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Artículo científico

Anatomy dental during the COVID-19

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Anatomía dental durante el COVID-19

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ABSTRACT

The objective of this study was to evaluate the teaching-learning of dental anatomy e-learning during the Covid-19 pandemic. A cross-sectional investigation was carried out. The teaching-learning of the students of dental anatomy. To do this, a questionnaire was developed that consisted of four dimensions that were, the methodologies used in teaching-learning, evaluations, coexistence and, the virtual classroom space, each of the dimensions mentioned had 5 questions with a total of 20 questions. The evaluation of the teaching-learning of dental anatomy e-learning during the Covid-19 pandemic varied among the participants, when performing the analysis of the four dimensions, the majority of positive responses were in the evaluation dimension, followed by the methodologies dimension of teaching, coexistence in the virtual classroom and virtual classroom. Also, the frequencies of the responses were higher in the evaluations from good and very good, these frequencies being significant (Table 2, p-value <0.01). A statistically significant difference between men and women was found between positive and negative ratings (Table 3, p-value <0.01). The students had more positive than negative responses, the dimension that obtained the highest percentage of positive responses was the evaluation dimension. In general, students evaluate the teaching-learning evaluation of dental anatomy e-learning during the Covid-19 pandemic as very good, showing itself in all dimensions.

Palabras clave: dental, anatomy, e-learning, COVID-19.

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RESUMO

O objetivo deste estudo foi avaliar o ensino-aprendizagem de anatomia dentária e-learning durante a pandemia de Covid-19. Foi realizada uma investigação transversal. O ensino-aprendizagem dos alunos de anatomia dentária. Para isso, foi elaborado um questionário que consistia em quatro dimensões que foram, as metodologias utilizadas no ensino-aprendizagem, as avaliações, a convivência e, o espaço da sala de aula virtual, cada uma das dimensões mencionadas continha 5 questões com um total de 20 questões. A avaliação do ensino-aprendizagem de anatomia dentária e-learning durante a pandemia de Covid-19 variou entre os participantes, ao realizar a análise das quatro dimensões, a maioria das respostas positivas foram na dimensão avaliação, seguida da dimensão metodologias de ensino, convivência em sala de aula virtual e sala de aula virtual. Além disso, as frequências das respostas foram maiores nas avaliações de bom e muito bom, sendo essas frequências significativas (Tabela 2, p-valor <0,01). Uma diferença estatisticamente significativa entre homens e mulheres foi encontrada entre as avaliações positivas e negativas (Tabela 3, valor de p <0,01). Os alunos tiveram mais respostas positivas do que negativas, a dimensão que obteve o maior percentual de respostas positivas foi a dimensão avaliação. Em geral, os alunos avaliam a avaliação ensino-aprendizagem de e-learning de anatomia dentária durante a pandemia de Covid-19 como muito boa, apresentando-se em todas as dimensões.

Keywords: dentário, anatomia, e-learning, COVID-19.

RESUMEN

El objetivo de este estudio fue evaluar la enseñanza-aprendizaje del e-learning de anatomía dental durante la pandemia Covid-19. Se realizó una investigación transversal. La enseñanza-aprendizaje de los estudiantes de anatomía dental. Para ello, se elaboró un cuestionario que constaba de cuatro dimensiones que eran, las metodologías utilizadas en la enseñanza-aprendizaje, las evaluaciones, la convivencia y, el espacio del aula virtual, cada una de las dimensiones mencionadas contaba con 5 preguntas con un total de 20 preguntas. La evaluación del e-learning de enseñanza-aprendizaje de anatomía dental durante la pandemia Covid-19 varió entre los participantes, al realizar el análisis de las cuatro dimensiones, la mayoría de las

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respuestas positivas estuvieron en la dimensión de evaluación, seguida de la dimensión de metodologías de docencia, convivencia en el aula virtual y el aula virtual. Asimismo, las frecuencias de las respuestas fueron mayores en las evaluaciones de bueno y muy bueno, siendo estas frecuencias significativas (Cuadro 2, valor p <0.01). Se encontró una diferencia estadísticamente significativa entre hombres y mujeres entre las calificaciones positivas y negativas (Tabla 3, valor de p <0.01). Los estudiantes tuvieron más respuestas positivas que negativas, la dimensión que obtuvo el mayor porcentaje de respuestas positivas fue la dimensión de evaluación. En general, los estudiantes valoran muy bien la evaluación de enseñanza-aprendizaje del e-learning de anatomía dental durante la pandemia Covid-19, mostrándose en todas las dimensiones.

Palavras-chave: odontología, anatomía, e-learning, COVID-19.

INTRODUCTION

When a country like Peru, as of August 27, 2020, occupies the first place with the most deaths in the world due to the Covid-19 pandemic, education at all levels is compromised and, returning to face-to-face classes is uncertain. Therefore, it is necessary to take urgent measures to mitigate its consequences, one of these measures would be to implement teaching-learning strategies in virtual environments. The global confinement as a result of the Covid-19 disease has caused multiple problems in society, both in the economic, social, cultural, health, and educational fields, among others. The education sector has not been the exception, schools and universities around the world have been affected by failing to provide education to 1.570 million students in 191 countries (UNESCO, 2020), (OHCHR, 1999).

UNESCO (UNESCO, 2020) estimates that approximately 23.4 million higher education students and 1.4 million teachers in Latin America and the Caribbean have been affected by the suspension of face-to-face classes, forcing educational institutions worldwide to take a leap unprecedented technology in human history, making teachers rethink their educational strategies and plans to the e-learning format to face a new reality, with the intention of ensuring pedagogical continuity by guaranteeing the right to education. Given this fact, international organizations urged countries to provide well-prepared, adaptable, and accessible educational environments for

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both schools and universities (https://plus.google.com/+UNESCO, 2017; IFRC, 2020; OHCHR, 2020). Applying teaching-learning methods during the Covid-19 pandemic is a challenge when there is no experience. Knowing the classification of teaching-learning methods is important for the teacher to expand their knowledge, these are classified into active and passive (D'souza et al., 2020). Active teaching-learning methods are considered as participatory, with them you can achieve results that would not be achieved with passive methods that are characterized by unidirectional communication from the teacher to the students (Aspiazú et al., 2013). As in a face-to-face environment, teachers must gather a series of competencies to successfully develop the e-learning environment. These competencies are aimed at teaching-learning management, specialty, digital, and ethics competence. The teaching-learning of courses that involve health sciences through e-learning education is already a reality, and dentistry is no exception. It is a challenge, clinical teaching-learning in e-learning modality, in universities such as Northampton or Oxford, in the United Kingdom virtual reality systems and simulators are being applied, in a three-dimensional and interactive environment (3D) allowing the students develop cognitive knowledge (Pottle, 2019). This fact does not escape the dental anatomy course, which is theoretical-practical in nature, whose competencies that must be acquired by students are the identification of the morphological and anatomical characteristics of permanent and milk teeth (Kato & Ohno, 2009). The reproduction of the morphology of the teeth is immersed within the practical component, this implies that dental students must develop cognitive knowledge, motor skills (manual dexterity) and, the artistic sense with the object of meet the demands of the dental profession (M. M. Bakr et al., 2017; Conte et al., 2020; Kellesarian, 2018). Complying with the course competencies in the e-learning modality is a challenge. Especially when it comes to dental carving since this involves the development of the student's manual dexterity (R. A. de Azevedo et al., 2018). For the development of this competence, traditionally 2D drawing practices and 3D wax carving have been used, using wax blocks (R. A. de Azevedo et al., 2018; Lone et al., 2018). At present, methods for the teaching-learning of psychomotor skills in dentistry are being incorporated, such as 3D images, digital atlases, animated computer graphics, three-dimensional models, real photos of human teeth, gamification, reality

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virtual augmented and haptic (R. A. de Azevedo et al., 2018). In this sense, the objective of this research was to evaluate the teaching-learning of dental anatomy during the Covid-19 pandemic.

METHODOLOGY

A cross-sectional investigation was carried out in a

dental school in the dental anatomy course was virtualized, use was made of technological resources and teaching-learning methodologies. Among the technological resources, the virtual classroom was used, which contained educational material such as 3D applications, videos, forums, questionnaires, and the delivery of interactive classes through the Blackboard Collaborate platform where the classes were recorded. The methodologies used for teaching-learning were active methodologies such as gamification, flipped class, project-based learning, and design thinking.

To evaluate the teaching-learning of the students about the teaching of dental anatomy during the Covid-19 confinement, a questionnaire with four dimensions was elaborated, which were, the methodologies used in teaching-learning, evaluations, coexistence, and the classroom space virtual, each of the dimensions mentioned had 5 questions with a total of 20 questions. The validation was carried out by judges with the purpose of evaluating the content, the reliability followed the approach of the analysis of internal consistency of the items, through the calculation of Cronbach's alpha coefficients where the four dimensions are highly correlated ($p < 0.01$), and the reliability is very good (Conbrach's $\alpha = 0.856$). The questionnaire was created using Google Form, at the end of the classes the link was sent to the students through their email accounts in order for them to complete it anonymously. A total of 40 students out of 48 enrolled in the course answered the questionnaire in a period of three days. Since the design requires all questions to be answered, all electronic questionnaires were completed.

Statistic análisis

The application of statistical techniques such as the analysis of frequency distribution tables, the non-parametric Mann-Whitney U test, the Exploratory Factor Analysis, and classical Cronbach's alpha was applied.

The data processing was carried out through SPSS / Windows 25.0.

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RESULTS

A total of 48 students enrolled in the course, but only 34 agreed to be part of the study, representing 71% of the total population, 29.4% were male and 70.6% were female. With the questions asked in the investigation, they were arranged in a series of categories (Quispe, 2013), in ordinal qualitative frequency tables they were contrasted by assigning two categories, one of them indicating the positive and negative modal (Blanco, s. f.); in which the majority of the participants had evaluated as positives greater than 73% (Table 1). Figure 1 shows the general proportions of positive and negative responses to each question of the four dimensions of the questionnaire.

The evaluation of the teaching-learning of dental anatomy e-learning during the Covid-19 pandemic varied among the participants, when performing the analysis of the four dimensions, the majority of positive responses were in the evaluation dimension, followed by the methodologies dimension of teaching, coexistence in the virtual classroom and virtual classroom. Besides, the frequencies of the responses were higher in the evaluations from good and very good, these frequencies being significant (Table 2, p-value <0.01). A statistically significant difference between men and women was found between positive and negative ratings (Table 3, p-value <0.01).

The e-learning dental anatomy evaluation form during the Covid-19 pandemic indicates adequate psychometric properties, in which its components are correlated given the scale used and these were very high (Spearman correlations $p < 0.01$).

The reliability indicator of the questionnaire was analyzed with Cronbach's alpha, which showed very good reliability (López, s. f.) where the reliability for the entire questionnaire was very good (Conbrach's $\alpha = 0.856$); for men and women, the reliability indicator is 0.814 and 0.844 respectively (Table 4). To collect the indirect measures that were related to the concepts of interest in teaching-learning, these variables being latent, it was analyzed with the methodology in which it relates the observed variables with the factor analysis, finding groups of homogeneous questions of variables from the total of questions, which found an adequate fit to the construct explained by a factor "Virtual classroom with relevant characteristics" that allows its application in this context of virtual education, their assessments of the analytical verification methodology were optimal (Kaiser-Meyer Index- Olkin KMO

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= 0.500, Barllet Chi-quare test of sphericity

X2 = 443.434, p <0.001 Table 4).

Table 1

Analysis of the four teaching-learning dimensions of e-learning dental anatomy during the Covid-19 pandemic.

Scale	**Very bad No use Nothing**				**Excellent Very useful / Quite**	**Negative response** 1 a 3	**Positive responses** 4 a 5
Ítems	1	2	3	4	5		
Teaching Methoology							
For the learning of the course, the virtual classes were			3	9	22	3 (8.8%)	31 (91.2%)
For the learning of the course, the seminar developed by you was			1	8	25	1 (2.9%)	33 (97.1%)
For the learning of the course the works developed in class were			1	6	27	1 (2.9%)	33 (97.1%)
For the learning of the course the KAHOOT application was	3		4	12	15	7 (20.6%)	27 (79.4%)
To learn the course, the Bone Box - Dental Lite application used in the course was		1	1	7	25	2 (5.9%)	32 (94.1%)
Evaluations							
For learning the classes given by the teacher were			3	3	28	3 (8.8%)	31 (91.2%)
Assessments reflected what was learned in class				8	26	0 (0.0%)	34 (100.0%)
For your learning, the development of the forums were			3	9	22	3 (8.8%)	31 (91.2%)
For his learning the elaboration of the scientific article seemed to them			1	8	25	1 (2.9%)	33 (97.1%)
The teacher's way of evaluating seemed to them				6	28	0 (0.0%)	34 (100.0%)
Coexistence in the virtual classroom							
The preparation of group work with his colleagues seemed to them			6	7	21	6 (17.6%)	28 (82.4%)
The times established for the presentation of works seemed to them			2	6	26	2 (5.9%)	32 (94.1%)
The interaction with the teacher in the virtual classroom was				5	29	0 (0.0%)	34 (100.0%)
The interaction with their peers in the virtual classroom was			5	12	17	5 (14.7%)	29 (85.3%)
The interaction with the teacher of the course through applications such as WhatsApp, Facebook, Twitter, etc., seemed to them			2	4	28	2 (5.9%)	32 (94.1%)
Virtual classroom							
The interaction with his classmates through applications such as WhatsApp, Facebook, Twitter, etc., seemed to them		1	4	8	21	5 (14.7%)	29 (85.3%)
The organization of the virtual classroom seemed to them			3	13	18	3 (8.8%)	31 (91.2%)
His virtual classroom seemed attractive			3	11	20	3 (8.8%)	31 (91.2%)

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The instructions in the virtual classroom were			1	6	27	1 (2.9%)	33 (97.1%)
The management of the virtual classroom seemed to them	5	2	2	4	21	9 (26.5%)	25 (73.5%)

Figure 1

Positive and negative responses by dimension

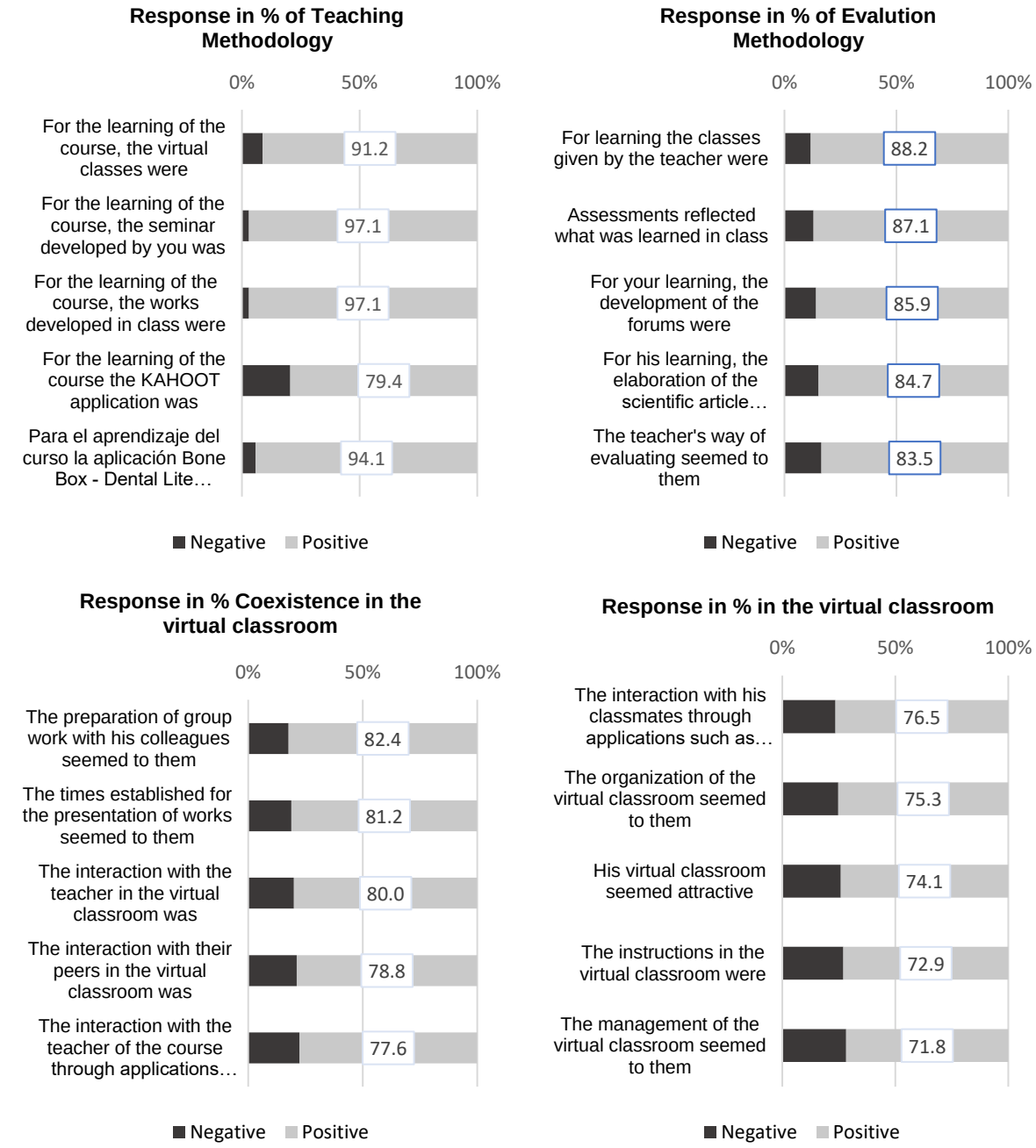

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Table 2

Analysis of the four teaching-learning dimensions of e-learning dental anatomy during the Covid-19 pandemic.

Scale	Very bad	bad	Neither bad no good	Good	Very good	Negative response	Positive response	Total
Factors	f %	f %	f %	f %	f %			f %
Teaching Methodology	3 (1.8%)	1 (0.6%)	10 (5.9%)	42 (24.7%)	114 (67.1%)	14 (8.2%)	156 (91.8%)	170 (100%)
Evaluations			7 (4.1%)	34 (20.0%)	129 (75.9%)	7 (4.1%)	163 (95.9%)	170 (100%)
Coexistence in the virtual classroom			15 (8.8%)	34 (20.0%)	121 (71.2%)	15 (8.8%)	155 (91.2%)	170 (100%)
Virtual classroom	5 (2.9%)	3 (1.8%)	13 (7.6%)	42 (24.7%)	107 (62.9%)	21 (12.4%)	149 (87.6%)	170 (100%)

* ($p < 0.05$)

** ($p < 0.05$)

Table 3

Analysis of the four teaching-learning dimensions of e-learning dental anatomy during the Covid-19 pandemic.

Scale		Very bad No use Nothing				Excellent Very useful / Quite	Negative response	Positive response
Factors		1	2	3	4	5		
Teaching Methodology	Man			1	12	37	1	49
	Woman	3	1	9	30	77	13	107
Evaluations	Man				11	39	0	50
	Woman			7	23	90	7	113
Coexistence in the virtual classroom	Man			4	4	42	4	46
	Woman			11	30	79	11	109
Virtual classroom	Man	1		1	7	41	2	48
	Woman	4	3	12	35	66	19	101

Statistical difference of man and woman U Mann-Whitney responses p - value = 0.000 **

** ($p < 0.01$)

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Table 4

Factorial loads of the items

Virtual classroom with relevant characteristics	
D4- You found your virtual classroom attractive	0.849**
D4- The instructions in the virtual classroom were	0.842**
D4- The organization of the virtual classroom seemed	0.787**
D1- For the learning of the course, the virtual classes were	0.682**
D1- For the learning of the course, the seminar developed by you was	0.668**
KMO statistics = 0.500; Chi square X2 = 443.434, p <0.001 Reliability index: Cronbach's α = 0.856; α Men = 0.814 α Women = 0.844 Descriptive Factors or dimensions: Teaching methodology (M = 4.55, DE = 0.46), Evaluations (M = 4.72, DE = 0.37), Coexistence in the virtual classroom (M = 4.62, SD = 0.41), Virtual classroom (M = 4.43, SD = 0.60), Spearman correlation between pairs of Factors p <0.01 **	

** (p < 0.01)

DISCUSSION

The adaptation of e-learning education has been carried out in recent years, but it has become more important as a result of the Covid-19 pandemic. Educational institutions in the areas of health have not been the exception, many medical schools have substituted face-to-face education by telemedicine formats (Ahmed et al., 2020; Goh & Sandars, 2020), which cannot be extrapolated to dental education due to the high proportion of dental clinical education (Quinn et al., 2020). In this context, the objective of this research was to evaluate the e-learning dental anatomy during the Covid-19 pandemic. As a result, there is a constant concern regarding the acquisition of clinical competence in virtual environments. Given this fact, practical solutions have been found, such as clinical reasoning, case reports, and self-reflection activities (Iyer et al., 2020; Quinn et al., 2020; D. T. Wu et al., 2020; K. Y. Wu et al., 2020). During confinement, dental students received virtual classes, under the concept of being considered the "millennial generation", there are studies that show their familiarity with online learning (Miller & Metz, 2015), achieving that virtual environments have a good acceptance coinciding with the data reported by Inquimber (Inquimbert et al., 2019). Over time, new methods have been developed for teaching dental anatomy such as 3D images (Magne, 2015), online learning that includes educational videos, interactive systems, systems that monitor the ability of

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students, among others, demonstrating its importance in motivating and teaching dental students (Zitzmann et al., 2020). In this sense, the objective of this research was to evaluate e-learning dental anatomy during the Covid-19 pandemic. Thus, Inquimber (Inquimbert et al., 2019) and Dhulipalla (Dhulipalla et al., 2015) highlight that the pedagogical support most requested by the students was video and more so when they are treated in 3D, demonstrating better visual understanding. Miller (Miller & Metz, 2015) and Kavadella (Kavadella et al., 2012) affirm that videos can improve students' ability to apply the knowledge acquired in the basic sciences to new clinical situations by promoting the integration between the basic sciences with the clinical disciplines, a trend that has been practiced for the last 15 years (Landes et al., 2014; Rafai et al., 2016; Scheven, 2012). In the School of Dental, the dental anatomy classes were e-learning, however, it remained with the commitment to reinforce the dental carving classes since it cannot be substituted (R. de A. de Azevedo et al., 2015). An alternative that is presented Faced with this problem, haptic simulators such as MOOG SimodontVR Virtual Dental Trainer (Inc, s. f.) studies carried out on haptic simulators suggest that they can be used as a complement in clinical practice but not replace conventional practice (Murbay et al., 2020; Zafar et al., 2020). There is no clear evidence that haptic simulators improve the development of psychomotor skills in dentistry (M. Bakr et al., 2014). Hence the importance of wax carving of natural teeth for the development of psychomotor ability (R. A. de Azevedo et al., 2018). One of the methodologies used in the virtual classroom was the flipped classroom with the aim of increasing student participation and support learning, as corroborated by studies carried out by 38 another of the points evaluated in the questionnaire was the interaction of the students with the teacher, the satisfaction of the students about this point is probably due to the use of the flipped classroom, these results were also reported by Wang (Wang & Liu, 2019) (Quoß et al., 2017). Gamification methods were used in the present study, they adapt the mechanics of games to educational environments to improve the teaching-learning process (Fuster-Guilló et al., 2019). The application used to apply gamification in the present study was Kahoot, which had a good calcification by the students of the Dental Anatomy course. When reviewing the literature about the learning experience based on the Kahoot Fuster (Fuster-Guilló et al., 2019), it reports that studies on the

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improvement of student performance derived from the use of gamification and serious games in courses with different contexts are not conclusive. On the other hand, Castro (Castro et al., 2019; Ismail et al., 2019) reports that Kahoot favors competitiveness and motivates students to actively participate in their learning process.

CONCLUSIONS

The students had more positive than negative responses, the dimension that obtained the highest percentage of positive responses was the evaluation dimension. In general, students evaluate the teaching-learning evaluation of dental anatomy e-learning during the Covid-19 pandemic as very good, showing itself in all dimensions.

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