

DENTAL STUDENTS' CONCEPTIONS IN PHARMACOLOGY USING CASE-BASED PEDAGOGY

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ABSTRACT: *The current teacher-centered strategy in Pharmacology results in passive and superficial learners. This study intended to improve the dental students' comprehension of pharmacological concepts by active student involvement in the learning process through case-based pedagogy. This study was a quantitative descriptive research wherein a pretest and a posttest were given to check the pharmacological concepts of the students of Iloilo Doctors' College-College of Dentistry using case-based pedagogy. Their perceptions towards CBP were also determined after the intervention. Descriptive and inferential statistics were used as statistical tools. The results of the study revealed a significant difference in the results of the pretest and the posttest, as shown by the 14.66 and the 18.56, respectively, with the t-test result of $(49) = 5.686, p < 0.05 (p=0.000)$. The students were very satisfied with the case-based pedagogy in Pharmacology, with an overall mean score of 4.08. The case-based pedagogy improved the pharmacological concepts of the dental students as it enhanced their understanding of pharmacological concepts, amplified their interests, increased their motivation to learn, and improved their communication and collaborative skills. The contribution of the teacher-facilitator and the pedagogical plans had further made an impact on their learning process. This learning method is ideal among students in health sciences.*

Keywords: case-based pedagogy, dental students, pharmacology

1. INTRODUCTION

Dentistry (Doctor of Dental Medicine) is a straight six-year program with the first two years as a Pre-Dental curriculum and a four-year Doctor of Dental Medicine (DMD) curriculum [1]. In 2018, CMO #3 was implemented, making the Dentistry program a six-level program (Dentistry I to VI). Pharmacology is being introduced during the second year of Dental of Medicine (DMD) and during the third year of the DMD curriculum, respectively. Dental students enrolled in Pharmacology should have complied with the course requirements of General Physiology with Family Planning and Biochemistry.

Pharmacological concepts are important for good clinical practice [2]. Learning the basic concepts and principles in Pharmacology is an essential foundation of a dental student in preparation for her/his clinical practice. At the end of the course, students are anticipated to learn pharmacokinetics and pharmacodynamics along with the indications and contraindications of drugs, especially of drugs used in the dental field.

Giving lectures is the most typical teaching method in medical education. The teachers put more effort into preparing the information their students need to learn. The students do not exert much effort in the process of learning. According to the study, the students found the traditional lecture method of teaching less effective, less enjoyable, and does not encourage/motivate the learning process of the students, which results in superficial learning [3]. Thus, alternative pedagogical practices were sought. Among the now recommended strategies are Problem-Based Learning [4], Outcome-Based Learning [5], Process Oriented Guided Inquiry Learning (POGIL) [6] and Case-Based Learning [7].

Many studies have been conducted on teaching pedagogies [8, 9, 10, 11, 12, 13], student preferences and readiness [14, 15],

student motivation and attitude [16, 17, 18, 19], teachers skills, competencies, and challenges [20, 21, 22], assessment techniques and tools [23, 24, 25, 26] and other related factors [27, 28, 29, 30, 31, 32, 33] in order to enhance students learning outcome but little was done on investigating dental students' conceptions in Pharmacology using case-based pedagogy.

Case-based pedagogy (CBP) is a newly formulated teaching method wherein it uses cases and scenarios to arouse the inquisitiveness of the students to critically analyze every situation/condition presented. It provides clinical situations/settings using real patient scenarios as an overview/preparation for clinical exposure [34]. As stated in [35], with CBL, students cannot just be mere spectators; instead, they learn to determine, apply what they have learned, and adapt new ideas in every clinical scenario being presented to them.

Students enrolled in Pharmacology oftentimes experience difficulty in learning pharmacological concepts with a teacher-centered method of learning which leads to poor comprehension and poor academic performance. The latter is often observed/reflected when they are in their clinical year in Dentistry, wherein they are to manage different clinical cases as clinicians. Thus, the researcher hypothesized that there is no significant difference in the pre-test and post-test scores in the pharmacological concepts of dental students.

This research study attempted to evaluate dental students' responses to pharmacological concepts using case-based pedagogy. Specifically, it also aimed to answer the following questions: (1) What are test results of the dental students in pharmacological concepts during pretest and posttest?; (2) What is the comparison between the pretest and the posttest results of the dental students on pharmacological concepts?; (3) What are the dental students' views on the use of case-based pedagogy?; and (4) What pedagogical plans may be designed to improve the instructions in Pharmacology?

2. MATERIALS AND METHODS

The study was conducted at Iloilo Doctors' College (IDC)- College of Dentistry, Timawa Avenue, Molo, Iloilo City. It is located in Region 6 of the Philippines on the island of Panay.

An approval from Centro Escolar University's Institutional Ethics Review Committee (IERC) to conduct the research was secured prior to the conduct of the study.

The researcher included the following topics in the preparations of the lesson plans/ case scenarios: analgesics, antiinfective agents and emergency drugs. Analgesics and antiinfectives are the most commonly prescribed medications in dentistry [36]. It is very important for every clinician to learn the preparations on how to avoid medical emergencies in the dental clinic as well as the pharmacological management if one occurs [37].

A researcher's self-made questionnaire was prepared to make sure that enough items were collected to cover all the aspects of the topics and be able to address the specific problem stated in the statement of the problem. A table of specifications was used to classify the questionnaires and was validated by four experts teaching Pharmacology from Centro Escolar University. It underwent the process of item analysis to check and have an acceptable index of difficulty and discriminating power during the pilot testing.

The respondents of the pilot test were fifty (50) 4th-year dental students who were not part of the respondents of the study but who were enrolled in a Pharmacology class during the first semester of the school year 2017 -2018.

A purposive nonrandom sampling method was utilized in the selection of the respondents of this study, who are the 50 students taking Pharmacology during the first semester of the school year 2017-2018.

The gathered raw data were processed using the Statistical Packages on Sciences Software (SPSS). The following grading system was used to interpret the result ratings:

Scale	Description
33-45	Very High
22-32	High
11-21	Average
0-10	Low

A perception questionnaire with a Likert scale, was prepared by the researcher to check on the views or perceptions of the dental students. Below is the scale and the nominal descriptions used in this study:

5	Excellent
4	Very satisfactory
3	Satisfactory
2	Good
1	Poor

The results were gathered, recorded, tabulated, and submitted to the statistician for statistical analysis using the following rating:

Scale	Description
4.20 – 5.00	Excellent
3.40 – 4.19	Very Satisfactory
2.60 – 3.39	Satisfactory
1.80 – 2.59	Good
1.00 – 1.79	Poor

The gathered data were treated using descriptive statistics such as the frequency and percentage distribution, mean and

standard deviation, and Inferential statistics such as t-test for paired.

The reliability of the test questionnaires was checked after the pilot testing and was considered reliable with an alpha value of 0.605.

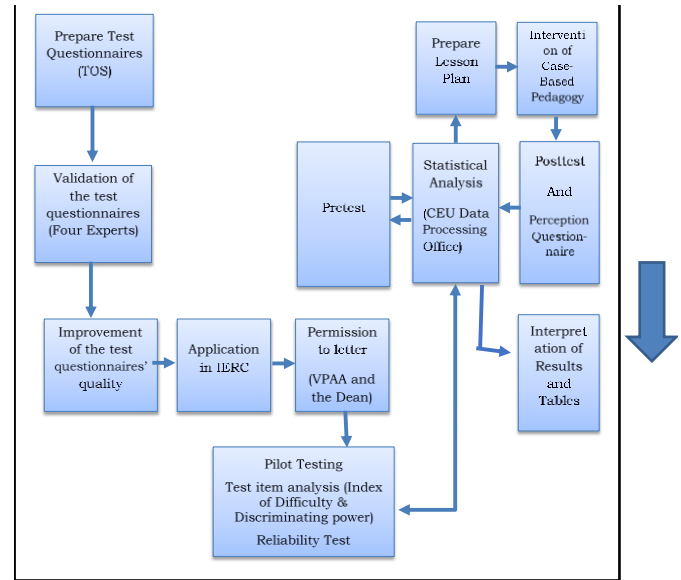


Figure 1. A schematic diagram of the procedure

3. RESULTS AND DISCUSSIONS

The result of the pretest

The pretest was given to check or measure the pharmacological concepts of the dental students prior to the intervention of case-based pedagogy. Based on the grading system set for the interpretation of the results, the pretest had a mean score of 14.66 which is within the scale of 11-21 and a standard deviation of 2.92; it was described as "Average." The mean score of the pretest is comparable to the results obtained in [2] when they introduced case-based learning for teaching pharmacology in a rural medical college in Bihar, and upon introducing clinical case scenario among M.B.B.S. students, with mean scores of 19.63 and 14.96, respectively [38].

Table 1. Result of the Pretest on the Pharmacological Concepts of the Dental Students

	Mean	Standard Deviation	Description
Pretest	14.66	2.92	Average

The posttest result

The table shows the result of the posttest given to check or measure the pharmacological concepts of the dental students after the intervention of case-based pedagogy. Based on the grading system set for the interpretation of the results, the posttest had a mean score of 18.56 which is within the scale of 11-21 and a standard deviation of 4.05; it was described as "Average." The results of this study were comparable with the posttest results obtained in the study in [39] when case-based learning was incorporated in the curriculum of pediatrics with a mean score of 34. 71. Although the result was higher than that obtained in [2, 38], with a mean score of 22.95 and 24.04, respectively, they both support the findings that the introduction of case-based pedagogy enhanced the knowledge of the dental students as significant improvement in their scores was evident.

Table 2. Result of the Posttest on the Pharmacological Concepts of the Dental Students

	Mean	Standard Deviation	Description
Posttest	18.56	4.05	Average

The comparison of the pretest and of the post-test

The table below shows the comparison between the pretest and posttest results on the pharmacological concepts of the dental students. The table shows a significant difference existed between the pretest and posttest results at $t(49) = 5.686$ with $p=0.000$ at $p < 0.05$ significant level, with mean scores of 14.66 and 18.56, respectively. This also means that the pretest and posttest of the dental students on pharmacological concepts were not the same. The results of this quantitative research show an improvement on the pharmacological concepts of the dental students.

These results agree with the findings of researchers [2, 38, 40] when case-based learning was introduced in pharmacology courses. Moreover, the same results were also obtained by several researchers in various medical fields, such as pediatrics [39], endocrine physiology [42], and ophthalmology [43], showing enhanced knowledge after the introduction of case-based pedagogy.

Table 3. Comparison of the Pretest and the Posttest Results

	Mean	t- value	df	Significant
Pretest	14.66			
Posttest	18.56	5.686	49	0.000

Alpha= 0.05 Level of Significance

The result of the dental students' views on the use of case-based pedagogy

The table shows the result of the dental students' views and conceptions on the use of case-based pedagogy in understanding pharmacological concepts. As shown, all items were described as "Very Satisfactory," with an overall mean score of 4.04 and a standard deviation of 0.82.

On the question, "In general, how do you find the use of case-based pedagogy in Pharmacology?" a mean score of 4.08 and a standard deviation of 0.82 were obtained. This means that the students find case-based pedagogy useful to their learning process, enhance their understanding of pharmacological concepts, and amplify their interest in learning. Ref [44] also concluded that one of the positive preliminary effects of introducing case-based learning is the arousal of interests of students in the subject.

The question, "How do you find the relevance of using case-based pedagogy in Pharmacology?" a mean score of 4.12 and a standard deviation of 0.87 were obtained. This means that the students find the case-based pedagogy relevant to studying Pharmacology. Ref [45] showed that 100% of the student-respondents in their study strongly agreed that case-based learning was more interesting and challenging than lectures.

On the question, "How did the use of case-based pedagogy increase your pharmacological conceptions?" a mean score of 3.96 and a standard deviation of 0.78 was obtained. This means that the case-based pedagogy increased the students' pharmacological conceptions. This is also similar to the findings

of a study in [45], where students improved their understanding of pharmacological concepts and enhanced their analytical, problem-solving, and diagnostic skills and clinical decisions. On the question, "Were you motivated to learn concepts and principles in Pharmacology using case-based pedagogy?" a mean score of 4.10 and a standard deviation of 0.84 were obtained. This means that students were motivated to learn concepts and principles in pharmacology using case-based pedagogy. This agrees with the results of the study conducted in [2], where 91% of the student-respondents agreed that the interactive nature of case-based learning has aroused the interest of the students on the topic and motivated them to self-learning. On the question, "How was your learning experience with case-based pedagogy?" a mean score of 3.92 and a standard deviation of 0.78 was attained. This means that the students have a very satisfactory learning experience using the case-based pedagogy. A study showed that 83% of the students strongly agreed that case-based learning improved their communication skills, and 97% strongly agreed that this pedagogy enhanced their interest in participating in group discussions [38].

Table 4. Dental Students' Views on the Use of Case-Based Pedagogy

Items	Mean	Standard Deviation	Description
1. How do you find the relevance of using case-based pedagogy in Pharmacology?	4.12	0.87	Very Satisfactory
2. Were you motivated to learn concepts and principles in Pharmacology using case-based pedagogy?	4.10	0.84	Very Satisfactory
3. In general, how do you find the use of case-based pedagogy in Pharmacology?	4.08	0.82	Very Satisfactory
4.How did the use of case-based pedagogy increase your pharmacological conceptions?	3.96	0.78	Very satisfactory
5.How was your learning experience with case-based pedagogy?	3.92	0.78	Very Satisfactory
Overall Mean	4.04	0.82	Very Satisfactory

Pedagogical Plans to Improve the Instructions in Pharmacology

It is timely to use this method of learning in Pharmacology, specifically in the laboratory part of the course, wherein topics about the different drugs used in Dentistry as well the different drugs used in medical fields are being scheduled to be discussed. Students will be divided into small groups made of a maximum of five (5) students per group. The lecture part of the course will have thorough discussions of the topics by the teacher, which should encourage students' participation/interaction while students will have the chance to apply the information/ theories/ principles they had learned from the lecture during the laboratory part of the course.

The pedagogical plan includes the following parts, namely: intended learning outcomes, learning resources, learning methodology, and the learning outcomes. The intended learning outcomes include the objectives of the session. Different resources consist of learning materials and aids used in the course. The learning methodology includes the topic of the session, the preliminaries/ preparations prior to the session, such

as opening prayer, checking of attendance, the management of the classroom and the procedures in group work, and the presentation of the case scenario. The case scenarios were specially created/designed and patterned to real clinical scenarios to make the teaching-learning process more meaningful and relevant. Guidelines on the procedures to be observed during the discussions are also presented with the guide questions to direct the students in the important matters/topics.

4. CONCLUSION AND RECOMMENDATIONS:

The conclusion drawn based on the results of the study is that case-based pedagogy improved the pharmacological concepts of the dental students.

Here are the forwarded recommendations based on the results and conclusions: Recommendations

The following recommendations were based on the summary of findings and conclusions:

(1) the College of Dentistry of Iloilo Doctors' College to incorporate case-based learning in the Pharmacology curriculum, particularly in the laboratory part of the course; (2) the use of Case-based pedagogy may be explored by other courses in the Dentistry program as well as by other colleges and medical fields and specializations; (3) replicate the study in a larger scale to further validate its effectiveness as a teaching strategy in Pharmacology; and (4) further validation of all the instruments used in the study (researcher-made questionnaire for pharmacological concepts, perception questionnaires, and the case scenarios) for greater effectiveness.

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