the perception of medical students about a Surgical Pathology course, it was also found that there is a percentage of students who prefer traditional theoretical classes (28.9%) over activities such as the presentation of clinical cases (15.4%) (11).

5. Conclusions

- The DCCP practical activity helps medical students to better understand the macroscopic and microscopic aspects of Pathological Anatomy; even surpassing the flipped classroom method.
- The DCCP is perceived as an innovative and useful methodology for the development of pathology skills and theoretical learning in a meaningful and relevant way, which better prepares students to face real-world challenges as health professionals.
- The importance of considering students' preferences and needs when designing teaching strategies should not be forgotten. The qualitative evaluation of the DCCP activity and of the subjects in general provided valuable information for continuous improvement; reaffirming the importance of incorporating these in the evaluations of teaching practices.
- The combination of student-centred approaches, work in real-world environments, appropriate teaching support and quality study material can lead to a more effective and satisfying learning experience for students in these disciplines.

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