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Artículos científicos

Estructura dimensional y validación de un cuestionario para valorar la competencia informacional autopercibida en educación superior

Dimensional structure and validation of a questionnaire to assess self-perceived informational competence in higher education

Estrutura dimensional e validação de um questionário para avaliação da competência informacional autopercebida no ensino superior

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Resumen

El objetivo general de la investigación consistió en evaluar las dimensiones de la competencia informacional desde la autopercepción de estudiantes de nuevo ingreso de educación superior pertenecientes a la región noroeste de México. El estudio se fundamenta en el paradigma positivista con un enfoque cuantitativo a partir del método de múltiples hipótesis de trabajo (MMWH, por sus siglas en el inglés) de tipo descriptivo-correlacional. Se aplicó un cuestionario *ad hoc* a una muestra de 568 estudiantes de nivel licenciatura pertenecientes al estado de Sonora de centros públicos y privados durante el período agosto-diciembre 2021. El instrumento evalúa cuatro dimensiones de la competencia informacional: Búsqueda, Tratamiento, Evaluación y Comunicación de la Información. Los resultados del análisis de fiabilidad del instrumento arrojaron un alfa de Cronbach de 0.84. Los análisis descriptivos

indican que los estudiantes se perciben en un rango entre intermedio a moderado de competencia informacional, con una media mínima de 2.89 y una máxima de 4.48. Las dimensiones que refieren a la búsqueda y comunicación de la información fueron de las más altas en sus medias, niveles de intermedios a avanzados fueron aquí alcanzados; mientras que las dimensiones de Gestión y Evaluación de la Información, de bajo a intermedio. En los coeficientes de correlación de Spearman se obtuvieron relaciones significativas bidireccionales entre las dimensiones analizadas, por encima de 0.51 con nivel de significancia de 0.01. Se concluye que, derivado de los cambios en los paradigmas de educación virtual-remota por la pandemia covid-19, los estudiantes universitarios del noroeste de México han incrementado sus niveles de dominio de sus conocimientos y habilidades informacionales.

Palabras claves: competencia informacional, educación superior, educación virtual.

Abstract

The general objective of the research consisted of evaluating the dimensions of informational competence from the self-perception of incoming students of higher education from the northwestern region of Mexico. This study is based on the positivist paradigm with a quantitative approach using the descriptive-correlational method of multiple working hypotheses (MMWH). An *ad hoc* questionnaire was applied to a sample of 568 undergraduate students belonging to the state of Sonora from public and private centers during the period August-December 2021. The instrument evaluates four dimensions of informational competence: Information Search, Processing, Evaluation and Communication. The results of the reliability analysis of the instrument yielded a Cronbach's alpha of 0.84. The descriptive analyses indicate that the students perceive themselves in an intermediate to moderate range of informational competence, with a minimum mean of 2.89 and a maximum of 4.48. The dimensions referring to the search for and communication of information were among the highest in their means, intermediate to advanced levels were reached here; while the dimensions of Information Management and Evaluation, from low to intermediate. In Spearman's correlation coefficients, significant bidirectional relationships were obtained between the dimensions analyzed, above 0.51 with a significance level of 0.01. It is concluded that, because of the changes in the virtual-remote education paradigms due to the covid-19 pandemic, university students in northwestern Mexico have increased their levels of mastery of their informational knowledge and skills.

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Keywords: informational competence, higher education, virtual education.

Resumo

O objectivo geral da investigação consistiu em avaliar as dimensões da competência de informação a partir da auto-percepção dos estudantes do ensino superior provenientes da região noroeste do México. O estudo é baseado no paradigma positivista com uma abordagem quantitativa utilizando o método descritivo-correlacional de múltiplas hipóteses de trabalho (MMWH). Foi aplicado um questionário ad hoc a uma amostra de 568 estudantes universitários do estado de Sonora, provenientes de escolas públicas e privadas, durante o período entre Agosto e Dezembro de 2021. O instrumento avalia quatro dimensões de competência de informação: Pesquisa de Informação, Processamento, Avaliação e Comunicação. Os resultados da análise de fiabilidade do instrumento produziram um alfa de Cronbach de 0,84. As análises descritivas indicam que os estudantes se sentem na faixa intermediária a moderada da literacia de informação, com uma média mínima de 2,89 e uma máxima de 4,48. As dimensões referentes à procura de informação e comunicação encontravam-se entre as mais elevadas nos seus meios, tendo sido aqui atingidos níveis intermédios a avançados; enquanto as dimensões de Gestão e Avaliação da Informação, de baixo a intermédio. Nos coeficientes de correlação Spearman, foram obtidas relações bidireccionais significativas entre as dimensões analisadas, acima de 0,51 com um nível de significância de 0,01. Conclui-se que, como resultado das mudanças nos paradigmas da educação virtual-remota devido à pandemia de covid-19, os estudantes universitários no noroeste do México aumentaram os seus níveis de domínio dos seus conhecimentos e competências de informação.

Palavras-chave: competência informacional, ensino superior, educação virtual.

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Introduction

The announcement of the health emergency as a result of the 2019 coronavirus disease (covid-19) caused the global closure of educational institutions at all levels, from initial to higher, this as a measure to contain and spread the virus, which forced an abrupt transition from a traditional teaching-learning model mediated by attendance to a distance model mediated by information and communication technologies (ICT) (Campa, 2021; Diaz, Gellibert and Zapata, 2021). In this sense, the pandemic marked a before and after in the dynamics of interconnection, self-management of knowledge, innovation and learning in the educational community, as it prompted a redirection to make the use of ICTs more efficient in training processes and in education. praxis that exists in daily life (Camacho, Rivas, Gaspar and Quiñonez, 2020; Expósito and Masollier; 2020; Zavala, González and Vázquez, 2020).

Faced with this new scenario, the protagonists of educational processes have resized and reassessed their practices to face the accelerated pace of technological innovations in the current information and knowledge society (Carneiro, Toscano and Díaz, 2019; García, 2021). For higher education institutions (IES) it continues to be a preponderant challenge to guarantee the training of professionals in different fields of knowledge with a critical and reflective vision that provide added value to society. For this reason, the development of skills is necessary, including the appropriation of informational and technological resources for lifelong learning (Díaz and Loyola, 2021; George, 2021) .

It is relevant to clarify that this research focuses on the population of first-time university students, which implies a greater challenge due to the jump they make from the upper secondary level to the higher level. For this reason, student diversity, the adaptive processes that they live in terms of the demands and demands of this new educational level must be considered, even more so in a context of confinement, and the new formats that are presented in virtual education. (Castellar, Villadiego, Gamero y Gamarra, 2021; Pérez, Vázquez y Cambero, 2021).

According to data from the National Survey on Availability and Use of Information Technologies in Households (Endutih) of the National Institute of Statistics and Geography [Inegi] (2020), there are 84.1 million Internet users in Mexico, of which It stands out that 90.5% are between 18 and 24 years old. The three main electronic means to browse the Internet are: smart cell phone (smartphone) with 96.0%, laptop with 33.7% and television with Internet access with 22.2%. And the main activities they carry out are: entertainment

(93.8%), search for information (91.0%) and access to social networks to communicate (89.0%).

The review of the literature around the object of study shows that university students do not have sufficient literacy to handle information. Although they have access to numerous amounts of information on the Internet, they do not know how to evaluate, use and take advantage of it in a systematic, strategic and ethical way to carry out academic work, because the Internet is predominantly browsed for leisure and entertainment purposes (Basilotta, García-Valcárcel, Casillas and Cabezas, 2020; Cabero and Llorente, 2020; Fuentes and Fernández, 2021). Other studies in relation to the educational effects of the covid-19 pandemic point to the existence of digital gaps in the student and teaching community, which not only refer to access to technologies, but also to their knowledge, that is, what we are able to do with the technologies and for what (Álvarez y García, 2021; Kuric, Calderón y Sanmartín, 2021; Murillo y Duk, 2020).

For their part, Valenzuela, Valdenegro, Oliveros, and Alvarado (2021) state that, in order to deal with technological changes, it is essential to master informational skills, which include the search, evaluation, processing, and communication of information. These skills are key at all educational levels. Undoubtedly, future professionals should be trained in these skills to facilitate adaptation to the changes presented by the knowledge society.

Due to the above, the present study has as primary objective to analyze the dimensions of informational competence from the self-perception of new higher education students belonging to the northwestern region of Mexico. In addition, as specific objectives, it is intended to examine the dimensional structure of the scales of self-perceived informational competence, as well as the degree of validity and reliability of an instrument to measure it.

By virtue of the foregoing, the following central questions were raised: what variables are associated with informational competence? What is the level of informational competence of first-year higher education students? What dimensional structure make up the scales? of self-perceived informational competence? and, finally, what is the degree of internal consistency presented by the scales of the dimensions analyzed and the level of reliability of the instrument?

Dimensions of self-perceived informational competence

Information skills are part of the field of information literacy; they are a response to the need to train professionals trained in the use, treatment and evaluation of information resources (Barceló, 2022). According to the contributions of Zabala and Arnau (2014) and Perrenoud (2011), informational competence is a reflexive and strategic process that implies an analysis of the search, evaluation and use of information based on ethical understanding and treatment, critical and efficient of this. Pinto, Uribe, Gómez and Cordón (2011) explain that information competencies make up the set of knowledge, skills and behaviors that individuals display to recognize information, locate it, evaluate it and give it an appropriate use in an ethical manner in the construction and communication of the knowledge.

Various studies group the dimensions that make up self-perceived informational competence as follows:

1) Information search: refers to the way in which individuals search and access information in order to identify, locate and select the most relevant information (Alonso and Saraiva, 2020). This dimension is characterized by the ability that students show to locate information in libraries, databases and digital repositories (Martínez and Garcés, 2020).

2) Information management: it is oriented to the management of tools, resources and methods for the planning, organization and evaluation of information systems (Fernández, 2008). Conde, Cruz and García (2022) refer that information management implies the knowledge and management of applications, academic text processing systems, spreadsheets, databases and information storage.

3) Evaluation of the information: it consists of critically analyzing the sources and selecting the information that provides veracity and support. Ethical issues that involve the proper handling of information for legal use must be considered here. This implies cognitive and motivational processing where students must carry out a complex mental process to gather, understand, process and evaluate information (De los Santos, 2021).

4) Communication of information: refers to participating appropriately in virtual spaces, as well as the use of tools that the Internet offers to disseminate and communicate information and contribute to groups or networks, both academic and extracurricular (López and Sevillano, 2020). . For his part, Koltay (2011) proposes interaction, dissemination and dissemination as determining

competencies of communication in virtual environments. Thus, being competent implies being able to communicate in digital environments, share resources or materials through online tools, connect and collaborate with others through interaction and participation in communities and groups in networks.

The aforementioned highlights the need for training in informational competence, seen as a transversal competence in the curriculum of each university student. In short, it is the ability to use knowledge, values and skills in an integrated manner for problem solving and optimal evaluation of information. (De los Santos y Martínez, 2021; Maridueña, Espinoza y Granados, 2020; Pinto y Guerrero, 2017).

Materials and method

The focus of this research was quantitative with the use of the method of multiple working hypotheses (MMWH, for its acronym in English). This type of research has the purpose of searching for and transforming empirical information into scientific knowledge based on the construction and conformation of theoretical-methodological frameworks that specify the new knowledge until the results are achieved (Contreras and Campa, 2017). On the other hand, the MMWH is particularly useful for the analysis of complex ecological processes in which the null hypothesis has little value and there is a whole set of alternative hypotheses of interest to the researcher (Chamberlain, 1965). Based on this method and to answer the questions of the study, the following working hypotheses were proposed:

- H1: The dimensions (information search, management, evaluation and communication) are positively and significantly related to the informational competence variable.
- H2: The greater the number of observable indicators in the dimensions of self-perceived informational competence and participants in the study, the higher the degree of internal consistency in the structure of the scales that make up the instrument.
- H3: The virtual-remote education paradigm increased the level of mastery of information skills in university students.
- H4: New college students perceive themselves as having an advanced level of command in information skills.

The scope of the study is descriptive-correlational with a non-experimental-cross-sectional design. Descriptive-correlational studies, according to Contreras, León and Zozaya (2020), allow, in addition to specifying properties and characteristics of the variables analyzed, to establish their relationships. These types of research do not assume causality between the study variables, but rather their fundamental purpose lies in establishing their association and describing the properties and characteristics of the dimensions analyzed; while the main characteristic of non-experimental-cross-sectional studies is the non-manipulation of the dimensions involved in the research and the measurements are collected in a single period of time (Contreras and León, 2019).

The sample was selected by the intentional non-probabilistic method and was made up of a total of 568 university students, 57% women and 43% men, of which 296 (52%) are from public institutions and 272 (48%) from private institutions. belonging to the northwestern region of Mexico in the state of Sonora. The distribution by field of knowledge was made up as follows: 34% of social sciences, 22% of economics and administration, 16% of biology and health, 12% of engineering, 10% of exact and natural sciences and 6% of science. humanities and fine arts. For research purposes, the selection criteria were: 1) easy access to the various university centers and 2) proximity to students.

An ad hoc instrument made up of four scales with 30 items was used for data collection. The scales that make up the questionnaire are: Information Search, Information Management, Information Evaluation and Information Communication. Each dimension was developed based on the review of academic and empirical literature. The Information Search dimension is made up of seven items, two of which were taken from the García, Martínez and Rodríguez (2019) questionnaire to assess self-perceived skills in secondary school students in Spanish cities. The scale proposed by the aforementioned authors is originally made up of four observable indicators; the other five additional indicators incorporated in this instrument were elaborated from the scientific literature. For its part, the Information Management dimension is made up of six items. This drank from the work carried out in other contexts by Pinto (2010) and Pinto and Guerrero (2017), who investigate the ability to select specialized information, knowledge in the reference and citation regulations and, finally, ability to treat and organize of the information collected.

For its part, the Information Evaluation dimension is made up of eight items. This scale reflects the ability to judge and discriminate reliable information from that which is not,

as well as the ability to recognize sites with little credibility on the Internet and assess whether the information consulted is recent and useful.

Now, due to the covid-19 health situation that is still being experienced and because some educational centers have not resumed their work and academic activities one hundred percent, the online tool Google Forms was chosen for data collection. With the support of collaboration and research networks between academics and researchers from various HEIs, the link was provided through various communication channels (emails and various educational platforms for the application of the instrument during online classes). This network of researchers and program coordinators from these universities was explained the purpose of the study and its valuable contribution. The data collection was in the months of August-December 2021. In this way, the participation of students from different HEIs in the northwestern region of Mexico, both from public and private centers, was achieved. The questionnaire had to be answered by the student body in an approximate period of 20 minutes with five response options in Likert scale format (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Almost always and 5 = Always).

The validation of the instrument was carried out in two phases. The first by experts (research teachers) from public and private institutions of higher education in Mexico. The second phase was through a pilot study of 84 students in two public and private HEIs. The Cronbach's alpha index that the instrument yielded in the pilot survey was 0.82, a more than acceptable measure that guarantees the reliability of the questionnaire.

For the processing and analysis of the information collected, a data matrix was created in the SPSS Statistics version 26 program. The descriptive analysis was carried out for the academic and sociodemographic variables. As part of the statistical analysis, the central tendency measures were obtained: minimum (Min), maximum (Max), mean (M), standard deviation (SD) and the reliability analysis for each of the scales that make up the questionnaire using Cronbach's alpha coefficient (α). The Cronbach coefficient was chosen to guarantee the internal consistency of the scales used. The specialized literature establishes that the acceptable values of this statistical measure can range between a sufficient and satisfactory level (0.60 and 0.70) (van Griethuijsen et al., 2014; León, Contreras and Meneses, 2021).

Once the analysis was carried out to evaluate the internal consistency and reliability of the questionnaire scales, the correlation analysis was carried out for non-parametric Spearman ro tests. This type of test is ideal for inspecting the behavior of quantitative

variables when interacting together (Contreras, León, and Zozaya, 2020; Roy, Rivas, Pérez, and Palacios, 2019). Thus, in order to analyze the bivariate correlations with the dimensions of self-perceived informational competence and to test the initial hypothesis, the Spearman test was used, since this is recommended for numerical variables of the ordinal type and general information.

Results

From Cronbach's alpha coefficient, the data show that the questionnaire was consistent and reliable, presenting an alpha greater than 0.844. Individually, in the Information Search dimension, made up of seven items, an alpha of 0.85 was obtained; The Information Management dimension, made up of six items, presented a reliability coefficient of 0.81; For its part, Information Evaluation showed an alpha of 0.79, while the Information Communication dimension exhibited a coefficient of 0.84. According to the parameters of the academic literature, the reliability coefficients of the instrument are more than acceptable in their ranges, since they are moderate to high, according to Ruiz (2002) and Palella and Martins (2012). Below, in Table 1, these results are reiterated.

Table 1. Reliability and degree of internal consistency of the self-perceived informational competence instrument using Cronbach's alpha

	Alfa
Instrumento con 30 ítems	0.844
Dimensiones	
Búsqueda de la información	0.853
Gestión de la información	0.816
Evaluación de la información	0.792
Comunicación de la información	0.841

Source: self made

The descriptions of the Information Search dimension of self-perceived informational competence (table 2) by university students in general terms showed average levels of moderate to relatively high (3.24 to 4.43). The item that showed a lower mean than the rest was "I can retrieve previously identified information for later consultation and treatment" (3.24), followed by the item "I know information search strategies (eg descriptors, Boolean operators: OR, AND, NOT, (), among others)", with an average (3.25), and "I recognize

specialized academic and scientific information search engines (Google Academic, Redalyc, Academia, Scielo, RefSeek and others)" (3.45). The rest of the items showed high averages: "I can search for various information simultaneously with the support of links and hyperlinks" (4.43), "I know how to organize information with some specific criteria for later consultation and identification" (4.19) and " I am able to identify different query search engines on the Internet" (4.20).

Table 2. Information Search Dimension

Ítems	N	Mínimo	Máximo	Media	DE
1) Soy capaz de identificar diferentes buscadores de consulta en Internet.	568	1	5	4.20	1.025
2) Reconozco buscadores de información especializada académica y científica (Google Académico, Redalyc, Academia, Scielo, RefSeek y otros).	568	1	5	3.45	1.214
3) Conozco las estrategias de búsqueda de información (ej. descriptores, operadores booleanos: OR, AND, NOT, (), entre otros).	568	1	5	3.25	1.315
4) Puedo buscar diversa información de manera simultánea con el apoyo de enlaces e hipervínculos.	568	1	5	4.43	1.002
5) Puedo recuperar información previamente identificada para su posterior consulta y tratamiento de esta.	568	1	5	3.24	1.589
6) Puedo filtrar información especializada en diversos buscadores.	568	1	5	4.01	1.079

7) Sé organizar la información con algún criterio específico para su posterior consulta e identificación.	568	1	5	4.19	0.989

Source: self made

In relation to Information Management (table 3), the data show low averages regarding the writing of academic papers (essays, reports, summaries, analysis) (2.89) and in recognizing and separating the idea of the main author from the text of the quotes referred to in the reference material (3.26). In contrast, the high averages were in those items that refer to organizing and systematizing useful information to prepare tasks or academic papers (4.41) and copying and pasting useful reference information for academic papers without mentioning the author (3.88).

Table 3. Information Management Dimension

Ítems	N	Mínimo	Máximo	Media	DE
8) Soy capaz de identificar información especializada y materiales de consulta en internet para la elaboración de trabajos académicos (ej. revistas especializadas, artículos de revistas, libros digitales y capítulos de libro, tesis, reseñas académicas y ensayos).	568	1	5	3.49	0.915
9) Soy capaz de redactar trabajos académicos (ensayos, reportes, informes, resúmenes, análisis) dando crédito y citando a los autores responsables de los materiales consultados.	568	1	5	2.89	1.315
10) Reconozco e identifico la normativa de citación y referencias bibliográficas para la elaboración de trabajos académicos.	568	1	5	3.42	1.210
11) Soy capaz de reconocer y separar la idea del autor principal del texto de la de citas referidas en el material de consulta.	568	1	5	3.26	1.036
12) Soy capaz de organizar y sistematizar la información que me es útil para elaborar tareas y/o trabajos académicos.	568	1	5	4.41	0.989
13) Copio y pego la información de consulta que me es útil para trabajos académicos sin mencionar al autor.	568	1	5	3.88	0.998

Source: self made

The Information Evaluation dimension (table 4) showed moderate to high averages for the most part (3.12 to 4.48). The item that reflected a moderate mean with 3.12 was "I recognize the classification of various reference materials, according to their typology, such as: research and dissemination articles, digital books, book chapters, academic and scientific essays, theses, reviews, among others. others". The rest of the items presented moderate to high means: "I know how to judge the quality of the reference materials" (3.86), "I know how to discriminate reliable and unreliable information" (4.02), "I am able to recognize false Internet sites and of little credibility" (4.06), "I am able to contrast information and reference materials for academic papers" (4.10), "I am able to detect spelling and grammatical errors in information consulted on the Internet" (4.15) and "I recognize and I detect when the information is useful for the preparation of academic papers" (4.25). Finally, the students under study perceived themselves with the ability to "Evaluate the information they consult on the Internet, whether it is recent or current" (4.48), the latter being the highest mean reported.

Table 4. Information Evaluation Dimension

Ítems	N	Mínimo	Máximo	Media	DE
14*)* Sé juzgar la calidad de los materiales que consulto en Internet.	568	1	5	3.86	1.116
15) Sé discriminar entre una información confiable y no confiable.	568	1	5	4.02	1.112
16) Soy capaz de reconocer sitios en Internet falsos y de poca credibilidad.	568	1	5	4.06	1.127
17) Soy capaz de contrastar la información y materiales de consulta en Internet para trabajos académicos.	568	1	5	4.10	1.012
18) Reconozco la clasificación de diversos materiales de consulta, según su tipología (ej. artículos de investigación y divulgación, libros digitales, capítulos de libro, ensayos académicos y científicos, tesis, reseñas, entre otros).	568	1	5	3.12	1.575
19) Soy capaz de detectar errores ortográficos y gramaticales en la información que consulto en Internet (ej. signos de puntuación, sintaxis, acentuación, vicios del lenguaje, cohesión y estructura superficial, entre otros).	568	1	5	4.15	0.983
20) Reconozco y detecto cuando la información me es útil para la elaboración de trabajos académicos.	568	1	5	4.25	1.016

21) Evalúo que la información que consulto en Internet sea reciente o actualizada.	568	1	5	4.48	0.878

Source: self made

Regarding the Information Communication dimension (table 5), the analysis presented reflects data that are very similar to the previous dimension, showing moderate to high means (3.15 to 4.45). The item that showed a moderate mean of 3.15 was “I am aware of the trail of personal data that I leave when I browse the Internet”. The rest of the items showed relatively high means: "I participate in forums, platforms and discussion channels" (3.94), "I am able to create digital content, such as: images, texts, tables, videos, audios and multimedia" (3.92).) and “I identify the various internet platforms to share specialized information, (3.96). On the other hand, the items "I am able to prepare digital presentations for the exhibition and dissemination of information" and "I use social networks to share reliable information" showed a mean of (4.12); while the items "I know the basic rules of etiquette for communication and responsible interaction in virtual environments" (4.08), "I am aware of the meaning of digital identity (4.10) and, finally, the item with the highest mean reported in this dimension (4.45), "Share information through the different platforms and social networks".

Table 5. Communication of information

Ítems	N	Mínimo	Máximo	Media	DE
22) Soy consciente del rastro de datos personales que dejo cuando navego en Internet.	568	1	5	3.15	1.163
23) Soy capaz de elaborar presentaciones digitales para exposición y difusión de la información *(Ej. PowerPoint, Prezi, Google Slides, SlideShare, Canva, u otros).*	568	1	5	4.12	1.078
24) Identifico las diversas plataformas en Internet para compartir información especializada.	568	1	5	3.96	1.019
25) Comparto información por las diferentes plataformas y redes sociales.	568	1	5	4.45	0.889
26) Participo en foros, plataformas y canales de discusión.	568	1	5	3.94	0.945
27) Utilizo las redes sociales para compartir información confiable.	568	1	5	4.12	1.106
28) Soy capaz de crear contenido digital *(Ej. imagen, textos, tablas, videos, audios y multimedia).*	568	1	5	3.92	1.124

29) Soy consciente del significado de identidad digital.	568	1	5	4.10	1.128
30) Conozco las normas básicas de netiqueta para la comunicación e interacción responsable en ambientes virtuales.	568	1	5	4.08	1.042

Source: self made

For the correlation analyzes between the dimensions of self-perceived informational competence, the parametric method of Spearman's correlation coefficients was used to calculate variables with interval or ratio measurement levels. This correlation coefficient makes it possible to measure the strength and direction of the association between the variables (Sagaró and Zamora, 2020). Reguant, Vilà and Torrado (2018) warn that the correlation coefficient fluctuates between the values -1 and +1, where 0 is equal to null, that is, there is no link between variables. On the other hand, values closer to -1 or +1 imply a higher level of association.

Under these correlation parameters, the degree of association between the variables of self-perceived informational competence was analyzed (Table 6). As can be seen, the values of the Spearman coefficients range between 0.51 and 0.63, which when interpreted according to the properties proposed by Cohen (1988), as they are the most widespread and respected in the academic and scientific literature, it is possible to affirm that the degree of correlation between the variables of self-perceived informational competence is moderate to strong. In this regard, the null hypothesis (H0) is ruled out, which establishes the non-existence of the correlation between the dimensions of self-perceived informational competence: Information Search, Management, Evaluation and Communication. Consequently, when the existence and degree of association between the variables is determined, the research hypothesis that posits a positive correlation between the dimensions that make up self-perceived informational competence by university students is accepted. The findings of the correlations are described below.

The Information Management dimension has an association and significance level of 0.01 with the Information Search dimension, presenting a correlation coefficient of 0.538, a positive and strong degree of association. The Information Evaluation dimension also

correlates with the Information Search dimensions, with a significance level of 0.01, showing a coefficient of 0.515, and Information Management, with a significance level of 0.01 and a coefficient of 0.635. . In both cases, according to the statistical literature, both correlations are strongly positive.

Finally, the Information Communication dimension is strongly and positively correlated, with a level of significance at the 0.01 level, with the Information Search (0.620), Information Management (0.540) and Information Evaluation (0.560) dimensions.

Table 6. Correlation of the dimensions of self-perceived informational competence

	Búsqueda de Información	Gestión de la Información	Evaluación de la Información	Comunicación de la Información
Búsqueda de Información	1			
Gestión de la Información	0.538**	1		
Evaluación de la Información	0.515**	0.635**	1	
Comunicación de la Información	0.620**	0.540**	0.560**	1

** The correlation is significant at the 0.01 level (bilateral).

Source: self made

Discussion

Higher education is responsible for the comprehensive training of professionals, not only to obtain the educational level or university degree, but also in the development and achievement of skills. As for the latter, they are the ones that will allow effective labor insertion, as well as innovate and adapt to the social demands of the post-pandemic (Dussel, Ferrante and Pulfer, 2020; Falcón and Moure, 2020). In this sense, HEIs must guarantee training in skills that facilitate adaptation to the changes presented by the knowledge society. Using ICT effectively will not only allow good professional and work performance, but will also promote continuous learning throughout life. Therefore, the development of information skills plays a key role in training processes, especially the search, management, evaluation and communication of information (Sánchez, 2016).

Based on the scope of the study and the descriptive-correlational analyzes with the MMWH method, with a total of 568 participants surveyed from public and private HEIs in Sonora, Mexico, the acceptance of the research hypothesis (H1) is confirmed, which raises the association of the Search, Management, Evaluation and Communication of Information dimensions with informational competence; In the correlation analysis, a positive and significant association of the dimensions of self-perceived informational competence was found, so the null hypothesis is ruled out.

There are significant theoretical-empirical investigations in other contexts of higher education that present similar findings on the existence and association of informational competence variables. The study by León and Contreras (2021) showed the relationship between the variables that make up digital and informational competence: information processing, communication, content creation, security, and problem solving. The authors exhibited a weak level of association between the five variables analyzed; the low level of relationship, as they argued, was due to the fact that the resulting sample was 114 participants, while the minimum required recommended by the specialized literature is between 150 and 200 subjects.

For their part, Gutiérrez and Contreras (2021) presented a diagnosis of information skills with 102 university students. The authors performed a validation of the instrument with three items for each dimension with the reliability analysis and obtained alphas greater than 0.60, while the association study of the variables analyzed showed a weak positive correlation between the search and evaluation variables (0.32). . These contributions not only present similar data in relation to the low levels of association presented in their studies, they also

present similarity in the number of indicators for each of the scales of their instruments and the number of participants in the study. In line with these arguments, Martínez, Tuya, Martínez, Pérez and Cánovas (2009) state that these correlation levels are low when the coefficients range between (0.26-0.50) and moderate to strong (0.50-0.75). Thus, the present The investigation showed a degree of correlation of the dimensions of self-perceived informational competence between moderate to strong, exhibiting coefficients greater than 0.51 with a significance level of 0.01.

Regarding the second approach, that is, the level of mastery of informational skills that university students present before the virtual-remote education paradigm, it can be affirmed that they are located between a range of intermediate to moderate. The data coincide with the results revealed by Hernández (2021) and Gutiérrez and Contreras (2021). The dimensions that refer to search and communication were among the highest in their means, reaching advanced levels of informational competence. These results were similar to those found by Contreras and León (2020), who mostly identified intermediate and advanced levels in skills for the search, treatment (management) and communication of information.

As a last approach regarding the self-perception that university students have in their information skills, it can be pointed out that they perceive themselves as having an advanced level, mainly in the dimensions of Search and Communication. On the other hand, those that require more academic training are the Management and Evaluation dimensions. The lack of competence in the writing of academic papers (essays, reports, summaries, analysis) is clearly evident, the lack of understanding of the importance of giving credit to the authors responsible for the materials consulted in the preparation of academic papers, the poor praxis of copying and pasting information from the sources consulted, all of which exposes the inability to adequately manage the information; It can also be pointed out within the shortcomings the lack of recognition in the classification of various reference materials, according to their type, such as research and dissemination articles, digital books, book chapters, academic and scientific essays, theses, reviews, among others. others, and the inability to judge the quality of reference materials and discriminate between reliable and unreliable information.

These results coincide with the contribution of Córdova, Piscoya and Zurita (2021) who found in their study that students perceive themselves as having an intermediate to advanced level in information search and analysis skills. On the other hand, the study by Gómez, Clavel and Navaridas (2022) highlights the malpractice regarding the citation and

acknowledgment of the authorship of academic sources, as well as the plagiarism of the materials consulted, this being a very recurrent practice in students. first-time university students due to the lack of training in these dimensions.

Conclusions

Based on the results obtained, it is stated that the dimensions of Information Search, Management, Evaluation and Communication are positively and significantly associated. Likewise, it is ratified that the existing theoretical structure of the dimensions that make up the instrument to assess self-perceived informational competence are congruent with each other, by showing a high degree of internal consistency for the dimensions of self-perceived informational competence, which indicates that it has with construct validity in each of the scales of the instrument and its analyzed metrics.

On the other hand, it is revealed that the informational skills of university students in northwestern Mexico are increasing according to the evidence collected in recent years. This increase, it is estimated, is due to the changes and effects derived from the COVID-19 pandemic. Although partial results are shown, the findings have been particularly significant in the association of the dimensions of self-perceived informational competence, showing strong and positive correlations.

At the methodological level, it is important to note that the size of the sample constitutes a possible limitation in the study, since it only focused on the state of Sonora in the northwestern region of Mexico, so it is convenient to consider other states in the region. and even extend the study to the central region to have a more representative sample of the country and extrapolate the results. Finally, it is specified that mediating or external variables were not considered to increase statistical precision, perform factor analysis and multiple regression for model testing.

Future lines of research

For future lines of research, the application of other designs and scopes of research, such as explanatory or experimental, is proposed in order to increase the accuracy and prediction of self-perceived informational competence in relation to other independent variables. It is even suggested to opt for the choice of other paradigms of constructivist or naturalistic conception to delve into the analyzed dimensions of informational competence.

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