

Competencias docentes para la educación en línea

Teachers competencies for on-line education

Competências de ensino para educação online

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Resumen

Las competencias para la docencia en línea es un tema que requiere especial atención en sistemas educativos como el mexicano, el cual necesita alternativas para facilitar el acceso a la educación superior y para superar las limitaciones de tiempo y espacio que tiene la mayor parte de la población. En tal sentido, en el presente documento se ofrece una investigación de corte cuantitativo. En concreto, y a partir de la construcción de un modelo teórico de competencias para la docencia en línea, se analizaron (desde la perspectiva de los estudiantes y empleando como referente de contraste las opiniones de gestores de cada uno de los programas que participaron en el estudio y el modelo educativo institucional) las competencias de los docentes en línea considerados con un alto nivel de desempeño en el contexto de seis universidades públicas de México. Los resultados obtenidos presentan a la docencia en línea como de alto nivel de competencia en las seis universidades analizadas. Asimismo, la respuesta de los estudiantes permite identificar un perfil homogéneo del docente en línea en el panorama educativo nacional; sin embargo, existen áreas de oportunidad y de mejora que permitirán consolidar a la formación en línea como una alternativa de calidad para la educación superior en México.

Palabras clave: competencias, docencia, educación en línea.

Abstract

“On-line teaching competencies” is a topic that requires special attention within the Mexican educational system where new alternatives are required; these alternatives should overtake the limitations of time and space that most people have and provide them with access to education.

This is a quantitative research based on a theoretical framework for on-line teaching which focuses on the analysis of the on-line competencies demonstrated by teachers with high-level performance in six Mexican Public Universities. The study is conducted from the students’ perspectives and the comparison is based on the opinion from the managers of the programs, as well as the educational framework of each institution. The results of this research present on-line teaching having a high-level of competence in the six Public Mexican Universities where this study was carried out; students’ answers allowed to identify a homogeneous on-line teacher’s profile within the national educational context. Nevertheless, there are areas that can be improved in order to consolidate on-line education as a high-quality alternative for Mexican higher education.

Keywords: competencies, teaching, on-line education.

Resumo

Competências para o ensino online é um tema que requer atenção especial em sistemas educacionais como o México, que precisa de alternativas para facilitar o acesso ao ensino superior e superar as limitações de tempo e espaço que grande parte da população possui. Nesse sentido, este documento oferece uma investigação quantitativa. Especificamente, e a partir da construção de um modelo teórico de competências para o ensino online, foram analisadas as opiniões dos gestores de cada um dos programas participantes do estudo (na perspectiva dos alunos e tendo como referência de contraste o modelo educacional institucional) as competências dos professores online considerados de alto nível de desempenho no contexto de seis universidades públicas no México. Os resultados obtidos apresentam o ensino online com elevado nível de competência nas seis universidades analisadas. Da mesma forma, a resposta dos alunos permite identificar um perfil homogêneo do professor online no panorama educacional nacional; No entanto, existem áreas de oportunidades e melhorias que permitirão consolidar a formação online como uma alternativa de qualidade para o ensino superior no México.

Palabras-chave: habilidades, ensino, educação online.

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Introduction

One of the great challenges of the 21st century for developing countries (such as Mexico) is to serve the school population that requires higher education, because although it has been shown that access to it has increased - from 10.9% in 2000 to 30% in 2017 According to data from the Organization for Economic Cooperation and Development (OECD) (2019) -, the records indicate that only 17% of the population between 25 and 64 years old has a bachelor's degree or higher. In fact, in 2017 in Mexico only 3.7% (that is, 4.4 million people) were enrolled in a higher education program, figures that are really insufficient to meet the needs of a growing country. This situation is accentuated because 55.3% of the population is economically active (National Institute of Geography and Informatics Statistics [Inegi], 2019) and the limitations of times, spaces and conditions that this implies make it unlikely that they can continue their studies of conventional way.

To this reality it must be added that in recent years social security has decreased (Jasso López, 2013), which prevents economically active people from accessing programs during the evening hours or at night. In addition, at the beginning of 2020 the global health crisis derived from Covid-19 appeared, so in Mexico (as of March 24 of that year) there was a need to establish restrictions on access to education, not only for the economically active, but also those who were enrolled in a higher education program (Ministry of Public Education [SEP], 2020).

This panorama has represented an opportunity for the growth of online education, which began as distance education in Mexico in the early 1900s with cultural missions (Unesco, 1951) and evolved in each of its stages until reaching the use of the Internet. In this journey, it has gone from an alternative and little demanded modality to another parallel and complementary to the conventional educational system.

Now, online education is characterized by the fact that the axis of the educational process is the student, since since there is no presence, it is he who must take control, organizing his time to meet the learning objectives in the periods established by the institution (Kauffman, 2015). For this reason, it could be mistakenly thought that the role of the online teacher becomes blurred and becomes an unimportant element. However, the reality is that the teacher continues to be one of the pillars; in fact, its function is more complex and demanding than in traditional education, since

it goes from being just a transmitter of knowledge and administrator of the educational process to fulfilling diverse roles for which it is essential to develop specific pedagogical, social, administrative skills, technological (Berge, 1995) and evaluative (Paulsen, 1995).

For this reason, several investigations have tried to determine what competencies an online teacher must develop in order to successfully fulfill their role. In this regard, Castañeda, Esteve and Adell (2018) highlight that usually the competences for online teaching focus on the technological aspect, with a slight emphasis on the pedagogical one. In this sense, an interesting proposal of the authors is that teachers must transcend into real situations and spaces where the student develops personally and professionally so that their training has relevance and meaning.

García et al. (2018), for their part, take up several models for the evaluation of teaching competencies within which they note a disengagement towards social and emotional aspects; therefore, they emphasize the need for online teachers not only to focus on cognitive and technological aspects, but to develop their practice in such a way that they really help manage and monitor their students' learning, providing feedback on their performance and motivating cohesion. group through self-regulation processes. This perspective is interesting because it also emphasizes the social aspect and goes a little deeper into the motivation of emotions, which - according to this position - is achieved through an active, constant and dedicated participation of the teacher towards the study group and the discipline that teaches.

Likewise, Campos Céspedes, Brenes Matarrita and Solano Castro (2011) add to the technological, pedagogical and social competences not only the investigative competences to promote in students a vision capable of addressing the care situations of their profession with a scientific systemic vision, but also the academic leadership competence, understood as the constant search for academic excellence. This proposal does not contemplate special skills in psychological or more practical matters, such as evaluation or resource management.

In a different and complementary view to the above, Tejeda Fernández and Pozos Pérez (2018) delve into technological competence and its implications for the online teacher. This perspective represents an important challenge for anyone who wishes to venture into virtual education, as well as for institutions, since they must train teachers who are capable of differentiating and effectively applying each possibility.

Another interesting study is presented by Fernandes, Sotolongo and Martínez (2016), who seek to identify the necessary competencies for university teachers, which should not be associated only with technological knowledge, but also with pedagogical and investigative knowledge.

It is true that researchers such as Kaendler, Wiedmann, Rummel and Spada (2015), Huda et al. Have dedicated themselves to this topic. (2017), Gómez (2005), DiPietro, Ferdig, Black and Presto (2010), Ryan, Hodson-Carlton and Ali (2005) and Valencia-Molina et al. (2016); However, few studies have focused on the competencies that online teachers must have in order to consider their successful practice in the context of universities in Mexico, even though this modality has grown, so it requires knowing the elements that would allow training and the evaluation of teachers who wish to practice in online educational programs.

Therefore, this article focuses on presenting the findings of a research conducted with the collaboration of six higher education institutions in the country that offer online education programs to try to find answers to the following questions:

1. How do students of public universities in Mexico perceive teaching skills in contrast to a theoretical model for online teaching integrated by pedagogical, technological, social, administrative and evaluative aspects?
2. Do aspects such as the academic degree being studied or the student's previous experience as a facilitator affect their perception of the competence of their online courses?
3. Does the perception of students about the competencies of their online teachers vary depending on the institution where they study?
4. What supports and demands are raised by the management of public universities in Mexico for online teachers, in contrast to the theoretical model of specific competencies for online teaching?

From these questions, the following hypotheses were raised:

H1: The model of specific competencies for online teaching in public universities in Mexico must consider the development of pedagogical, social, administrative, technological and evaluative competencies.

H2: There is high similarity in the perceptions of the students of the study institutions on the elements that make up the specific competencies for online teaching, which is why we can speak of a homogeneous profile of specific competencies of the online teacher in public universities from Mexico.

H3: The undergraduate or postgraduate academic degree that the surveyed students take influences their perception of the level of competencies that the online teacher shows in their practice.

H4: The experience that students have as facilitators influences their perception of the competences shown by their facilitators, considering a higher level when they have experience as facilitators and lower when they do not.

The research was guided by the following objectives:

General objective

- Determine the specific competencies for online teaching in six public universities in Mexico and the elements that comprise them through the analysis of the perceptions that their students have about the teaching practice in online graduate, undergraduate and graduate programs.

Specific objectives

- Weight the influence of variables such as institution of origin, previous experience as facilitators or academic degree in the perceptions of students of online educational programs on the competence of their teachers.
- Recognize the critical aspects that students identify in a teacher with a high level of competence through an analysis of the elements that make up the specific competencies for online teaching.

Materials and methods

Design of the investigation

The research methodology followed two main lines: the construction of a theoretical model of competences for online teaching (Domínguez-González, Limón and Limón, 2010) and the study of the perception of students from six public universities in Mexico about the Relevance of the model to assess the competence of teachers in your online program. This information was triangulated with that obtained from the psychopedagogical models of the six institutions and the resources offered by the institutions from the perception of university managers to the online teaching function.

The research was non-experimental or ex post facto social, based on the analysis of events that have already occurred, that is, the experience that students already had about the competencies of their teachers. It was also applied research, as it focused on a cross-sectional understanding of the nature of online teaching based on research and ideas that were had in this regard. Finally, it is considered as correlational because it sought to determine the degree of association of the five study variables: pedagogical, administrative, social, technological and evaluative competences. (Domínguez-González *et al.*, 2010).

Study population and sample obtained

The method of selecting the sample of both institutions and populations within each institution was intentional for convenience. Specifically, six representative public institutions of higher education in the country were chosen (table 1) dedicated to face-to-face training, but which in their structure had a division dedicated to distance education, which is why they had successfully incorporated it in its educational offers at a higher level with official validity.

The chosen informants were validated according to this criterion: to be regular students in each of the higher level programs (undergraduate, specialty, diploma and postgraduate), whose progress in their respective programs was greater than 50% to confirm that they had had interaction with the less 50% of the teaching staff of the program and were immersed in the dynamics of online education. The study had the total participation of 87 students (Table 1), of which 46% were men and 54% women. The average age was 28.6 years; 62% had undergraduate studies, 2% with specialty studies, 15% master's studies, and 21% doctoral studies. All of them with Internet access, as well as personal computer equipment (at home, in their workplaces or in public places) and with knowledge about the use of educational platforms, office software and online education. This research included representation from leading public higher education institutions from the northern, central, bajío and southeast areas of the country (Domínguez González, 2012).

Tabla 1. Instituciones, programas y población que participó en el estudio

Institución	Zona	Programa	Población
Universidad de Guadalajara (UDG)	Bajío	Licenciatura en Educación	18
Universidad Nacional Autónoma de México (UNAM)	Centro	Diplomado Superior en Marketing	4
Universidad Autónoma de Zacatecas (UAZ)	Centro	Especialidad en Tecnologías Informáticas Aplicadas a la Ed.	19
Universidad Autónoma de Nuevo León (UANL)	Norte	Maestría en Psicología	11
Universidad Autónoma de Tamaulipas (UAT)	Noreste	Maestría en Tecnología Educativa y el doctorado en Educación Internacional	18
Universidad Veracruzana (UV)	Sureste	Licenciatura en Educación Artística	17

Fuente: Elaboración propia

Study variables

To obtain the perceptions of the students, as an initial phase a model of competencies for online teaching was designed based on the homologation of roles proposed by Berge (1995) and Paulsen (1995), for which each role was considered as a specific competence that the line teacher needs for their practice; From this perspective, each aspect that needs to be developed to effectively fulfill a role was translated into an element of the competence associated with the role (Domínguez-González et al., 2010). This proposal was considered pertinent because it contemplates teaching work with a comprehensive vision of all the roles that it must play, and not only from the technological perspective that most of the approaches take, including the vision shared by Unesco (Valencia-Molina et al. ., 2016). Therefore, the competences and study variables were defined as follows:

- Pedagogical competence: Conducts the pedagogical techniques and tools necessary for student learning in accordance with the conditions and characteristics of the educational model.
- Social competence: Designs social interaction strategies in the learning group to promote cohesion in the group.
- Organizational or administrative competence: Manage the teaching resources and communication in the course for the construction of a virtual space suitable for learning.
- Technological competence: Manages the technological tools required by the institutional platform in accordance with the program's study plan.
- Evaluative competence: Designs and applies the necessary evaluation strategies to the course in accordance with the contents and intentions of the program.

Design and validation of instruments

Once these competencies were converted into study variables, the qualitative variables were required to be categorically operationalized so that they were measurable and quantifiable, since they are variables that integrate a series of characteristics on teacher performance, but do not represent a numerical measurement scale; Each category is mutually exclusive, so it was constructed in such a way that each one considered all the possible alternatives of the variable (Ávila, 2006). From this operationalization of the variables, the 64 items that made up the research instrument were constructed with a Likert scale measurement: 16 items to measure pedagogical competence, 11 for social, 16 for administrative, 10 for technological and 11 for the evaluative *.

The student-directed instrument was content validated by experts in online education and competencies, and an instrument design expert fine-tuned the measurement scales. It was designed in digital format with free access software PHPESP, version 1.8.2. A piloting applied to a population of 36 subjects with characteristics similar to the target population allowed having data to perform a Crombach alpha test to determine the reliability of the instrument. The variables analyzed together gave a value of .948, while the individual analysis by variables obtained values higher than 80%, for which a high level of reliability was considered (Table 2).

Tabla 2. Análisis de confiabilidad de la prueba piloto

Dimensión	Alfa de Cronbach	Ítems sujetos a eliminación	Correlación del ítem	Alfa de Cronbach con la eliminación
Pedagógica	.853	10	.016	.909
Social	.905	21	.42	.911
Administrativa	.895	38	.348	.900
Tecnológica	.838	52	.215	.859
Evaluativa	.879	-	-	-

Fuente: Elaboración propia

An exploratory factor analysis of principal components applied to this set of data obtained with the pilot test made it possible to identify homogeneous groups of variables that correlate with each other with values greater than 50% +1 of the highest value, with which it was also possible to identify some dimensions or factors that explain much of the information contained in the data; These dimensions not explicit in the instrument made it possible to understand the critical points of the student's interest in online teaching performance. Thus, 13 factors helped to explain 91.35% of the observed variance, of these factors 6 are the most representative, since they explain 66.96% of the observed variance.

A semi-structured interview format was designed to collect information from the directors or managers of the programs on the support and resources available to teachers to carry out their function. The instrument used was validated by experts, a pilot test was carried out to identify inconsistencies and it was adjusted according to the findings.

Data collection and information processing procedure

The psychopedagogical models operating in each university were analyzed by means of the information obtained in their respective portals. Subsequently, the instrument was applied in the six chosen programs. The students were instructed to take as a basis the teacher they considered the most competent and to proceed to determine if the factors of each competence were covered with a high level of performance. From the total number of surveys received, those that were not answered in their entirety or that had an inconsistent response pattern derived from the platform were eliminated; From this, a total of 87 case studies were obtained, distributed as follows: 19 from UAZ, 18 from UDG, 18 from UAT, 17 from UV, 11 from UANL and four from UNAM. The information was organized in a spreadsheet and the nominal and numerical variables were recorded.

Analysis of the information

The resulting table was analyzed descriptively with Statistica v.9.0 software. The descriptive statistical data obtained offered information on frequencies, measures of central tendency as mean, indicators of dispersion, standard deviation, variance and mean deviation, as well as range, interquartile, skewness and kurtosis.

A reliability test was performed by block (Table 3) and by instrument sections (Table 4) with Cronbach's alpha, and high reliability results were obtained, higher than 80% and the block analysis provided a value of .968, Therefore, it is considered that the information obtained through the instrument offers a good level of reliability in each competence according to the objective for which it was created.

Tabla 3. Análisis de confiabilidad del instrumento completo

Media	Dv Std	Casos	Alpha Cronbach	Alpha Std	Med. Corr inter-item
288.848	23.7963	46	.9685	.9734	.3810

Fuente: Elaboración propia

Tabla 4. Análisis de confiabilidad del instrumento por competencias

Competencia	Media	Dv est	Casos	Alfa Cronbach	Alpha Est	Med. Corr inter-item
Pedagógica	73.016	6.5147	62	.8957	.9246	.4458
Social	48.015	8.2989	64	.9532	.9556	.6728
Administrativa	72.553	9.3491	65	.9543	.9567	.5968
Tecnológica	45.125	5.1254	64	.8592	.8750	.4250
Evaluativa	45.788	6.5865	85	.9414	.9459	.6384

Fuente: Elaboración propia

Since the data did not present a normal distribution, non-parametric statistics were used. Considering that the objective was to determine the relevance of each competency within the proposed theoretical model, the correlations between competencies were analyzed; As it was ordinal data - as proposed by Chok (2010) -, the Spearman correlation was applied to the arithmetic means, grouped by competence, first to the total set of data and then by subgroups according to the degree academic degree , specialty, graduate and postgraduate.

A confirmatory factor analysis of principal components was carried out, which allowed the identification of coincidences in the underlying factors in the data collected from the students, which were contrasted with the pilot test and the similarity and the existing differences were verified. It is important to mention that although the total sample did not cover the minimum that is considered feasible for a confirmatory factor analysis - which is 100 cases, according to Mavrou (2015) -, it has been shown with studies based on computational simulations that even in samples Small may make sense to apply this type of analysis, since it allows finding valuable latent patterns and the size of the sample should not be the only criterion for rejecting it.

A Mann Whitney U test was applied, since it is the non-parametric alternative to the T test to determine the difference in means with the academic level dichotomous variable, in the first instance, and with the previous experience dichotomous variable, in order to determine whether There was or there was no difference between the students' perceptions depending on the academic degree they are studying or the previous experience they may have as facilitators.

The Kruskal Wallis test was also applied for multiple independent samples, using as a grouping variable the institution, grade and previous experience as facilitators to know if there were significant differences between the perceptions of the students according to these variables.

A Chi2 test of two by two tables was applied, defining two levels of competence: high for those weights of four and five, and low for the weights of one, two and three; With this regrouping of variables, the bivariate statistic could be applied to determine whether the academic level or the experience that students may have as facilitators influence the weights given to their teachers.

Finally, the multivariate correspondence analysis helped to observe the association between the variables and their intensity (Greenacre, 2008) with which it was possible to determine the influence that the combination of the variables institution and academic degree has on the perceptions of the students.

Regarding the data obtained from the managers, given that it was basic information and that responses were obtained from one person per institution, it was not necessary to apply statistical analysis, but rather it was used as a descriptive antecedent of the demand and resource conditions in which the company operated. online teaching in the institution, which together with the analysis of the prevailing educational model in each institution allowed triangulating the information and identifying strengths and opportunities in the teaching performance in the institutions.

Results

The results of this research are presented in accordance with the three basic sources of information considered in the methodological design used: institutional psycho-pedagogical model, information offered by managers and students' perception.

Institutional educational model

Regarding the institutional educational model (table 5), coincidences were found between the institutions, since all are based on a combination of constructivist, humanist and sociocultural educational theories, that is, focused on learning. This means that teachers seek with their practice to guide the student in such a way that they build their own learning and take responsibility for their process. Thus, the teacher can create environments with good communication, promoting respect and group cohesion. All institutions have a department or cell for the production of educational material for the courses of each educational program, so the teacher can focus on facilitating the process, and not on the production of the educational materials that it requires.

Another point of agreement is the use of knowledge management systems to organize and deliver resources and conduct communication. No institution uses simpler methods such as free virtual communities, but all have invested in the acquisition, construction or adaptation of complex educational platforms, which allow the construction of online learning environments with diverse and varied communication and learning tools. The emphasis on this point is evident because two of the six institutions have invested time and resources in designing their own educational platforms (Nexus and Eminus).

Tabla 5. Aspectos relevantes de los modelos educativos institucionales

Institución	Enfoque psicopedagógico	Esquema de estudios	Plataforma LMS	Características Relevantes
Universidad Autónoma de Tamaulipas	Constructivismo con una fuerte tendencia al humanismo.	Mayormente en línea con breves estancias presenciales.	Black Board	Centrado en el estudiante. Aprendizaje significativo y enfocado en competencias. Uso extensivo de las TIC.
Universidad de Guadalajara	Constructivista con tendencia sociocultural.	100 % en línea, cuenta con centros de atención.	Moodle	Centrado en el estudiante. Enfocado en competencias para ser, aprender a ser y conocer, hacer, convivir y emprender. Uso extensivo de las TIC.
Universidad Autónoma de Nuevo León	Constructivista con tendencias humanistas.	Totalmente en línea.	Nexus Plataforma propia.	Centrado en el aprendizaje. Uso extensivo de las TIC. Fuerte enlace con el sistema de investigación, innovación y desarrollo tecnológico.
Universidad Veracruzana	Constructivista con tendencia sociocultural.	Totalmente en línea.	Eminus Plataforma propia.	Centrado en el estudiante. Uso extensivo de las TIC. Apoyo de una división creadora de material educativo.
Universidad Autónoma de Zacatecas	Humanista con tendencias constructivista y multicultural.	Totalmente en línea.	Moodle	Centrado en el aprendizaje. Enfocado al desarrollo de competencias.
Universidad Nacional Autónoma de México	Constructivista	Totalmente en línea.	Moodle	Centrado en el aprendizaje. Uso extensivo de las TIC.

Fuente: Elaboración propia

Management

The information provided by the managers of the educational programs indicated that 81% of the teacher hires focus on the professional profile for the subject to be provided and on their ability to adopt the prevailing psychopedagogical approach in their teaching technique. institutional educational. They place little emphasis on asking the teacher for periodic reports of activities and reports of student cases that require special attention. Regarding the support offered by the

institution to the teacher to fulfill its function, it was considered that they provide the necessary technological resources to develop their activities, supervision and feedback on their performance.

The managers indicated that in 65% of the cases they give support to the teachers for the creation of educational materials for the course, which implies that the teacher must invest time in developing the required educational materials. Regarding specific teacher training, the institutions offer courses on pedagogical (76%) and social (68%) aspects, they have less attention in training on evaluative and technological activities (60%) and the most neglected activity is that which refers to the management of administrative aspects in the course (52%).

Regarding existing policies and guidelines in the institution on the key aspects of this research, it was found that there is more clarity in the pedagogical and administrative activity (80%) and less clarity in the social activities (76%), while the Policies and guidelines with less development are those related to the technological and evaluative aspect (72%).

Students' perceptions

Given the dynamics established for the research, of the 64 items, 57 had an average greater than four (more than 81% to 100% competence), six had an average very close to four and one had an average of 3.06 (61% to 80%), which means that all students were able to identify a highly competent teacher according to the proposed theoretical model of competencies.

Spearman's correlation analysis shows a high level of correlation between pedagogical, social and administrative competences, less strong with technological competence, and the weakest correlations correspond to evaluative competence (Table 6). As can be seen, there is a significant correlation between all the competencies, although the weakest correlation is presented with the evaluative competence, which is why the null hypothesis (H1) is rejected, since there is a correlation between all the competencies. Therefore, a model of specific competencies for online teaching in public universities in Mexico must consider the development of pedagogical, social, administrative, technological and evaluative competencies.

Tabla 6. Correlaciones generales entre competencias

Todos los grupos Correlación de Orden de Rangos de Spearman Las correlaciones marcadas en rojo son significativas a $p < .05000$ 87 casos					
Variable	Pedagógica	Social	Administrativa	Tecnológica	Evaluativa
Pedagógica	1.000000	0.717423	0.745703	0.588504	0.422554
Social	0.717423	1.000000	0.788144	0.599497	0.509554
Administrativa	0.745703	0.788144	1.000000	0.758757	0.486773
Tecnológica	0.588504	0.599497	0.758757	1.000000	0.378683
Evaluativa	0.422554	0.509554	0.486773	0.378683	1.000000

Fuente: Elaboración propia

The confirmatory factor analysis offered data similar to those of the exploratory analysis, where three factors help to explain 54.47% of the variance of the data, a synthesis of the activities referred to in the items related to the first factor can be defined as adequate management. of resources and communication, which alone contributes 38.96% to the explained variance. The items related to the second factor refer to evaluative aspects in the course and contribute 9.43% to the explained variance. Finally, the third factor presents saturation above .5 in an item that refers to the orderly management of the discussion forums and contributes 6% to the explained variance, it refers to administrative aspects. This information turned out to be interesting to identify key aspects of the students' perceptions and the areas that are of greatest interest to them, regardless of the sample size.

A Kruskal-Wallis test (Table 7) - taking the institution as the grouping variable and the median for each competence as data for contrast - indicated that although the data could represent some level of difference between the observations of the students depending on their institution, the p value is greater than .05 for all competencies, both in the statistical and in the medians test. Consequently, students' perceptions are similar regardless of the institution where they study the online educational program, which is why the null hypothesis (H2) is rejected and one can speak of a homogeneous profile of the competent teacher in public higher education institutions. in Mexico.

Tabla 7. Análisis de varianza por rangos

	Kruskall-Wallis			Prueba de mediana		
	N	KW	p	Ji2	Df	p
Pedagógica	87	4.0878	.5368	4.8141	5	.4930
Social	87	6.8978	.2283	3.8746	5	.5679
Administrativa	87	4.7759	.4438	6.2374	5	.2838
Tecnológica	87	4.0028	.5490	5.5405	5	.3535
Evaluativa	87	2.6518	.7535	5.8995	5	.3161

Fuente: Elaboración propia

A Mann Whitney U hypothesis test to test the hypothesis that academic level affects students' perceptions about the level of competence of their teachers was applied with the data of the mean of each competence in contrast to the academic level. From the analysis, a level of $p > .05$ was obtained for all competences, so the null hypothesis (H3) is accepted, which indicates that there is no difference in the perceptions of the students according to the academic level (table 8).

Tabla 8. Prueba de hipótesis U de Mann-Whitney con variable *nivel académico*

	Suma rango 1	Suma rango 2	U	Z	Nivel-p	Z ajustada	Nivel-p	N Lic	N Pos	2*1 p exacta
Pedagógica	1603.00	2225.00	847.00	0.5453	0.5855	0.5491	0.5830	35	52	0.5904
Social	1653.00	2175.00	797.00	0.9781	0.3280	0.9993	0.3176	35	52	0.3320
Administrativa	1600.50	2227.50	849.50	0.5237	0.6005	0.5319	0.5948	35	52	0.6023
Tecnológica	1435.50	2392.50	805.50	-0.9045	0.3657	-0.9189	0.3581	35	52	0.3676
Evaluativa	1487.50	2340.50	857.50	-0.4544	0.6495	-0.4633	0.6432	35	52	0.6512

Fuente: Elaboración propia

The same Mann Whitney U test applied to test the hypothesis that previous experience as facilitators affects their perception of the competence of their facilitators, reported values higher than .05 for all competences, indicating that there is no difference in the perceptions of the students on the competences of their teachers, even if they have experience as facilitators, for which the null hypothesis (H4) is accepted (table 9).

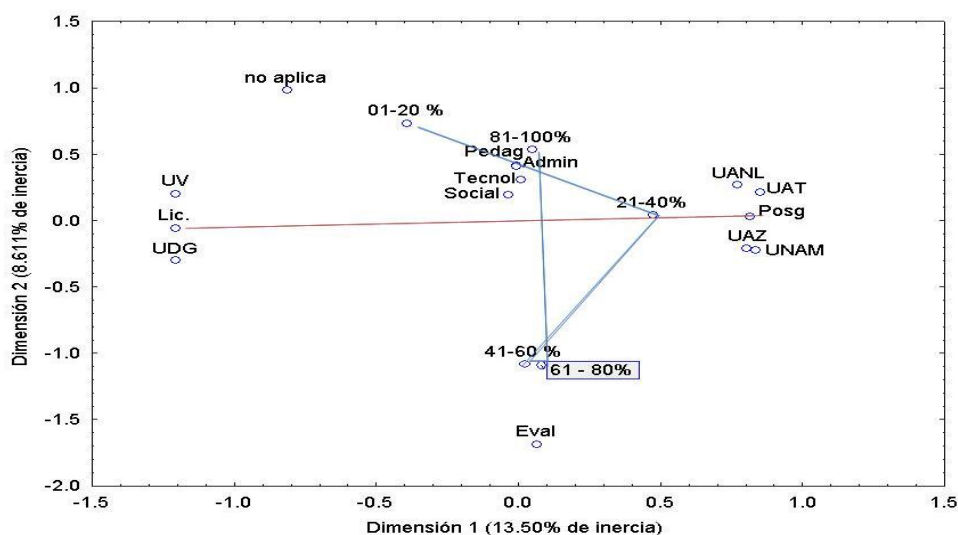
Tabla 9. Prueba de hipótesis U de Mann-Whitney con variable *experiencia previa*

	Suma rango 1	Suma rango 2	U	Z	Nivel-p	Z ajustada	Nivel-p	No Exp	Si Exp	2*1 p exacta
Pedagógica	3368.00	460.00	394.00	0.3065	0.7592	0.3086	0.7576	76	11	0.7672
Social	3302.50	525.50	376.50	0.5300	0.5961	-0.5415	0.5881	76	11	0.6008
Administrativa	3315.50	512.50	389.50	0.3640	0.7159	-0.3697	0.7116	76	11	0.7195
Tecnológica	3338.00	490.00	412.00	0.0766	0.9389	-0.0778	0.9379	76	11	0.9448
Evaluativa	3333.50	494.50	407.50	0.1341	0.8933	-0.1367	0.8913	76	11	0.8948

Fuente: Elaboración propia

Finally, a multiple correspondence analysis was applied in order to observe the effect of variables such as the academic degree studied by those who provided their perceptions, as well as the institution to which they belong in the competencies defined for the study. The results of the analysis can be seen in Figure 1.

Figura 1. Análisis de correspondencias múltiples



Fuente: Elaboración propia

It was observed that between the first axis (13.50%) and the second (8.61%) they explain approximately 22% of the variability of the data, which - being a low value - indicates little dependence of the frequencies with respect to the variables tested. (institution and grade) and also

confirms that the students' response is independent of the institution and grade; However, the graph shows two interesting aspects:

1. Pedagogical, administrative and technological competences to a greater degree —and a little less social ones— are grouped near the response level of 81% - 100%, which indicates that most students consider online education as a quality service where teaching has a high level of competence.
2. Assessment proficiency is the only one that is clustered near the 61% - 80% level, indicating that it is the lowest-weighted proficiency rated by students. This confirms the correlation analysis and identifies this competence as a critical factor of attention in online programs.

To statistically validate the results observed in the correspondence analysis, a test of observed frequencies against expected frequencies was performed, taking two levels of competence on an axis: high for the weighted values of four and five, and low for the weighted levels of one, two and three, and on the other axis the five study competences. The results were a Chi2 value of 31,172.78 with four degrees of freedom and a value of $p = .000$, which indicates that there is a marked tendency towards high weights and that there is a high level of reliability in the observed differences.

Discussion

The results obtained from the three sources of information offer a clear picture of how online teaching operated in public universities when this research was developed. In the first place, the educational models of the six universities have an approach that allows the incorporation of online education, since they are considered student-centered, with a humanistic approach and a marked tendency to use ICT. All have at least one department dedicated to the production of educational resources for online education, which shows an intermediate to high level of preparation of the institution to offer online education. In addition, they have invested resources to offer at least one program in this modality.

On the other hand, they provide training for teachers who enter this modality, but they focus on technological, pedagogical and even social aspects, so there is little training in evaluative and administrative elements. This can represent an area of weakness, since if the teacher has deficiencies in these areas, the student could become discouraged and even abandon not only the course, but also the program.

Focusing the research on six public universities in the country (leaders in the center, north, bajo and southeast) offered a broader panorama of the perception of students about the competencies of their teachers. For example, it was observed that students rate their teachers as highly competent, which reflects that online education is considered a quality alternative to access better academic training. This is consistent with what the OECD (2019) reports when it indicates that in the period from 2017 to 2019, 600,000 students were registered in online educational programs out of the 4.4 million who were in higher education.

In this situation, the proposed theoretical model helped to recognize the competences that, ideally, the teacher should develop, regardless of the institution of the student's assignment, the academic level they attended or even the previous experience they had as a facilitator. In this regard, it is worth highlighting that these variables were considered important because it was anticipated that an educational program of a university such as UNAM (the largest and with the largest budget in Mexico) could be valued with better quality than those of other smaller public universities. In the same way, it was noted that the academic level could influence the results, since a person who is carrying out doctoral studies would have a longer academic career that would make them more tolerant of poor teacher service and would even have a greater motivation to finish their studies regardless of the teacher's guidance. Likewise, it was estimated that the previous experience that the student had as a facilitator could show him more empathic in the face of the lack of skills of his teachers. However, the research showed that none of these variables affect the perception of the high competence of online teachers.

It is clear that these perceptions may vary, since, for example, the current pandemic situation in the country has led to reconsider online education, its scope and its particular needs in terms of teacher training. In other words, virtually every teacher has had to rush into online education, often unprepared and without a clear idea of what to do, highlighting strong areas of opportunity in teacher training (figure two).

Figura 2. Modelo de competencias del docente en línea

Fuente: Domínguez González y Pérez Domínguez (2021)

There are many approaches to what the online teacher should and should not do (Campos Céspedes et al., 2011; Castañeda et al., 2018; Fernandes et al., 2016; García et al., 2018; Tejada Fernández and Pozos Pérez, 2018; Valencia-Molina et al., 2016). However, this research was delimited by the exploration of the five specific competences that the online teacher - according to Berge (1995) and Paulsen (1995) - would have to cover in their practice, that is, pedagogical, social, administrative, technological knowledge and evaluative.

In this sense, the theoretical model of competencies derived from this perspective (Domínguez-González et al., 2010) proved its relevance to evaluate quality teaching in online educational programs; However, it is important to note that the research had a quantitative approach and was limited by the type of information that can be operationalized to obtain data and apply statistics. The foregoing opens the possibility of establishing qualitative studies to analyze the experience of those teachers identified as highly competent. Thus, their vision could be recovered to propose, based on that experience, courses of action within the institutions to train teachers in this modality and even for the mixed modality, which although it has different characteristics, and is a viable alternative not only for those who opt for online programs —which as mentioned is a growing population—, but also for those who, due to unforeseen contingencies, must use it.

On the other hand, the research was delimited by the online teaching practices identified in the selected institutions, which constitutes an example of what would be possible to find in other public universities in Mexico, specifically in conventional ones that have a division dedicated to online education. In other words, it is probable that the results taught in this work cannot be generalized for institutions with other operating schemes.

Finally, one of the main limitations of this research was the response of the students, since although mechanisms were sought to motivate their participation, it was difficult to find more study subjects. The most striking case was that of UNAM, which is a pioneer in distance education in Mexico and has several online programs, however it was not possible to achieve a broader participation.

Conclusions

The proposed theoretical model turned out to be effective, since the general objective of determining the specific competencies for online teaching and the elements that integrate them was met through the perceptions of students from public universities in Mexico, in undergraduate and graduate programs. Even so, the experience of those teachers who were identified as highly competent should be deepened, as it will help to develop more relevant training programs for online teaching.

On the other hand, it can be concluded that the variables of the institution of origin, previous experience as facilitators or the academic degree of students in online educational programs do not affect their perceptions of the competence of their teachers. Therefore, it is possible to speak of a homogeneous profile and important areas of opportunity to strengthen the basic academic nuclei of these programs, which would help reduce school dropouts that many present. In this sense, although there are multiple factors that can increase this dropout (OECD, 2015), a large part of them can be taken care of by the institution, by forming academic nuclei with the appropriate skills to meet the needs of students in this modality .

Regarding the objective of recognizing critical aspects that students consider to identify a teacher as having a high level of competence, it could be clearly observed that the pedagogical, social, administrative and technological aspects do not constitute a problem for students - as might be thought - As the technology and dynamics required to study online are obstacles that are relatively easily solved. However, the evaluation element does constitute a critical aspect that requires special attention.

The hypothesis that the model of specific competencies for online teaching in public universities in Mexico should consider the development of pedagogical, social, administrative, technological and evaluative competencies was accepted, but it is considered an area of knowledge that should continue working, since Conditions change, as do the needs of the country.

Regarding the second hypothesis, it can be pointed out that the institution does not influence the perception of the students, which is why it is possible to speak of a homogeneous profile of specific competences in public universities in Mexico. Even so, studies on these same competences in private universities in the country or abroad would provide interesting ideas about convergences or divergences in the area of study.

On the other hand, the rejection of the third and fourth hypotheses allowed us to infer that the academic degree or previous experience as online teachers does not infer the perceptions of the students, that is, it does not generate any special empathy that causes an overvaluation of the performance of their students. teachers, which allows an impartial evaluation to be highlighted.

Finally, it is highlighted that students consider online education as a quality service, which offers an opportunity to turn it into a real, viable and reliable alternative for the achievement of training and growth objectives.

Future lines of research

The importance that online education has taken in the country and in the world is clear; Therefore, it is necessary for teachers who enter this modality to focus on acquiring the necessary skills to facilitate the learning process. Therefore, it is suggested that future investigations apply a competency framework such as the one proposed in this investigation to identify strengths and areas of opportunity. Likewise, more qualitative work is needed to explore the implications of each competence mentioned in this research and to recover the experiences and knowledge of those who have carried out this function to lay more solid foundations that allow consolidating this modality in the national panorama.

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