

**Conditioning factors for the learning and design of removable partial dentures at the UAC-
Cusco***

**Factores condicionantes del aprendizaje y diseño de prótesis parcial removable en la UAC-
Cusco**

**Fatores condicionantes para o aprendizado e projeto de próteses parciais removíveis na
UAC-Cusco**

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ABSTRACT

Background: The conditioning factors of learning, important in the level of teaching, training, evaluation of the removable partial prosthesis design (RPP) and in the methodology; reflect self-perceived difficulties in the level of knowledge of removable prosthesis design, impairing the skill and experience of the undergraduate student. **Purpose:** To determine the relationship between the conditioning factors of learning and the design of RPP. **Method:** It was a scientific, descriptive, comparative; sampling, not probabilistic, by quotas of voluntary subjects; with a 95 % confidence, of mixed students, a universe of 56 students, and a studied population of 24.35 %; the conditioning factors of learning and the ability to design a removable prosthesis were measured in data collection sheets, using a questionnaire, together with the knowledge test for Kennedy classification; an examiner was in charge of the evaluation; the qualifications of the designs were subject to the guide of qualification criteria of Loza; with ratings (adequate, fair and poor) for Classes I, II, III and IV and for the type of analysis, descriptive statistics were used. **Results:** For the variable factors conditioning learning; the level of education was 66.1 % deficient, 28.6 % regular and 5.4 % adequate; for the variable removable prosthesis design; 67.9 % were deficient, 25 % fair and 7.1 % adequate. **Conclusion:** There is a very high relationship between the conditioning factors of learning and the design of RPP.

Keywords

assessment; dental education; dentistry; education; predoctoral education; prosthesis design; removable partial prosthesis; prosthodontics; undergraduate education

RESUMEN

Antecedentes: Los factores condicionantes del aprendizaje, importantes en el nivel de enseñanza, capacitación, evaluación del diseño de prótesis parcial removible (PPR) y en la metodología; reflejan dificultades autopercibidas en el nivel de conocimientos del diseño de prótesis removible, perjudicando la habilidad y experiencia del alumno de pregrado. **Objetivo:** Determinar la relación entre los factores condicionantes del aprendizaje y el diseño de PPR. **Método:** Fue un estudio científico, descriptivo, comparativo; de muestreo, no probabilístico, por cuotas de sujetos voluntarios; con una confianza al 95 %, de alumnado mixto, un universo de 56 alumnos, y una población estudiada del 24,35 %; los factores condicionantes del aprendizaje y la habilidad en el diseño en prótesis removible, se midieron en hojas de recolección de datos, mediante un cuestionario, junto con el test de conocimiento para la clasificación de Kennedy; un examinador estuvo encargado de la evaluación; las calificaciones de los diseños, estuvieron sujetas a la guía de criterios de calificación de Loza; con valoraciones (adecuado, regular y deficiente) para las Clases I, II, III y IV y para el tipo de análisis, se utilizó la estadística descriptiva. **Resultados:** Para la variable factores condicionantes del aprendizaje; el nivel de enseñanza fue del 66,1 % deficiente, 28,6 % regular y el 5,4 % adecuado; para la variable diseño de prótesis removible; el 67,9 % fue deficiente, el 25 % regular y el 7,1 % adecuado. **Conclusión:** Existe relación muy alta, entre los factores condicionantes del aprendizaje y el diseño de PPR.

Palabras clave

diseño de prótesis; educación; educación de pregrado; educación dental; educación predoctoral; evaluación; odontología; prótesis parcial removible; prostodoncia

RESUMO

Antecedentes: Os condicionantes da aprendizagem, importantes no nível de ensino, treino, avaliação do desenho da prótese parcial removível (PPR) e na metodologia; refletem dificuldades autopercebidas no nível de conhecimento do desenho de próteses removíveis, prejudicando a habilidade e experiência do aluno de graduação. **Objetivo:** Determinar a relação entre os fatores condicionantes da aprendizagem e o desenho PPR. **Método:** Foi um estudo científico, descritivo, comparativo; amostragem, não probabilística, por cotas de voluntários; com 95 % de confiança, de alunos mistos, um universo de 56 alunos e uma população estudada de 24,35 %; os condicionantes de aprendizagem e a capacidade de projetar uma prótese removível foram medidos em planilhas de coleta de dados, por meio de um questionário, juntamente com o teste de conhecimento para a classificação de Kennedy; um examinador foi responsável pela avaliação; as qualificações dos projetos foram submetidas ao guia de critérios de qualificação da Loza; com classificações (adequada, regular e ruim) para as classes I, II, III e IV e para o tipo de análise, utilizou-se a estatística descritiva. **Resultados:** Para os fatores variáveis que condicionam a aprendizagem; o nível de escolaridade era 66,1 % deficiente, 28,6 % regular e 5,4 % adequado; para o desenho de prótese removível variável; 67,9 % eram deficientes, 25 % regulares e 7,1 %

adequados. **Conclusão:** Existe uma relação muito elevada entre os fatores condicionantes da aprendizagem e o desenho do PPR.

Palavras chave

avaliação; desenho de próteses; educação; educação de graduação; educação odontológica; educação pré-doutorado; odontologia; prótese parcial removível; prótese dentária

INTRODUCTION

In Peruvian universities, the level of knowledge in the design of removable partial prostheses (RPP) is from fair to poor, in a study they evaluated whether clinical experience influenced the ability of students to correctly design the metal structures of said prostheses, showing that the students made fewer errors in the design after the clinical experience (539 errors in the first examination and 366 in the second), highlighting the clinical experience, and constant practice in novices (1-4). The conditioning factors of learning, important in the level of teaching, training, evaluation of the design of (RPP) and in the methodology; reflect self-perceived difficulties in the level of knowledge of design, harming the ability and experience of the undergraduate student (5,6). Strengthening the conditioning factors of learning, through theory and the use of organized teaching materials; Furthermore, according to the opinion of experts, many dentists graduated from Peruvian universities ignore the correct design of a removable prosthesis, whose deficit in learning the design, generates serious problems in professional training and in the future patient with this attachment, without design. or adequate oral preparation (1,7).

Learning constitutes a stable change of behavior through practice, which involves specific stimuli and responses, improving behavior; in turn, there are two types of learning that alter behavior; the associative and the non-associative (8,9). Thus, within the conditioning factors of learning highlighted in this study, we have: The methodology in the design of prostheses; It is the stage of the project, which consists of directing specific techniques, in order to achieve a specific task, based on theoretical positions; frequently using the magisterial lesson, ineffective for the proposed goals, generating critical factors; in laboratory teaching, in the number of professors for practical training, in the theoretical and clinical teaching of removable prostheses. However, it has been shown that team-based learning (TBL) methodology, such as case-based learning (CBL), is preferable for mass teaching than traditional lecture-based instruction (LB), giving immediate results ; However, many universities agree to change and improve the syllabus, teaching the removable prosthodontics course, acquiring competencies, improving clinical practice, even recommending the use of clinical applicative manuals (9-17).

The level of training seeks to facilitate new knowledge and tools for the maximum development of abilities and skills based on the design of this prosthetic attachment; added to professional interest, scientific evidence, clinical experience, training, produces qualitative results; Thus, in a design workshop seminar for removable prostheses, better evaluative results were obtained; standardizing the group, where the majority of students learned, gained confidence in various treatments and improved the academic curriculum (1,18-22).

The level of teaching in the design of RPP is the transmission of skills and experiences, making use of the clear and precise intellect of teachers and the discussion of clinical cases, a field in which insufficient treatments are carried out, to the detriment of the student (5.6). The level of evaluation, through the assessment of knowledge, skills, attitudes and student performance, valued in the design of prostheses; Together with the application or implementation of the indicated procedures, they achieve an adequate design, producing dialogue, understanding and improvements in the student; it is qualitative, because the processes are complex and reduces to numbers, simplifying its most substantive part (23-25). Consequently, the evaluation of the qualitative program called, study skills development program (P.D.H.E.) and its correlation with eight criteria; feasible, consistent, evaluable, congruent, convenient, contextualized, generalizable and flexible; improves learning needs (6).

Designing a RPP is to trace its shape and structure, on a diagnostic model, parallelized and without alteration of the mouth, a condition of clinical practice, and carried out in preclinical practice laboratories, to later be replicated in real definitive models in clinic; It is helpful to use teaching materials such as; videos, internet, computer aided learning (CAL) program for 3D models; benefiting their learning; following principles and sequences, designing the metallic structures in the artificial attachment, with a red pencil and the retentions with a blue pencil, like this; Occlusal rests, retainers, major connectors, minor connectors, proximal contact plates and base extensions (5,26-36).

These learning factors intervene when exercising memory (5); Through the memory of the set of images, defining forms and structural details recorded in the mind with the consequent knowledge

and mastery of the design of the prosthetic device by the 9th Semester student in diagnostic models (37,38); and understanding in their ability to understand the indications in the design of removable prostheses, rescuing the most important ideas and the possibility of establishing links with previously acquired ideas, based on experience; prior to oral modification (6). Where the parallelization of the model is always carried out prior to the design of a RPP, offering greater retention, support and stability, important for quality standards, and for the benefit of designs; especially for the great casuistry of the lower arch, improving; supports, minor connectors and edentulous care protocols (1,26,39,40). It is an academic contribution, since university teaching must constantly be updated; Universities worldwide make changes in the teaching methodology for students and in the university curriculum; To achieve a goal, that its graduate students obtain optimal knowledge in the exercise of their professions and dentistry is part of it; It is beneficial, because the principles of the design of a RPP are something that every general dentist should know and it is the responsibility of every university to ensure that its students learn these concepts; it is novel, because it could manifest itself in the Colombian dental population; Various investigations carried out in different latitudes of the world, highlight that many dentists graduated from different universities do not know how to properly design said prosthetic attachment, and in this case in Peruvian universities (1,5).

Finding a reality in the undergraduate student, which is seen in Peru, corresponding to the lack of learning of the RPP design within the Peruvian university classrooms; the student or future dentist is the one who assumes or will assume the responsibility of making said abutment. Because it is the student who knows the oral status of the patient but not the dental technician; raising a question, in what way are the conditioning factors of learning related to the design of removable partial

dentures at UAC-Cusco? (1). The present study presents as a hypothesis, the conditioning factors of learning are significantly related to the design of RPP; and the objective, to determine the relationship between the conditioning factors of learning and the design of RPP in students of the 9th semester of the UAC-Cusco (5,10,41,42).

MATERIALS AND METHODS

Type of study and design. The type of study is scientific, descriptive, quantitative, bivariate, analytical, comparative and cross-sectional; and its correlational design (43,44).

Definition of the universe, population, type of sampling and sample size. The population was based on a number of 230 students of both sexes from the 9th semester of the professional stomatology career of the Faculty of Health Sciences of the Andean University of Cusco (UAC); The sample was obtained in a non-probabilistic way by quotas and from voluntary subjects at 95% confidence, consisting of a total of 56 students of both sexes from the 9th semester, representing 24.35% of the studied population (43).

Description of the inclusion and exclusion criteria of the sample. Thus, considering the inclusion criteria: Students from the 9th semester of the stomatology professional career of the UAC faculty of health sciences who are enrolled in said academic semester; students who have taken the removable prosthesis course and have taken it with a passing grade; students who signed the commitment to participate in the project until its completion and voluntarily. Taking as Exclusion criteria: Students who have taken some additional external training to the removable

prosthesis course; students who copied the design of their partner (s); students who obtained in their hands, data sheets and data collection sheets, without any code to guarantee their anonymity (5,43).

Ethical considerations of the study and approval by institutional ethics committees.

Participants collaborated by signing a commitment sheet, and anonymity to guarantee their evaluation, and based on similar studies of removable prosthesis design and methodology (22), found in search engines in PubMed®, SciELO®, Google Scholar®. of national and international indexed journals, both in English and Spanish. The experts who validated the test were professors at the Universidad Nacional Mayor de San Marcos, Universidad Nacional San Antonio del Cusco, and Universidad Peruana Cayetano Heredia; According to the assessment of the five experts, regarding the validation of the instruments, an assessment resulted for the variable X = 76.6% and for the variable Y = 90.00%, which represented a high applicability in the studied sample; the research protocol received approval from Dr. Revoredo, for the use of Loza's qualification criteria (43).

Procedures. Using one envelope per participant duly coded for anonymity, which contained surveys and the removable prosthesis design on a sheet prepared with the four Kennedy classes for partial edentulous; the administrative procedure, by sending a request to the Academic Vice Chancellor, to the Dean of the Faculty of Health Sciences and to the Dean of the Professional Career of Stomatology, to have the participation of the students of the 9th semester of the Career Professional of Stomatology from the Faculty of Health Sciences of the Andean University of Cusco and awaiting your approval; The data collection stage was divided into phases: First phase;

informed consent of the research, to the participating students, explaining the importance of their collaboration (5). Second stage; 3 sheets were distributed; one with Kennedy's four classifications of the partial edentulous, with bicolor pencils, and in the others, a questionnaire to measure knowledge of removable prosthesis design related to their teaching.

Third phase: The pilot test was developed in a classroom of the Professional Career of Stomatology of the UAC with 10 students from the 10th semester, with envelopes duly coded for their anonymity, containing surveys, the test of knowledge of the design of the removable prosthesis with the four Kennedy classes, giving them 25 minutes for the development of the survey and 35 minutes for the development of the design using bicolor pencil and designing them according to suggested guidelines; The results of this test of the removable prosthesis design, and the data collection sheets, were evaluated by an examiner (1). The definitive test: I worked together with my already calibrated assistant, in 1 classroom of the Professional Stomatology Career at the UAC with 56 cardinally numbered folders and with 56 students from the 9th semester of said career, who signed the research project cooperation commitment. The envelopes coded for their anonymity were distributed individually with the surveys with 28 questions, with the test of knowledge of the removable prosthesis design along with blue pencils and bicolor pencil, giving them 25 minutes to develop the surveys and an additional 35 minutes to design the 4 Kennedy classes individually; then the data collection sheets, and the knowledge test developed were collected in an orderly fashion, and placed in a labeled envelope (43,44).

To assess the results, the surveys and the knowledge test were examined; the evaluation was carried out by a single examiner; Each case was assigned a numerical value from 0 to 12 for class I, from

0 to 13 for classes II and III and from 0 to 10 for class IV, according to the application of duly calibrated criteria and the use of a criteria guide for the RPP qualification, established by Loza (5). The numerical data from the qualification of the surveys and knowledge tests were entered in a data table, adding columns interpreting the skill scores in the design of removable prostheses in the categories; adequate, fair and poor; the interpretation was made by the determination of ranges, where the cuts were established by the researcher and the gold standard in the study. The distribution and analysis of the ability in the design of removable prostheses and the conditioning factors of learning indicated by the students, was developed by visual inspection of the tables of distribution of frequencies and figures. The relationship of the RPP design domain scores and the conditioning factors of learning highlighted by the students, was made thanks to the partial correlation coefficient, to the control of the effect of the Kennedy classification and of the students of the 9th semester of the UAC, this correlation was finally interpreted according to values suggested by Cohen's Kappa (1,5,43,44).

Technical characteristics of instruments and materials. The data collection instruments were formal and structured, informative and instructive, towards more objective and truthful data (43). For variable X, a questionnaire was applied on a4 bond sheets; formal and structured instrument, with informative and instructive sections, describing the purpose of the research, 28 questions with closed and open answers were included, the questions being: 1,2 corresponding to methodology, 3-6 at the training level, 7- 14 at the teaching level and 20-28 at the assessment level; calibrated as follows: 19-28 questions answered, 15-20 points (adequate); 9-18 questions answered, 11-14 points (regular); and of 0-9 questions answered, 0-10 points (poor). For variable Y, a knowledge test was applied on a4 bond sheets and Faber Castell two-color pencils, with guidelines to be

followed by the respondents, so that the data provided are objective and truthful; where item 29 also corresponded to the evaluation level and according to the qualification criteria of Dr. David Loza Fernández, including the following criteria for the different Kennedy classes (5,44):

- Class I; direct retainer (4 points), indirect retainer (1 point), major connector (4 points), minor connector (2 points), retention net for acrylic (1 point); total 12 points
- Class II; direct retainer (5 points), indirect retainer (1 point), major connector (4 points), minor connector (2 points), retention net for acrylic (1 point); total 13 points
- Class III; direct retainer (6 points), major connector (4 points), minor connector (2 points), retention net for acrylic (1 point); total 13 points.
- Class VI; direct retainer (4 points), major connector (3 points), minor connector (2 points), retention net for acrylic (1 point); total 10 points. Thus the total score of the 4 classes (48 points), therefore, calibrated; 33-48 points = (adequate), 17-32 points = (fair), 0-16 points = (poor) (1.5).

Calibration to examiners. To calibrate the examiner who evaluated the questionnaire and the knowledge test, it happened at the beginning of the study with discussions of design criteria between the examiner and a professor of the specialty in oral rehabilitation of the Universidad Peruana Cayetano Heredia (UPCH), who served as baseline study. The intraclass correlation coefficient was used to determine the reliability of the calibration process (0.780), which would be at the level of good agreement (5,43,45).

Variables studied and their operationalization. For the independent variable X conditioning factors of learning, were taken as dimensions; the methodology, the training level, the teaching level, and the evaluation level, and the following categories were taken: From 19-28 questions answered, 15-20 points (adequate); of 9-18 questions answered, 11-14 points (fair) and of 0-9 questions answered, 0-10 points (poor). While, for the dependent variable AND RPP design, they were taken as dimensions; the parallelization and quality standards, the following categories were used: 33-48 points (adequate), 17-32 points (regular) and 0-16 points (poor) (1,5).

Methods and instruments for the collection and organization of information. The valid questions of the questionnaire to evaluate the variable X were carefully constructed, taking into account the purpose of the test, the time, the number of people examined, the facilities, the population it was addressed to, the ability to write the items, the length of the test and the difficulty of the questions, understanding the context in which the survey was developed (45); the reliability of the information collection increased, with the survey technique; by the nature of the question, projected and of control, by the degree of freedom of the answers, closed and open; the indicators were introduced to questions by the number based on the degree of complexity of the dimension, based on time and not only based on the indicator; The questions were dispersed throughout the questionnaire to avoid contagion and they were placed from general to specific (funnel). The number of questions was not high so as not to tire the interviewee (44); the number of questions per topic depended on the nature of the problem investigated. being some few and others of greater number on a common aspect (battery); Finally, the questionnaire was organized, starting with the true false answers, followed by the short answers, the multiple-choice answers and leaving the open answer answers at the end (43).

The knowledge test to evaluate the variable Y was organized based on the classification of the 4 Kennedy classes for the partial edentulous, projected onto a bond sheet and in disorder to increase the degree of complexity in the student and taking as model references of figures from Dr. Loza's book. Variable X was calibrated with Cronbach's alpha and variable Y Kappa index.

Regarding the reliability of the instrument that was applied to the learning conditioning factors variable, Cronbach's alpha was .962 (96.25%), and for the variable Removable partial denture design, it can be seen that Cronbach's alpha was. 898 (98.8%); the instruments applied had a high trend, according to the sample response (6,43).

Data analysis. The results obtained were recorded in files for this purpose, and were examined using the SPSS program, version 20, from IBM. The variables conditioning factors of learning and RPP design were examined, with their respective dimensions, the findings were expressed in percentages (43,44).

RESULTS

Having obtained the sample of 56 students, representing 24.35% of the studied population, a very high statistical correlation was obtained between both variables; The results identified in the conditioning factors for learning (Table 1) show that there were many difficulties in the teaching process of removable prosthesis design in preclinical studies, given by the methodology used, and

those who managed to design adequately did so out of interest specific to prosthetic dentistry or acquired experience (25).

TABLE 1
LEARNING CONDITIONING FACTORS

Validity		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Poor	37	66,1	66,1	66,1
	Fair	16	28,6	28,6	94,6
	Adequate	3	5,4	5,4	100,0
	Total	56	100,0	100,0	

In the methodology, which is used in class as a condition for student learning, 66.1% were deficient, 28.6% were regular and only 5.4% were adequate; considering problem solving, time, topic setting, knowledge building with meaningful learning; since there are professors in removable prosthesis laboratory practice, with different academic backgrounds, for 20 or 30 students per class, limiting the indications, explanations and practical corrections (5).

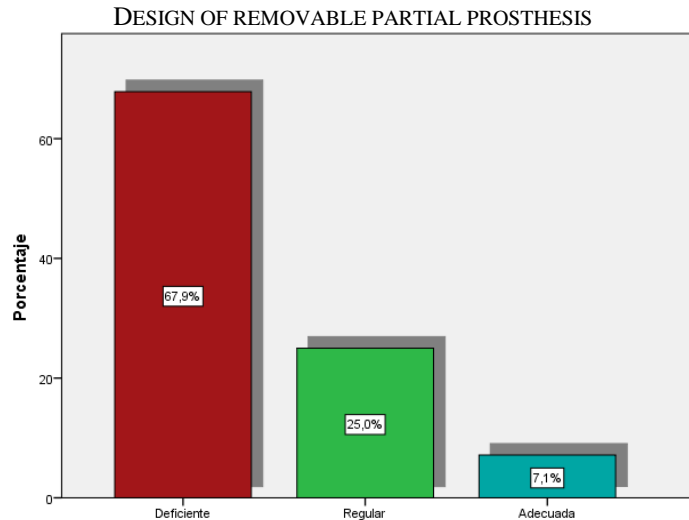
At the level of training on the management of removable prosthesis design; 73.2% were deficient, 19.5% regular and 7.1% adequate; students are not able to design simple and less complex edentulous models such as Kennedy's Class II with a 76.8% deficit; since the students will put into practice what they have learned in the theoretical classes and in the laboratory practices in the second semester of the fourth year, to simply make four removable prostheses according to a clinical case as a requirement, with which we can deduce that the students are going to practice very little removable prosthesis design in that semester, and with some students who have an interval of 4 to 8 months since they finished practice, and 6, 10 and 14 months since they received their last theoretical class (22).

At the level of teaching that students have in removable prostheses indicates 84.3% was deficient, 30.4% regular and 5.4% adequate; Due to the fact that, in removable prosthesis laboratory practices, teachers must reinforce and instruct what is overlooked in the theoretical area, creating a gap between the term of practices, theory and clinical practice (6).

At the evaluation level, 67.9% indicated achieving a deficient evaluation, 26.8% regular and 5.4% adequate; valuing knowledge, individual work, and its implementation in the design sequence; The student concern may be, for having spent a long time from the moment they were given the theoretical classes, to the clinical practical moment, coinciding with in the third year, and a record, to perform 4 treatments of removable metal-based prostheses and 2 acrylic-based with adapted retainers (1).

For the variable RPP design (Figure 1); In the case of the teaching of removable prosthesis design both in practice and in the clinic, many times the amount of removable prosthesis design exercises that one desires are not performed, which undermines student experience and skills; We have for Kennedy class I, 73.2% obtained a poor design, 19.6% regular and only 7.1% adequate; in Kennedy class II, 76.8% was a poor design, 16.1% regular and 7.1% adequate; in Kennedy class III, 57.1% were poorly designed, 28.1% were regular and 14.3% were adequate, and in Kennedy class IV, 66.1% were poorly designed, 26.8% were regular and 7.1% were adequate; as a consequence of the lack of planning in the teaching strategies in the rehabilitation of the edentulous; the best designed Kennedy class being III, followed by class IV, class I and finally class II (5,40,43).

FIGURE 1



DISCUSSION

From the results obtained according to the initial approaches; the methodology is distributed heterogeneously among all teachers: both influences from external graduate schools, as well as non-academic schools (5,6). The problem is that in laboratory and clinical practice the instructions between teachers are not consistent, so that students do not have many options and alternatives, other than just obeying the teacher in charge of the clinic; Also, there are professors in removable prosthesis laboratory practice with different dental schools for 20 or 30 students per class, which limits giving directions, making explanations and corrections or carefully reviewing the practice; The procedures developed put a questionnaire and a knowledge test to the test to evaluate the variables under study, whose instrument described the purpose of the research; It was expected to find homogeneity in the type of methodology applied by the teacher, because this would have decreased the degree of difficulty and the insecurity of the student at the time of designing the removable prosthesis, finding that the level of education obtained a deficit of 84.3% and the methodology had a deficit of 66.1%, influencing the best removable prosthesis design over class

III and that the design with the most deficit was for Kennedy class II. In what way are the conditioning factors for learning related to the design of a removable partial denture at UAC-Cusco? (1). The objective of this study was to determine the relationship between the conditioning factors of learning and the design of RPP (5,10,41-43).

The instruments were applied for both variable X and variable Y, showing the percentages of the conditioning factors of learning (table 1), in high relation to the percentages of the removable partial prosthesis design (figure 1), therefore, These independent and dependent variables show a directly proportional relationship. It was expected to find a relationship between both study variables, and it was used to evaluate the existence of a high correlation between the conditioning factors of learning with the removable prosthesis design, because a large deficit is shown in the removable prosthesis design level.

Analyzing the method used, its strength was, in facing the reality of the student at the time of designing the removable prosthesis, so that from this message, the type of methodology taught is useful and applicative, however, the advantage lies that the learning problems of removable prosthesis design in Peruvian universities be taken into consideration, so that other countries can analyze whether or not they are in the same educational problem; while its weakness was the lack of evaluation of the students at different times, to evaluate their progress in the design of removable prostheses, after the training process given to the student during their undergraduate studies, in addition, the disadvantage points out that the results of this study are only for students in the 9th semester of the professional career of Stomatology at the UAC and cannot be generalized to the other classes of students (5.40).

It was applicable, because it helped to understand the learning weakness, related to the RPP design; contributing to this accessible and economical therapy for the edentulous population, being an adequate scientific type of evidence to recommend the technological adoption in the design of RPP. On the other hand, it responded to the hypotheses of the study, because there was a very high relationship, between the conditioning factors of learning and the design of RPP, with a methodologically heterogeneous student teaching motivation, a methodology, training, teaching level in prosthesis design removable and poor evaluation; few students designed removable prostheses correctly. Concluding that the student's interest in the prosthesis area generates improvements in the removable prosthesis design in the absence of a good methodology (6).

It remains to be answered: How could learning be improved at said university, avoiding the need to delegate responsibility for the design of removable prostheses to the dental technician? emerging new questions, such as: Are the proven methodologies for the design of removable prostheses such as CAL and the use of 3D technology used in the 21st century by Latin American Dental Schools? Are the professors at the Peruvian Schools of Dentistry aware that the traditional methodology does not generate good results in the design of RPP? (1,6).

A high relationship was obtained between the conditioning factors of learning with the removable prosthesis design, because a small number of students who felt that a removable prosthesis was properly designed were wrong. They may not have been able to distinguish between a suitable and a poor design, due to a lack of theoretical or practical knowledge (22). Similar to that reported in the literature, Richard R et al (2003), encouraged a greater interest in searching valid literature to

support and incorporate evidence-based practices in daily prosthodontic treatment decisions; Graser GN. (1990), techniques taught in dental schools are often not used in practice; on the contrary, the interest of the professional in removable prosthodontics by new techniques and materials remains high, a 1988 survey by members of the Academy of General Dentistry (21); Ong CT et al (1999), conducted a survey based on a questionnaire of 150 general dentists (response rate of 74.6%) supported the change of the removable prosthesis curriculum, to improve its relevance for general dental practice modern (13); López CF. (2016), concludes, the content of the syllables and the teaching and learning process of the removable prosthesis course should be improved (14); While Revoredo A. (2007), does not observe a statistically significant relationship between the knowledge of removable prosthesis design of the students of the fifth year of studies with the critical self-perceived factors in their learning of removable prosthesis design (5).

At the training level, students are not able to learn to design simple edentulous models and / or with different dispositions of edentulous spaces and modifications for each classification (22). Generating confusion among students when designing, especially Kennedy Class II, with a unilateral edentulous gap, which increased the complexity of the design and produced that the results of this class II had the lowest percentage of designs performed properly and the highest percentage of poorly executed designs.

The problem, the students will put into practice what they have learned in the theoretical classes and in the laboratory practices in the second semester of the fourth year, to simply make four removable prostheses according to the clinical case as a requirement; deducing that students will practice very little removable prosthesis design in that semester, and perhaps students who have a

gap of 4 to 8 months since they finished practice, and a gap of 6, 10 and 14 months since they received their last class theoretical (5). At the training level, few students designed adequately, probably because of; learning methods, hours devoted to study, attendance at courses and congresses, degree of intelligence and individual understanding, etc.

Other authors such as Samuelson DB et al (2017), at the University of North Carolina, noted that students overwhelmingly preferred CBL instruction to LB; The findings of this study support the introduction and further testing of CBL in the preclinical dental curriculum, as possible future benefits evident during clinical training; Di Natali C. (2017), finds it significant to apply a removable prosthesis manual in achieving conceptual competence in students; Petropoulos VC et al (2006), highlighted that predoctoral clinical removable prosthesis programs change from one school to another, where a high percentage of schools agree on many issues; 25% of schools reported incorporating new educational materials. Use of Portrait artificial teeth at the predoctoral level (15,32); Pollard DJ et al (1994) produced CAL on aspects of partial denture design that covered topics of topography, support, and indirect retention. 85% of the participants found the program easy to use and 78% stated that the program improved their knowledge of removable prosthesis design, and less than half thought it had improved their practical skills; demonstrating this study, that CAL can be acceptable; Mahrous et al (2019), in the absence of differences in learning outcomes, students showed an overwhelming preference for having 3D virtual models for the curriculum, at the University of Iowa, with this software they create 3D models, which can be more flexibly altered or customized to teach students the design of removable dentures and associated components; Rashedi et al (2003), preclinical removable prosthesis educational programs vary between schools, a large percentage of schools agree on certain topics. 19% of

dental schools are incorporating new technologies, such as the Internet, into their preclinical removable denture curriculum (30,31).

At the RPP teaching level, there is another problem, since, in removable prosthesis laboratory practices, teachers must level what is not taught in the theoretical area, creating a large gap between the term of the practices, the theory and clinic (5,6). Theoretical teaching on removable prostheses is dictated during two months of the semester with a traditional methodology with outdated and complex bibliography, 10 lectures, and a 1-hour lecture class and a seminar on a topic related to removable prostheses; Therefore, the great correlation between factors conditioning learning in students with the removable prosthesis design was due to the fact that all had difficulties in their teaching of removable prosthesis design during their university studies. Authors such as Echeto et al (2015), suggest that TBL is a promising approach to teach RPP, not so much the traditional method, with successful results; Reinforcing what said by Hai-Ali et al (2013), the TBL, is an active learning educational strategy for courses with many students, found that the course grades were higher using the TBL method than the LB method (10,11).

The level of evaluation, according to the results of the conditioning factors of learning with the removable prosthesis design, found that there is a very low percentage of students who design RPP adequately, whose percentage varies according to the Kennedy classification, however it would have been ideal to start the study at the beginning of the seventh clinical semester, with a follow-up of 2 years until the end of the ninth semester, with a greater number of evaluators, records and knowledge tests, evaluating them at the beginning and end of their clinical stay (5,6). According to the literature Meléndez Y et al (2017), the level of knowledge to design a removable prosthesis

in the students of VII and IX cycle of the EPO of the UPT in 2017 was very bad in students of VII cycle and bad in the IX cycle students (3); Iglesias M. et al (2016) in San José, investigated the knowledge of removable prosthesis design in general dentists, highlighting a low level of indirect retainers and support design; there are 22.45% and 53.06% of the accepted connector designs, similar or equal to the ideal ones; 53.06% and 67.35% coincided in the supports, regardless of the years of service, and where the design of the major connector was high in most cases, less in class IV, I and II of higher Kennedy , contrary to other studies (42); Luque (2018), the level of knowledge about removable prosthesis design of stomatology students of VI, VIII and IX semester, was mostly regular (55.2%) (2).

Meanwhile, the minority had good knowledge (11.9%); While García E et al (2013) in Lima, studied the level of knowledge of removable prosthesis design in 20 dentists or technicians, who determined, they must have knowledge of the removable prosthesis components, indications for use, and characteristics; for example; Loza D. (1999) in Lima, analyzed critical factors in the design of the RPP, by evaluating a training program applied to twenty-three teachers of the Integral Clinic, determining that there was a correlation between theoretical-practical training, improving in the evaluation of the removable prosthesis design (1); McKinstry RE et al (1989) indicated that dental students made fewer design errors after clinical experience. Errors in two of 13 design elements increased after the clinical period. The increase in errors in these two elements could be due to the lack of attention to details or lack of reinforcement in the learning of certain basic concepts; Holt RD et al (1994), determined that the positive effects of video were greater in those recently rated. Despite improvements after watching the video, 105 (40%) indicated that they would leave the removable prosthesis design to the technician on some occasions; while the

program had been well received and had produced changes in intention, there was less objective evidence of change (36).

The students noticed that this low level of learning in the design of removable prostheses could be due to several conditioning factors in their undergraduate learning, which according to the degree of importance were: The methodology, the level of training, the level of teaching of removable prosthesis and the level of evaluation. The concern of the students, for having spent a long time from the moment they were given the theoretical classes at the time of applying what they learned in clinical practice, which is precisely in the third year, where there is a record for performing 4 treatments with removable prosthesis with metal base and 2 with acrylic base with adapted retainers. According to the literature Lechner SK et al (1998), the computer-assisted learning program uses QuickTime® to simulate a three-dimensional perspective of diagnostic models; Animated diagrams can be added to illustrate various points. Students practice at their own pace, in several virtual cases, and thus learn to design removable prostheses; Lechner SK et al (1999) (33,34), determined that CAL is an easy-to-use program for students with little or no computer experience; considered a useful learning resource; Its interactive nature as a learning process and the ability to rotate diagnostic models, allows CAL programs to use the full potential of the computer's ability, generating students impressed by aspects of the program that could not be duplicated by a book (6).

In the case of clinical removable denture teaching, many times you do not perform the number of removable denture treatments that you want, which results in the student gaining less experience. In the synthesis of the problem, a statistically significant correlation is observed between the

conditioning factors of learning with the design of removable prostheses by students of the 9th semester of the professional career of Stomatology of the UAC in the 2016-II semester, however, the results put on alert and contribute to better train future promotions of the Faculty and can help strengthen the weaknesses that syllables present in the area of RPP. For his part, Pérez A. (2015), for edentulism of great prevalence, defined a protocol for the correct elaboration of a metallic RPP, recovering the masticatory, aesthetic and phonetic functions (40); while Castillo R. (2016), gives importance to the development of a teaching activity appropriate to each of the learning styles, called "Design of objective methods for the evaluation of clinical competencies in Prosthesis for undergraduate students in Dentistry" (16,22).

CONCLUSIONS

There is a very high relationship between the conditioning factors of learning and the design of RPP among students of the 9th semester of the professional career of Stomatology-UAC-Cusco.

RECOMMENDATIONS

Take advantage of the learning of the RPP design, with programs like CAL, and methodologies like TBL and CBL; also improving the level of teaching, training and evaluation.

Apply a similar study in other latitudes other than Peru, to evaluate the educational reality in the design of RPP.

REFERENCES

1. Loza D. Identificación de factores críticos en el diseño de la prótesis parcial removible a través de la evaluación de un programa de capacitación aplicado a docentes de la Facultad de Estomatología de la Universidad Peruana Cayetano Heredia. Rev UPCH. 1999
2. Luque P. Nivel de conocimiento sobre diseño en prótesis parcial removible en alumnos de VI, VIII y IX semestre de la Escuela Profesional de Estomatología. Universidad Alas Peruanas. Arequipa, 2017. Rev UAP. 2018 jun. <https://doi.org/repositorio.uap.edu.pe/handle/uap/7642>
3. Meléndez Y, Condori D. Nivel de conocimientos para diseñar una Prótesis Parcial Removible de base metálica en los alumnos de VII y IX ciclo de la Escuela Profesional de Odontología de la Universidad Privada de Tacna en el año 2017. <https://doi.org/repositorio.upt.edu.pe/handle/UPT/197>
4. Bowman IF. Removable partial prosthodontics; comparison survey 1964 and 1969. J Dent Educ 1970; 4: 93-97.
5. Revoredo A. Nivel de conocimientos y factores críticos auto-percibidos en la enseñanza del diseño de prótesis parcial removible por alumnos del quinto año de Estomatología. Rev UPCH. 2007 jun; 17(1). <https://doi.org/10.20453/reh.v17i1.2430>
6. Pérez-Van-Leenden MJ. La investigación acción en la práctica docente. magis.2019 jul-dic; 12(24): 177-192. <https://doi.org/10.11144/Javeriana.m10-20.ncev>
7. García E, Hinostroza E, Ramos W. Nivel de conocimiento del diseño de RPP por 20 odontólogos o técnicos en la ciudad de Lima: Instituto superior tecnológico Daniel Alcides Carrión. 2013

8. Acevedo, F. Diálogo de saberes, los aportes de la otra edad en la era del conocimiento; Diálogo de Simón Rodríguez y Humberto Maturana. Rev USCR. 2016
9. Mario de Miguel F. En: Alianza, editores. Metodologías de enseñanza y aprendizaje para el desarrollo de competencias. Orientaciones para el profesorado universitario ante el espacio europeo de educación superior. Madrid: Dailet 2016; 317-318
10. Echeto LF, Sposetti V, Childs G, Aguilar ML, Behar-Horenstein LS, Rueda L, Nimmo A. Evaluación del aprendizaje en equipo y la instrucción tradicional en la enseñanza de conceptos de prótesis parcial removible. J Dent Educ. 2015 Sep; 79 (9): 1040-1048.
11. Hai-Ali R, Al Quran F. Aprendizaje en equipo en un módulo preclínico de prótesis removible de prótesis en una escuela de odontología de los Emiratos Árabes Unidos. J Dent Educ. 2013 Mar; 77 (3): 351-357.
12. Samuelson DB, Divaris K, De Kok IJ. Beneficios de la instrucción basada en casos versus la tradicional basada en conferencias en un curso preclínico de prostodoncia removible. J Dent Educ. 2017 abr; 81 (4): 387-394. <https://doi.org/10.21815 / JDE.016.005>
13. Ong CT, Pan N, Tiang R, Payne AG, Thomson WM. Percepciones de los odontólogos generales sobre la prostodoncia removible en el plan de estudios de pregrado. NZ Dent J. 1999 Sep; 95(421): 80-83
14. López CF. Relación del nivel de conocimiento en el diseño de prótesis parcial removible y factores asociados entre los alumnos del 4to año de la Facultad de Odontología de la UNFV- 2013. Rev UPCH. 2016 dic; 14T21: 39:41Z. <http://repositorio.upch.edu.pe/handle/upch/249>
15. Di Natali C. Aplicación de un manual de prótesis parcial removible en el logro de competencia en los estudiantes de la Facultad de Odontología de la Universidad de San Martín de

- Porres.2017. (trabajo de doctorado) Lima, Perú: Repositorio USMP; 2017. <http://repositorio.usmp.edu.pe/handle/20.500.12727/3166>
16. Castillo R. Adecuación de estrategias docentes a los patrones de aprendizaje específicos de los alumnos optimizando la eficacia de los principios del aprendizaje autónomo y la aplicación de las TICs para la adquisición de competencias en Prótesis Estomatológica. E Prints Complutense. 2016 oct.
 17. Freyre P. Pedagogía de la autonomía. México: Editorial Siglo XXI; 1996.
 18. Icaza JL, Ludeña MA, Bernabé E, Beltrán-Neira RJ. Auto-percepción del dominio de competencias clínicas odontológicas entre recién graduados de la Facultad de Estomatología de la Universidad Peruana Cayetano Heredia. Rev Estomatol Herediana 2006 Sept; 16(1): 9-14. <https://www.redalyc.org/pdf/4215/421539345003.pdf>
 19. McKinstry RE, Minsley GE, Madera MT. El efecto de la experiencia clínica en la capacidad de los estudiantes de odontología para diseñar marcos de prótesis parciales removibles. J Prosthet Dent. 1989 nov; 6(5): 563-566
 20. Richard R, Seals Jr, John DJ. Práctica basada en evidencia en prostodoncia removable. Tex Dent J. 2003 dic; 120(12): 1138-1145.
 21. Graser GN. Predoctoral removable prosthodontics education. J Prosthet Dent. 1990 Sep 1990; 64 (3): 326-33. [https://doi.org/10.1016/0022-3913\(90\)90016-6](https://doi.org/10.1016/0022-3913(90)90016-6)
 22. Nadal Cristóbal A. El programa universitario como herramienta de evaluación.2005 jun: 14-370.
 23. Pérez K. Evaluación de los diseños para prótesis removable prescritos por odontólogos en el área metropolitana de Barcelona. Rev Univ de Barcelona. 2014 jul; 13-20. <http://diposit.ub.edu/dspace/bitstream/2445/57743/1/57743.pdf>

24. Sánchez G, Cisterna F. La evaluación de los aprendizajes orientada al desarrollo de competencias en Odontología. Educ Med Super. 2014 ene-mar; 28 (1).
25. Maquilón J. Diseño y evaluación del diseño de un programa de intervención para la mejora de las habilidades de aprendizaje de los estudiantes universitarios. Rev UMU. 2010 Mar; 3(37): 371-378. <http://hdl.handle.net/10201/10682>
26. Loza D. Valverde R. Diseño de Prótesis Parcial Removible. 1ª ed. Madrid: Ripano; 2007.
27. Loza Fernández D. Prostodoncia Parcial Removible. 1ª ed. Lima: Actualidades Médico Odontológicas Latinoamérica; 2003.
28. McCracken. Prótesis Parcial Removible. 11ª ed. Madrid: Elsevier; 2004
29. Mahrous A, Schneider GB, Holloway JA, Dawson DV. Mejora del aprendizaje de los estudiantes en el diseño de prótesis parcial removible mediante el uso de modelos tridimensionales virtuales frente a dibujos bidimensionales tradicionales: un estudio comparativo. J Prosthodont. 2019 oct; 28 (8): 927-933. <https://doi.org/10.1111/jopr.13099>
30. Mahrous A, Schneider GB. Mejora del aprendizaje de los estudiantes de prostodoncia extraíble utilizando los últimos avances en modelado virtual 3D. J Prosthodont. 2019 abr; 28 (4): 471-472. <https://doi.org/10.1111/jopr.13044>
31. Rashedi B, Petropoulos VC. Current concepts and techniques in complete denture final impression procedures. J Prosthodont. 2003 jun; 12 (2): 116-123.
[https://doi.org/10.1016/S1059-941X\(03\)00005-6](https://doi.org/10.1016/S1059-941X(03)00005-6)
32. Petropoulos VC, Rashedi B. Educación sobre prótesis parcial removible en las escuelas dentales de EE. UU. J Prosthodont. 2006 ene-feb; 15(1): 62-8 <https://doi.org/10.1111/j.1532-849X.2006.00071.x>

33. Lechner SK, Thomas GA, Bradshaw M. Una solución multimedia interactiva para aprender diseño de prótesis parcial removible. J Prosthodont. 1998 Sep; 7 (3): 177-182. <https://doi.org/10.1111/j.1532-849x.1998.tb00201.x>
34. Lechner SK, Lechner KM, Thomas GA. Evaluation of a computer-aided learning program in removable partial denture framework designing. J Prosthodont. 1999 Jun; 8(2): <https://doi.org/100-105.10.1111/j.1532-849x.1999.tb00018.x>
35. Pollard DJ, Davenport JC. Una evaluación de la capacitación de profesionales de la odontología general en el diseño de dentaduras parciales utilizando un programa de aprendizaje asistido por computadora. Br Dent J. 1994 dic; 177 (11-12): 405-409. <https://doi.org/10.1038/sj.bdj.4808628>
36. Holt RD, Rule DC, Basker RM, Davenport JC, Ralph JP, Murray JJ, Eaton KA. La influencia en el diseño de prótesis parcial de un video de enseñanza para profesionales de la odontología general. Br Dent J. 1994 May; 176 (10): 379-385. <https://doi.org/10.1038/sj.bdj.4808462>
37. Ausubel D. Psicología del aprendizaje verbal significativo. New York;1961.
38. Tunnermann C. El constructivismo y el aprendizaje de los estudiantes. Puebla: UDUAL Pag 28. ISSN 0041-8935; 2011.
39. Garcia J. La calidad de la gestión académico administrativa y el desempeño docente en la Unidad de Post-Grado según los estudiantes de la maestría de la Facultad de Educación de la UNMSM. Rev UNMSM 2008.
40. Pérez A. Protocolo para permitir a los alumnos de la Facultad Piloto de Odontología elaborar correctas prótesis parciales metálicas removibles. Repositorio UG. 2015 jun. <http://repositorio.ug.edu.ec/handle/redug/17837>

41. Tomas, L. Relación entre los estilos de aprendizaje y el rendimiento académico en estudiantes de la Facultad de Odontología de la Universidad Nacional de La Plata. 2017 mar. Rev SEDICI; 978-987-42-3866-5. <http://doi.org/sedici.unlp.edu.ar/handle/10915/59220>
42. Iglesias M, Jiménez R, Vargas T. Conocimiento de diseño de RPP en odontólogos generales. Rev Educ Cienc Salud. 2016 jun; 13(2): 107-113. <http://www.2.udec.cl/ofem/recs/anteriores/col1322016/artinv13216c.pdf>
43. Gonzales N, Zerpa ML. La investigación educativa en el hacer docente. Laurus.2007 ene; 13(23) :279-309. <https://www.redalyc.org/pdf/761/76102315.pdf>
44. Ballester Brage Ll. Bases metodológicas de la investigación educativa. 2a ed. Palma de Mallorca: Univ de les Illes Balears; 2004.
45. Gallardo de Parada Y, Moreno Garzón A. Recolección de la información. 3a ed. Santa Fe de Bogotá: ICFES; 1999.