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Artículos científicos

Validación de un instrumento que mide el perfil actitudinal de los docentes y el desarrollo de competencias universitarias y transversales

Validation of an instrument, which measures the teacher's attitudinal profile and the development of university and transversal competencies

Validação de um instrumento que mede o perfil atitudinal de professores e o desenvolvimento universitário e de competências transversais

Espinosa-Solís Josué Israel

Universidad Autónoma de Chihuahua, México

jiespinosa@uach.mx

<https://orcid.org/0000-0002-2808-8038>

Pizarro-Norma

Universidad Autónoma de Chihuahua, México

npizarro@uach.mx

<https://orcid.org/0000-0002-4748-4271>

Parra-Acosta Haydeé

Universidad Autónoma de Chihuahua, México

hparra05@hotmail.com

<https://orcid.org/0000-0002-6964-4205>

González-Carrillo Eliazar

Universidad Autónoma de Chihuahua, México

egonzales@uach.mx

<https://orcid.org/0000-0002-7571-7570>

Talavera-Sánchez Oscar Joel

Universidad Autónoma de Chihuahua, México

otalavera@uach.mx

<https://orcid.org/0000-0002-4881-4658>



Bueno-Acuña Gerardo

Universidad Autónoma de Chihuahua, México

gbueno@uach.mx

<https://orcid.org/0000-0003-1345-9876>

Resumen

En el presente artículo se describen los resultados de la validación de un instrumento que mide el perfil actitudinal de los docentes y el desarrollo de competencias universitarias y transversales, iniciativa que surgió debido a que no se halló un instrumento específico para evaluar de forma integrada las actitudes del docente y las competencias de los estudiantes de la carrera Odontología. Metodológicamente, se planteó un estudio cuantitativo que se desarrolló por procedimiento deductivo. Para ello, se diseñaron dos instrumentos dirigidos a docentes y estudiantes que comprendieron un total de 117 y 118 ítems. Para la validación de contenido se empleó el juicio de expertos, los cuales valoraron su univocidad y pertinencia con base en Carrera, Vaquero y Balsells (2011). La validación de consistencia interna fue mediante el alfa de Cronbach, según las indicaciones de Hernández Sampieri y Mendoza (2018). En los resultados se observó, de acuerdo con los índices de univocidad (IU) y pertinencia (IP), que 109 ítems conservaron su redacción original, ocho fueron modificados y tres se eliminaron. El resultado de confiabilidad del cuestionario fue $\alpha = .972$ para el cuestionario de docentes y $\alpha = .989$ para el de estudiantes. Por ende, se puede concluir que se consiguió un instrumento de medición con alto nivel de confiabilidad, lo que garantiza que la información recabada se pueda generalizar a la población objetivo.

Palabras clave: instrumento, juicio de expertos, perfil actitudinal, validación.

Abstract

The current article describes the results from the validation of an instrument that measures the attitudinal profile of teachers and the development of university and transverse competencies, after a specific tool was not found that could evaluate in an integrated manner the attitudes from the teacher and the competencies from odontology students. Methodologically, a quantitative study was outlined, that was developed through deductive procedure, two tools were developed, directed at teachers and students that spanned a total of 118 and 117 items, for the validation of content which was through the judgement of experts who assessed the univocally and appropriateness on the basis of Carrera, Vaquero and Balsells (2011). The validation of internal consistency was made through the Cronbach Alpha on the basis of Hernandez Sampieri & Mendoza (2018). In the results it was seen through the indexes univocally (IU) and appropriateness (IP) from which 106 items kept their original composition, eight were modified and three were eliminated. The reliability result from the questionnaire were $\alpha=.972$ for the teacher questionnaire and $\alpha=.989$ for students. Conclusions: To have a measuring tool with high reliability level, which guarantees the information obtained can be generalized to the objective population.

Keywords: instrument, expert judgment, attitudinal profile, validation.

Resumo

Este artigo descreve os resultados da validação de um instrumento que mede o perfil atitudinal de professores e o desenvolvimento de competências universitárias e transversais, uma iniciativa que surgiu porque não foi encontrado um instrumento específico para avaliar atitudes de forma integrada. as competências dos alunos da carreira de Odontologia. Metodologicamente, foi proposto um estudo quantitativo desenvolvido por procedimento dedutivo. Para isso, foram elaborados dois instrumentos para professores e alunos que contemplavam um total de 117 e 118 itens. Para a validação de conteúdo, foi utilizado o julgamento de especialistas, que avaliaram sua singularidade e relevância com base em Carrera, Vaquero e Balsells (2011). A validação da consistência interna foi por meio do alfa de Cronbach, conforme as indicações de Hernández Sampieri e Mendoza (2018). Nos resultados, observou-se, de acordo com os índices de univocidade (IU) e relevância (IP), que 109 itens mantiveram sua redação original, oito foram modificados e três eliminados. O resultado da confiabilidade do questionário foi $\alpha = 0,972$ para o questionário do professor e

$\alpha = 0,989$ para o questionário do aluno. Portanto, pode-se concluir que foi alcançado um instrumento de medida com alto nível de confiabilidade, o que garante que as informações coletadas possam ser generalizadas para a população-alvo.

Palavras-chave: instrumento, julgamento de especialistas, perfil atitudinal, validação.

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Introduction

The university professor in his professional profile must have not only knowledge, attitudes and values within his discipline, but also pedagogical tools that support his teaching. In this regard, Valerio and Rodríguez (2017) define the teacher's attitudinal profile as the attributes that he possesses to guide essential learning in educational practice. In this sense, it is worth mentioning the competences that Fierro et al. (2019) propose in the new educational model called university renewal UACH-DS 2020. Within this, and in the process of transition from the current curriculum, Fierro et al. (2019) point out that in the new educational model, the university and transversal competences that all students must develop, as well as the performances that they must show during their learning process, are socialized in the academic units.

For this, the work of the teacher is essential, as this professional must try to promote the mastery of multiple competences in the student. Therefore, it is vital to validate the content and internal consistency of an instrument that serves to measure the attitudinal profile of teachers and their relationship with the development of university competencies (in this case in the students of the Faculty of Dentistry), the which are described below:

- Formal and quantitative reasoning to explain, model and predict everyday social, economic and natural realities.
- Research and scientific analysis to problematize natural reality in various contexts through rigorous empirical observations in order to answer questions of cause and effect, formulate and test hypotheses through experimentation and interpretation of data to make valid inferences, recognizing the scope and knowledge limitations.
- Research and social and historical analysis to recognize different forms of social, political, economic and cultural organization, and to understand human behavior in a meaningful way in its context and time.

- Multiculturalism and society to manage to address problems from different cultural perspectives, historical and social experiences to integrate understanding and tolerant world views, respecting and integrating diversity.
- Aesthetic and interpretive appreciation for the recognition of the aesthetic value and interpretation of works and cultural products.
- Creativity, innovation and entrepreneurship to generate changes in the economic, social and cultural sectors, through the implementation of an original response to a critical situation and in conditions of uncertainty that guarantees sustainability (Fierro *et al.*, 2020, pp. 30-33).

Likewise, in terms of transversal competences, the following can be mentioned:

- Oral and written communication in Spanish and English to establish effective communication in culturally significant situations.
- Information management to select relevant and pertinent information sources according to the situation, problem or project, and integrate the knowledge base to support arguments and solutions.
- Digital skills for the production, storage and retrieval of information, organization and visualization of data, communication, creation, use and management of interaction spaces in digital media.
- Intrapersonal and interpersonal ethical and moral reasoning for the reasoned consideration of the nature of the norms or of the ethical-moral arguments and to develop a critical reflection of the own and social norms of conduct.
- Sustainability to meet the economic, social, cultural diversity, a healthy environment and conservation and preservation needs.
- Metacognition for the knowledge and regulation of cognitive processes, that is, to become aware of the functioning of their way of learning, understand why the results of their activity are positive or negative, plan their activities and identify strategies and resources to improve their results (Fierro *et al.*, 2020, pp. 30-33).

The content validity of the variables of this instrument is conceptualized as the level of representation of each item, which reflects a specific domain of content (Hernández, Fernández & Baptista, 2014). This was developed through the expert judgment method, which defines the opinion of people with experience in the subject, recognized by others as qualified professionals in the topic to be evaluated. The selection of experts are people whose

specialization, professional, academic or investigative experience related to the research topic allows them to assess each of the items included in the tool, which must have clarity in the objectives and in the theoretical position (Soriano, 2014).

In the literature review, Hernández-Sampieri and Mendoza (2018) describe validity as the degree to which an instrument measures the variable it intends to evaluate. Likewise, Cohen and Swerdik (2020) mention that the validity of the content denotes how convenient the sample carried out is to a universe according to what is being measured to designate the attributes of the population as reactants or items.

Other authors - such as Escobar-Pérez and Cuervo-Martínez (2008) - point out that to write or define an adequate conceptualization and operationalization of the construct is needed, that is, the researcher must previously specify the dimensions to be measured and their indicators, based on which the items will be made. The variable measured by the instrument and the use that will be given to the scores obtained are fundamental aspects both for the estimation and for the conceptualization and validity of the content.

The process to enable the content validation of the instrument through expert judgment is efficient when specifying what is expected of them. Although this process can be carried out through various methods, using this technique has the result that the item or construct guarantees the scientific rigor of the process. (Pedrosa, Suárez-Álvarez y García-Cueto, 2013).

In the specific case of the reliability coefficient, it is linked to the homogeneity or internal consistency of each item, which is detailed through the alpha coefficient proposed by Lee J. Cronbach (1916-2001) in 1951. This has shown, since the last century, which represents a generalization of the KR-20 and KR-21 formulas of internal consistency developed in 1937 by Kuder and Richardson (Kerlinger and Howard, 2002), which were only applicable to binary rating or rating formats. dichotomous responses. Therefore, with the creation of the Cronbach scale, the researchers were able to evaluate the reliability and internal consistency of an instrument made up of a Likert scale or any multiple-choice scale.

Hernández, Fernández and Baptista (2014) explain that "the reliability of a measurement instrument is determined through various techniques and refers to the degree to which its repeated application to the same subject of study, which produces the same results" (p. 200). In this regard, it is important to differentiate between reliability and validity, as indicated by Morales (2007), since they are not synonymous, since an instrument can be

valid when measuring what it was designed for, but without the classification and order of the subjects of study.

In this sense, due to the recent implementation of the UACH-DS educational model, there is a lack of an instrument that evaluates the teacher's attitudinal profile, as well as the university and transversal competences of the teacher of the Faculty of Dentistry of the Autonomous University of Chihuahua (UACH).

In a research review, similar studies were found, although there is a knowledge gap in relation to this study phenomenon. Therefore, the opportunity arises to develop the instruments and validate them in their content and reliability, for which the following question was raised: what is the validity of the instrument by expert judgment of the teacher's attitudinal profile and its relationship with the development of university and transversal competences?

Therefore, in this validation the following objective was set: to show the results of the content validation and internal consistency of two instruments that measure the following variables:

- Independent variable: Attitudinal profile of dentistry teachers at the UACH.
- Dependent variable: Development of university and transversal competences (table 1).

Tabla 1. Definición de variables

Variables	Nominal	Conceptual	Operacional
Independiente Perfil actitudinal del docente	Son aquellas características más importantes del profesor como facilitador del proceso de aprendizaje, es decir, vinculación de la teoría y la práctica, clases dinámicas e interactivas y uso de experiencias reales (Valerio y Rodríguez, 2017).	El perfil actitudinal del docente universitario se define como aquella persona que manifiesta tres grandes cualidades: conocimiento pedagógico, habilidades didácticas y valores morales y éticos, entre los que se encuentran los siguientes: humanismo, vocación, responsabilidad, compromiso y conocimiento para realizar una planeación que se pueda usar en diversos contextos y una evaluación sistemática, diversificada y justa (Merellano-Navarro Almonacid-Fierro, Moreno-Doña y Castro-Jaque 2016).	Para la operacionalización del perfil actitudinal del docente se agruparon en 38 variables, entre las que se evaluaron lo siguiente: ser profesional, respetuoso, humanista facilitador, autocrático, entre otros. Como instrumento se utilizó una escala tipo Likert con valores centesimales con los siguientes indicadores: Univocidad óptima = 3, Univocidad alta = 2, Univocidad baja, = 1 y Univocidad nula = 0.
Dependientes Competencias universitarias Competencias transversales	Competencias universitarias y transversales son variables nominales de tipo politómicas que tienen tres o más unidades que se van a medir; en este caso, el conjunto de atributos que poseen los tipos que las definen como tal (Villasís-Keever y Miranda-Novales, 2016).	Competencias universitarias: Son aquellos conocimientos, habilidades, actitudes y valores que todo estudiante universitario debe desarrollar; tienen el propósito de formarlos en las categorías, metodologías de investigación y	Los aspectos por evaluar incluyen las variables de cada una de las competencias que comprenden las universitarias con 45 ítems y 26 de las competencias transversales con los siguientes indicadores: Univocidad óptima = 3, Univocidad alta

		<p>enfoques reflexivos y formación humanista, que le permitan abordar la realidad y situaciones del contexto (Fierro <i>et al.</i>, 2020).</p> <p>Competencias transversales: Hacen referencia a las capacidades que todo estudiante deberá dominar al término de la formación. Se desarrollan en forma metodológica, crítica y valoral a través de las unidades de aprendizaje, llevadas a cabo en los ciclos formativos y están vinculadas a una formación integral (Fierro <i>et al.</i>, 2020).</p>	<p>= 2, Univocidad baja, = 1 y Univocidad nula = 0.</p>
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Fuente: Elaboración propia

Materials and method

The methodology used was quantitative, descriptive and transversal, and was developed for the validation of reliability, relevance, relevance and theoretical coherence of the instruments described through the following phases:

Phase 1. Bibliographic review and construction of the instruments to determine the attitudinal, procedural and cognitive performances that define the teacher's attitudinal profile, as well as the university and transversal competences of the UACH-DS 2020 renovation educational model. electronic instruments in the Google Forms form, in centesimal scale, and the value for each of them was optimal univocity = 3, high univocity = 2, low univocity = 1 and null univocity = 0. It was aimed at teachers and students , with a total of 117 and 118



items, respectively, organized in four main axes: I) sociodemographic data, II) teaching attitudes, III) university skills and IV) transversal skills, which are shown in table 2.

Tabla 2. Estructura del instrumento

Apartados	Ejes	Número de ítems
I	Datos signalíticos	8
II	Actitudes docentes	38
III	Competencias universitarias	45
IV	Competencias transversales	26
TOTAL		117

Fuente: Elaboración propia

Phase 2. The content validation of the instrument was carried out through expert judgment, a technique that guarantees that the items or construct respond to the scientific rigor of the process (Pedrosa et al., 2013). The instrument was sent to 10 teachers with a background in research. The information issued by each of them was analyzed through the procedure defined by Carrera, Vaquero and Ballsels (2011) to determine the index of univocity (UI) and relevance (iP), with the application of the following formulas:

$$i_U = \frac{(\sum n_{UO} \cdot V_{UO}) + (\sum n_{UE} \cdot V_{UE}) + (\sum n_{UB} \cdot V_{UB}) + (\sum n_{UN} \cdot V_{UN})}{\sum n_{TU} \cdot V_{MU}}$$

As

i_U = Uniqueness index

\sum = Summation

n_{UO} = Number of responses obtained from the optimal univocity level

V_{UO} = Value assigned to the level of uniqueness

n_{UE} = Number of responses obtained from the high univocity level

V_{UE} = Value assigned to the high uniqueness level

n_{UB} = Number of responses obtained from the low univocity level

V_{UB} = Value assigned to the low uniqueness level



n_{UN} = Number of responses obtained from the null univocity level

V_{UN} = Value assigned to the null univocity level

n_{TU} = Total number of responses obtained for the level of unambiguity

V_{MU} = Maximum value of the levels of the uniqueness scale

$$i_p = \frac{(\sum n_{PO} \cdot V_{PO}) + (\sum n_{PE} \cdot V_{PE}) + (\sum n_{PB} \cdot V_{PB}) + (\sum n_{PN} \cdot V_{PN})}{\sum n_{TP} \cdot V_{MP}}$$

As

i_p = Relevance index

n_{PO} = Number of responses obtained from the optimal relevance level

V_{PO} = Value assigned to relevance level

n_{PE} = Number of responses obtained from the high relevance level

V_{PE} = Value assigned to the low relevance level

n_{PB} = Number of responses obtained from the low relevance level

V_{PB} = Value assigned to the low relevance level

n_{PN} = Number of responses obtained from the null relevance level

V_{PN} = Value assigned to the null relevance level

n_{TP} = Number of total responses obtained for the relevance level

V_{MP} = Maximum value of the levels of the relevance scale

Fuente: Carrera, *et al.* (2011)

After the development of the formula, the abbreviations shown in Table 3 are used, according to the assigned value of the level of uniqueness and relevance of each item.

Tabla 3. Abreviaturas de univocidad y pertinencia para cada ítem.

Óptima		Óptima	
V_{UE}	Valor asignado al nivel de univocidad elevada	V_{PE}	Valor asignado al nivel de pertinencia elevada
V_{UB}	Valor asignado al nivel de univocidad baja	V_{PB}	Valor asignado al nivel de pertinencia baja
V_{UN}	Valor asignado al nivel de univocidad nula	V_{PN}	Valor asignado al nivel de pertinencia nula
V_{MU}	Valor máximo de los niveles de la escala de univocidad	V_{MP}	Valor máximo de los niveles de la escala de pertinencia

Fuente: Carrera *et al.* (2011)

When using these formulas, the values assigned to the level of uniqueness and relevance for each item were a maximum of 1 and a minimum of 0 in each construct of the questionnaire, for which reason it was decided to keep the item without any change, modify it or eliminate it in accordance with the values obtained by the judges in the validation, as shown in the criteria in table 4.

Likewise, the results of the validation of the judges in the questionnaire addressed to teachers and students coincide, since the items are the same in each instrument. The only differences are the sociodemographic data and to whom the item is directed,

Tabla 4. Criterios para conservar, modificar o eliminar ítems según el índice de univocidad y pertinencia

Criterios según i_U		Criterios según i_P	
$i_U \geq .80$	Los ítems se mantienen en su forma original.	$i_P \geq .80$	Los ítems se mantienen en su forma original.
$i_U \leq .79 \geq .60$	Los ítems se modifican en su redacción.	$i_P \leq .79 \geq .60$	Los ítems se modifican en su redacción o ubicación.
$i_U \leq .59$	Los ítems se eliminan.	$i_P \leq .59$	Los ítems se eliminan.

Fuente: Carrera *et al.* (2011)

The contributions that the judges made in their evaluation were taken into account, which allowed modifying the items with the intention of improving the wording in the variable. After validation, the pilot test was sent to 32 teachers and 57 students from the UACH School of Dentistry, who agreed to participate in this process to determine if the instrument met reliability and consistency, and if it could be applied in the sampling phase.

The information produced by the piloting was analyzed with the statistical program Statistical Package for the Social Sciences (SPSS, v. 22).

Results

The review of the results by the judgment of experts in teaching allowed to carry out the analysis of univocity and relevance that is presented through the following table (5).

Tabla 5. Resultados de la validez del instrumento por jueces que determinan el índice de univocidad y pertinencia

Resultados según i_U		Resultados según i_P	
$i_U \geq .80$	107 ítems se mantienen en su forma original.	$i_P \geq .80$	110 ítems se mantienen en su forma original.
$i_U \leq .79 \geq .60$	10 ítems se modifican en su redacción.	$i_P \leq .79 \geq .60$	7 ítems se modifican en su redacción o ubicación.
$i_U \leq .59$	0 ítems se eliminan.	$i_P \leq .59$	0 ítems se eliminan.

Fuente: Elaboración propia

In the univocity indices (i_U) and relevance (i_P), 109 Items kept the original construct, 8 were modified in their wording and 3 were deleted. It is relevant to consider the recommendations proposed by four expert judges to be eliminated; In this sense, the results of the validity of the attitudes and competences instruments are presented in the following table: (6).

Tabla 6. Relación de los ítems modificados según el índice de univocidad y pertinencia

Ítem original	i_U	I_P	Ítem modificado o eliminado
Amigable	0.8	0.733	Cordial
Autoritario(a)	0.733	0.733	Arbitrario (a)
Conflictivo	0.633	0.666	Eliminado
Impulsivo	0.733	0.733	Eliminado
Inseguro	0.7	0.666	Eliminado
Represivo	0.7	0.666	Restringido (a)
Identifique la problemática del contexto real y la describa mediante modelos matemáticos.	0.7667	0.8333	Identifique la problemática del contexto real y la describa mediante ecuaciones matemáticas
Modele procesos complejos, evalúe datos, valore probabilidades y evalúe riesgos, prediga resultados o modifique los procedimientos para la resolución de problemas de su entorno.	0.7667	0.7667	Modele, evalúe y prediga resultados para la resolución de problemas de su entorno.
Distinga la investigación social para profundizar en las causas con información sobre las opiniones, creencias y valores de una sociedad en un momento dado.	0.7667	0.8667	Distinga la investigación social para profundizar en las causas, opiniones, creencias y valores de la sociedad.
Utilice las fuentes de información para argumentar y modelar explicaciones sobre los fenómenos sociales e históricos.	0.7667	0.8667	Utilice las fuentes de información para argumentar sobre fenómenos sociales e históricos.
Perciba la estética en las manifestaciones artísticas, culturales y científicas para mostrarla en sus expresiones socioafectivas e intelectivas, así como en las relaciones con el otro y consigo mismo.	0.7667	0.8667	Perciba la estética en las manifestaciones artísticas y científicas en sus expresiones afectivas e intelectuales.

Fuente: Elaboración propia

The result of the reliability and consistency analysis in the questionnaire addressed to the teachers showed a Cronbach's alpha of $\alpha = .972$, and for the students' instrument it was $\alpha = .989$ without having the need to modify any of the proposed items in this instrument and is presented in Table 7.

Tabla 7. Validación del alfa de Cronbach del instrumento

Casos	Cuestionario para docentes		Cuestionario para estudiantes	
	n	%	N	%
Válido	29	87.9	57	100
Excluido ^a	4	12.1	0	0
Total	33	100.0	57	100
	Alfa de Cronbach	N.º de elementos	Alfa de Cronbach	N.º de elementos
	.972	109	.989	106

Fuente: Elaboración propia

Discussion

The validation of the instruments presented in this article makes it possible to evaluate the attitudinal profile, the university and transversal competences of the educational model of the UACH (2020) that converge in the training of Dentistry students. In this sense, the participation of expert judgment with suggestions issued to fulfill the purpose of this methodological and research process stands out.

Regarding the results, a literature search related to the validity of the instruments was carried out. In this regard, an investigation by González and Suárez (2016) for the adaptation, validation and standardization of questionnaires for graduates and employers in the State of Mexico can be mentioned. In this sense, an important part was the adjustment of the instrument so that the items could measure the objects of study and the variables for which it was designed. In a similar way, the constructs were adapted in relation to the teacher's attitudinal profile, the university competencies and the transversal competences of the UACH dentistry students.

Regarding the validity by the expert judgment carried out in this research to the instruments, the results of Cronbach's alpha for teachers was $\alpha = .972$ and for students $\alpha = .989$, which is in agreement with the results of a double methodological assessment carried out by De la Cruz and Gordillo (2020), with a validation of univocity and relevance through piloting by expert judgment, with results of internal coherence of Cronbach's alpha of ≥ 0.80 , which is why the sequential and methodological validation process that guaranteed the validation process for the results that yielded a high consensus by the expert judgment.

Along the same lines, Sotelo, Sosa and Carreón (2020) validated an instrument to evaluate the performance of a quality management system in a higher education institution. Cronbach's alpha was obtained by crossing the variance of each item through the SPSS statistical software (v. 23), with a reliability result of .981 in 42 items; therefore, it was taken as a reference for this study, since it yielded similar results to establish whether the reliability parameter was acceptable or not.

Another study that should be emphasized is the one developed by Parra, Garay and Aguilar (2019) for the validity and consistency of a questionnaire that measured factors associated with the health, academic and professional performance of medical residents of Mexico. This questionnaire was validated by expert judgment with a uniqueness and relevance index of $\leq .79$ and $\geq .60$. The measurement of Cronbach's alpha coefficient was a $= .820$, results that are considered as theoretical references to modify constructs.

In this sense, it was decided to transform eight items of this instrument (10, 11, 42, 58, 62, 64, 71 and 74) and questions 18, 31 and 33 were eliminated to improve the writing and understanding by the participants. participants.

Conclusions

As shown in the results of this research, the instruments reflect a good level of validation of univocity, relevance and internal consistency, as well as the statistical analysis by means of Cronbach's alpha of the university and transversal competences proposed in the educational model of the UACH (2020).

In this context, the validation process of the instruments made it possible to present the results of an articulated process with scientific rigor. Consequently, it can be assured that the proposed objective was achieved, since success was guaranteed through the methodological and systematic analysis that favored the validation of constructs through this process.

Future lines of research

The results present a reference framework to contribute to the generation of knowledge by carrying out research projects in different lines or with other disciplines under a quantitative and educational approach, since the importance and rigor of the validation process guarantees the real and reliable information.

Limitations and strengths of the study

The university institutions are in constant renovation, and the UACH is not the exception; Consequently, the validated instrument sought to collect information from an educational model under construction to evaluate the development of university and transversal competences of students and teachers of the discipline of Dentistry in order to identify areas of opportunity and contribute elements to consider in the structure, organization and execution. This research, in short, offers researchers the procedure for the validation of a quantitative instrument that could be used in other contexts, although with the adjustments that are required by each context.

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Rol de contribución	Autor(es)
Conceptualización	Josué Israel Espinoza Solís - igual Norma Pizarro - igual Haydeé Parra Acosta – igual Eliazar González Carrillo – igual – Oscar Joel Talavera Sánchez – igual Gerardo Bueno Acuña - igual
Metodología	Josué Israel Espinoza Solís – igual Eliazar González Carrillo - igual
Investigación	Josué Israel Espinoza Solís – igual Norma Pizarro – igual Haydeé Parra Acosta - igual Eliazar González Carrillo - igual Oscar Joel Talavera Sánchez – igual Gerardo Bueno Acuña - igual
Análisis formal	Josué Israel Espinoza Solís – igual Oscar Joel Talavera Sánchez - igual
Curación de datos	Josué Israel Espinoza Solís – igual Oscar Joel Talavera Sánchez - igual
Escritura, preparación del borrador original	Norma Pizarro – principal Josué Israel Espinoza Solís - apoyo
Escritura, revisión y edición	Norma Pizarro - igual Josué Israel Espinoza Solís
Supervisión	Norma Pizarro
Asesoría de proyectos	Josué Israel Espinosa Solís
Adquisición de fondos	Gerardo Bueno Acuña