Problem Based Learning (PBL) to improve learning in Pharmacology and veterinary Pharmacy

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ABSTRACT

Problem-based learning (PBL) was introduced at Mc-Master University (1968) and is one of the most consolidated learning methods in the medical curriculum. This paper presents the process and evaluation of an experience of educational innovation developed with students of 2nd year of the Veterinary Degree of the ULPGC using the methodology of Problem based learning (PBL) in the subject of Pharmacology and pharmacy. The Objective was to assess the impact of problem-based learning (PBL) as a strategy to improve the teaching-learning process. The innovation has been developed in 15 groups of clinical cases, during the dates 16/4 to 16/5 of 2019. The process was developed in 4 phases: Phase 1. Theoretical introduction, Phase 2. Bibliographic review, Phase 3. Intervention development, Phase 4. Opinion evaluation. For its analysis, the Problem Impact Learning Assessment (EVIA) questionnaire was used to analyze the development of transversal competencies. The students' competency self-perception and academic results were analyzed as a measure of the quality of the innovation developed. The Results show that the best valued dimension is satisfaction and achievement (4.13; 1.05) and the lowest Transversability (3.18; 1.27). There is not much difference in the valuations of the different dimensions. There is a great correlation between the dimensions of the EVIA. There are strong correlations between the items of each dimension. The average grade of the theoretical exam taken in the 2019 course ($n = 60$) eliminating those not presented is (7.45; 1.12) with a minimum of 0 for those students not presented and a maximum of 9.6. The results suggest a positive impact of this new methodology on the teaching-learning process of the students by improving their self-perception of domain over their competencies.

Keywords: Problem Based Learning, Pharmacology, Veterinary, EVIA

1. INTRODUCTION

Problem-based learning (PBL) was introduced at the University of Mc-Master (1968) and is one of the most consolidated learning methods in the medical curriculum. It is a method that allows to develop all kinds of transversal competences, where the student is the main responsible for their own learning [1].

The integration of the PBL into the traditional veterinary curriculum was well received at the Veterinary Faculty of the University of Dublin, where there was an improvement in the understanding of the subject by the students [1].

Ardila, in his thesis Case Study: "significant learning in Pharmacology", worked through a mixed (qualitative-quantitative) research through surveys and periodic evaluations of 18 students to demonstrate the benefits of case studies as a method to improve academic performance in Pharmacology. Among the advantages observed, the author highlighted the development of assertive skills, abilities and criteria in the choice of the drug [9].

Many studies have described an improvement in clinical reasoning and an increase in the clinical skills of veterinary students who followed the inclusion of PBL in their curriculums [7, 10, 11, 12, 13, 14, 15, 16]. Since its inception at the Mc Master University School of Medicine (Canada) it was presented as an innovative educational proposal [4, 5, 6].

The process is developed based on small work groups, which learn collaboratively in the search to solve an initial, complex and challenging problem, raised by the teacher, with the aim of promoting the self-directed learning of their students. The role of the teacher becomes that of a learning facilitator [3,8].

The learning of the subject "Pharmacology and pharmacy" implies a wide dedication and study by our students, mainly due to:

1) To the extension of the teaching programs.

2) In the specific case, of the formation of the future professional in Veterinary Medicine, the diversity of species and existing animal pathologies and their corresponding treatments.

This paper presents the process and evaluation of an experience of educational innovation developed with students of 2nd year of the Veterinary Degree of the ULPGC using the methodology of Learning Based on Problems (PBL) in the subject of Pharmacology and pharmacy.

Main goal: Assess the impact of problem-based learning (PBL) as a strategy to improve the teaching-learning process.

Secondary Objectives:

1. Improve the quality of the teaching-learning process by acquiring both generic and transversal skills in the area.

2. Facilitate the integration of the subjects of Pharmacology and Pharmacy, microbiology and general pathology.

3. Promote the student's responsibility for their own learning.

4. Develop autonomy, critical thinking and the capacity for self-evaluation.

5. Improve generic skills such as teamwork, presentation and presentation of results.

2. METHODOLOGY

This is the descriptive study of a case, defining as a case the course of "Pharmacology and pharmacy" of the Veterinary Faculty of the ULPGC. Quasi-experimental design. The sample was not probabilistic, consecutive since it includes all the students who study the subject of Pharmacology and pharmacy in the second quarter of the year 2019. It consists of 65 students of second year of the Veterinary Degree. There was no sample selection criteria, except being a component of these practice groups; All the students officially enrolled in the subject in their first year were considered.

The innovation has been developed in 15 groups of clinical cases, during the dates 16/4 to 16/5 of 2019. The practical activities were designed and the dates of the external professionals were programmed based on previously endorsed experiences. [17, 18]. The activities were developed in the hours dedicated to the practical sessions of the subject Pharmacology and Pharmacy. Data collection was carried out the day of the last presentation. The questionnaires were administered by the professors in the university classrooms. The students proceeded to complete it voluntarily and anonymously, only indicating their ID. The Problem-Based Learning Impact Assessment (EVIA) questionnaire from Romera, Del Rey and Ortega was used, consisting of 20 items of a five-point Likert scale, 1 being strongly disagree and 5 strongly agreeing [17,18]. The data was encrypted and processed with SPSS in its version 26.0, which has all the permits and licenses.

Phase 1. Theoretical introduction: A theoretical introduction class (1 hour) was taught in which students were explained the general rules for their development, pointing out the objectives they intended to achieve. The grade contributes 30% of the final grade of the subject. The score will be valued for cooperative work, as an intra-group work philosophy. In the virtual campus, the professor contributed a material where the items that should appear in said work were specified.

Phase 2. Bibliographical review: Students must solve a problem (clinical case) that arises, requesting the tutorials they deem necessary for it, and must present a final report on it that will be evaluated and will contribute to the final grade of the subject. A tutor will be assigned to each group to which they can direct their doubts. The tutors will be teachers of the subjects of "Pharmacology and pharmacy", "microbiology" and "general pathology". Each group must have at least one personal meeting with their tutor during the development of each work in person or through the virtual campus tutorials.

Phase 3. Development of the intervention: The activities took place during the hours dedicated to the practical sessions of the subject (lasting 1 hour). After a daily master class session. Each member of the group had to intervene in this exhibition. The questions (10 test questions) made by the group are distributed to the rest of the classmates. Data collection was done on the day of the last presentation. The questionnaires were administered by the professors in the university classrooms.

Phase 4.Evaluation of opinions: 1. The Problem-Based Learning Impact Assessment (EVIA) questionnaire from Romera, Del Rey and Ortega was used, consisting of 20 items of a five-point Likert scale, 1 being strongly disagree and 5 strongly agreeing. With a participation of 65 students. The students voluntarily completed it by indicating their ID.

2. The students' competence self-perception and academic results were analyzed as a measure of the quality of the innovation developed.

The Problem Based Learning Impact Assessment (EVIA) questionnaire was used to analyze the development of transversal competencies. The competences analyzed were: A. Transfer potentiality of learning. B. Transversal character of learning and its adequacy. C. Satisfaction and achievement (In relation to the teaching methodology). D. Time and effort spent.

3. DATA

Transfer potentiality N:65	M	DT
1. What I have learned is useful for my professional future.	3,86	1,11
2. Promotes strategies to approach future professionals challenges	3,52	1,18
3. Promotes significant learning.	3,4	1,17
4. Facilitates the approach to real problems in my profession.	3,6	1,16
5. I have learned useful content and strategies for other subjects.	3,18	1,27
6. Allows to find usefulness to theoretical contents.	3,87	1,03

Adequacy and transversality N:65	M	DT
7. We learn in team work.	3,28	1,30
8. Working in an autonomous way has motivated me.	3,32	1,17
9. I would recommend it for other subjects.	3,5	1,27
10. You would recommend that clinical cases continue.	3,32	1,30

| Satisfaction and achievement N:65	M	DT
11. I liked the working environment in class.	4,13	1,05
12. I feel I have learned.	3,89	1,14
13. I am satisfied with the work I have done.	3,40	1,11
14. My learning expectations have been met.	3,37	1,21
15. The methodology used has motivated me to work.	3,78	1,03
16. The cases seemed attractive or interesting.	3,79	0,96
17. The cases that were presented facilitated learning.	3,98	1,19
18. The teacher favored the integration of cases.	3,58	1,16

Adequacy time and effort N:65	M	DT
19. The time taken to carry out the project has been adequate.	3,79	1,11
20. The effort required for it to be carried out has been adequate.	3,78	1,09

Table 1,2,3,4. Questionare for the evaluation of the Impact of Learning Based on Problems (EVIA). The Mean and deviation standar of the responds.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
P.1	65	1,00	5,00	3,8615	1,11631	1,246
P.2	65	1,00	5,00	3,5231	1,18727	1,410
P.3	65	1,00	5,00	3,4308	1,17219	1,374
P.4	64	1,00	5,00	3,6719	1,16911	1,367
P.5	65	1,00	5,00	3,1846	1,27343	1,622
P.6	65	1,00	5,00	3,8769	1,03844	1,078
P.7	64	1,00	5,00	3,2812	1,30285	1,697
P.8	65	1,00	5,00	3,3231	1,17404	1,378
P.9	64	1,00	5,00	3,5000	1,27242	1,619
P.10	64	1,00	5,00	3,3281	1,30997	1,716
P.11	65	1,00	5,00	4,1385	1,05885	1,121
P.12	64	1,00	5,00	3,8906	1,14250	1,305
P.13	65	1,00	5,00	3,4000	1,11524	1,244
P.14	64	1,00	5,00	3,3750	1,21499	1,476
P.15	65	1,00	5,00	3,7846	1,03821	1,078
P.16	62	1,00	5,00	3,7903	,96048	,923
P.17	62	1,00	5,00	3,9839	1,19414	1,426
P.18	62	1,00	5,00	3,5806	1,16715	1,362
P.19	62	1,00	5,00	3,7903	1,11821	1,250
P.20	61	1,00	5,00	3,7869	1,09719	1,204

Table 5. Descriptive statistic for the 20 items questionnaire from Romera in the 65 students. The Mean and deviation standar of the responds.
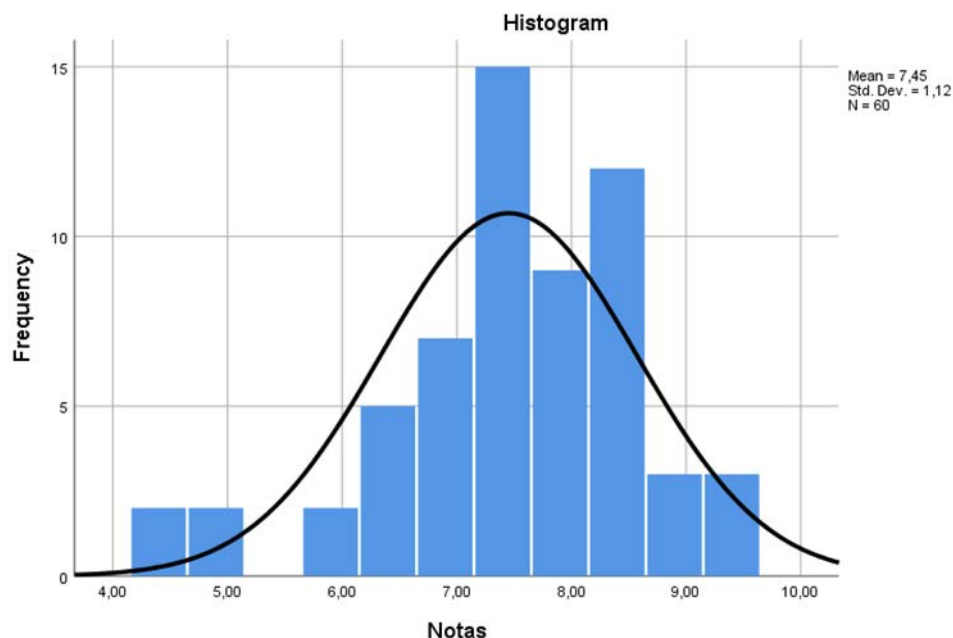
Graphic 1. The normal Disribution Bell curve of students grades.

4. RESULTS

The results on the evaluation of the impact of the PBL methodology used show positive effects according to the students involved. This is especially in aspects such as: I liked the working environment in class (4.13; 1.05), The cases that were presented facilitated learning (3.98; 1.19), I feel I have learned (3,89; 1,14), It allows to find a utility to the theoretical contents (3.87; 1.03). Thus, although equally positive, there are issues that have been valued with lower scores such as: I have learned useful content and strategies for other subjects (3.18, 1.27). We learn to work in teams (3.28, 1.30), Working autonomously has motivated me (3.32; 1.17). **(Tables 1,2,3,4,5)**

The best valued dimension is satisfaction and achievement (4.13; 1.05) and the lowest Transversability (3.18; 1.27). There is not much difference in the valuations of the different dimensions. There is a great correlation between the dimensions of the EVIA. There are strong correlations between the items of each dimension. The average grade of the theoretical exam taken in the 2019 course (n = 60) eliminating those not presented is (7.45; 1.12) with a minimum of 0 for those students not presented and a maximum of 9.6. **(Graphic 1)**

5. CONCLUSIONS

Many studies have described an improvement in clinical reasoning and an increase in the clinical skills of veterinary students who followed the inclusion of PBL in their curriculums. Since its inception at the Mc Master University School of Medicine (Canada) it was presented as an innovative educational proposal.

The initial aim of this study was centered in knowing students´ perception about PBL model and its competence development, as well as exploring what variables could be influencing the development of competences in Pharmacology

and pharmacy students. For this purpose, a questionnaire was designed which has evaluated student perception concerning four factors: transfer potentially of learning, transversal character of learning and its adequacy, satisfaction and achievement obtained and time and effort spent.

Results indicate that the EVIA is well built and its results are consistent.

The results show that three of the items with the highest score (I liked the working environment in class, the cases that were presented facilitated learning, I feel that I have learned) belong to the Satisfaction and Achievement dimension, so there are reasons to think that the methodology in the Veterinary Degree of ULPGC is liked by students and allows them to enjoy their learning successes.

Among the aspects that have obtained lower valuations, although even with values that show satisfaction are the items belonging to the transfer potential dimension: I have learned useful contents and strategies for other subjects (3.18, 1.27), We learn in team work (3.28; 1.30), Working in an autonomous way has motivated me (3.32; 1.17). This is due to the fact that the subjects evaluated are in the second course of their university studies and they may not yet see their usefulness for other subjects, such as the General Pathology course they will take in the next academic year.

A variable coincide with the main cognitive theories on learning, referred to the perception of the usefulness of the theoretical contents. It allows to find a utility to the theoretical contents (3.87; 1.03). The average grade of the theoretical exam taken in the 2019 course (n = 60) eliminating those not presented is (7.45; 1.12) with a minimum of 0 for those students not presented and a maximum of 9.6 and this is precisely the sense of PBL, being that information emerges from the need to solve a specific pharmacology problem.

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