

Analyzing the effectiveness of graduate competencies at the Polytechnic University of Zacatecas

Análisis de efectividad de las competencias de los egresados de la Universidad Politécnica de Zacatecas

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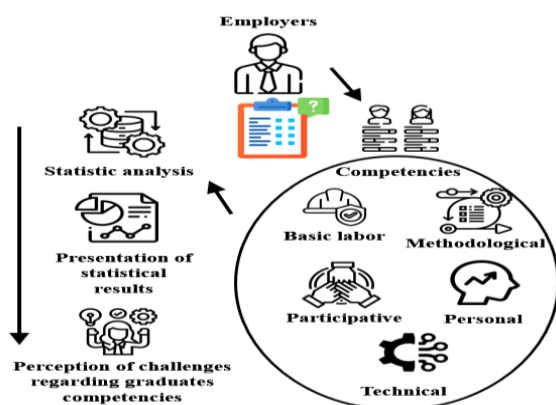
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Abstract

This article discusses the results of the evaluation of graduates' competencies from the UPZ academic programs, taking into account the opinions and perceptions of employers or companies. The present research reviews the literature on the concept of competency and its dimensions, establishes study variables, describes the methodology used, and presents the results through statistical techniques such as Spearman's Rho, Mann-Whitney U, and Kolmogorov-Smirnov tests. Together, these techniques allow for an understanding of the achieved results and contribute to the improvement of educational quality.

Resumen

En este artículo se discuten los resultados de la evaluación de las competencias de los egresados de los programas académicos en la UPZ, tomando en cuenta la opinión y percepción del empleador o empresa. En la presente investigación se revisa la literatura del concepto de competencia y sus dimensiones, se establecen variables de estudio, metodología empleada y se muestran los resultados a través de técnicas estadísticas como Rho de Spearman, U de Mann de Whitney y Kolmogorov-Smirnov, que en su conjunto permiten conocer los resultados alcanzados y así contribuir a la mejora de la calidad educativa.



Employer, Graduate, Competencies, Evaluation

Empleador, Egresado, Competencias, Evaluación

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Introduction

Currently, there are many definitions of competencies, as well as a variety of classifications and uses in both work contexts and theoretical perspectives of the concept, which leads to it being complex and involving a multidisciplinary approach. Therefore, there is growing interest in the identification and evaluation of competencies as a training element and subsequent professional development. The assessment of competencies allows understanding the performance of the worker and thereby facilitating decision – making and strategies for the company or institution. That is why, the present research aims to understand the professional competencies acquired by graduates of the academic programs of the Polytechnic University of Zacatecas, as evaluated from the perspective of the employer or company. To achieve this, a survey was conducted with 94 employers to assess basic labor, methodological, participative, personal, and technical competencies, which allowed determining the main characteristics demanded by employers towards graduates and describing the capacities acquired during their training and professional performance. In order to improve the educational quality of the University's academic programs and increase the degree of compliance with competencies in the workplace, statistical techniques are applied to understand the behavior of the gathered information.

Background

In the context of the information and knowledge society, the term "competence" emerged in the workplace to respond to the changes occurring in an increasingly complex, flexible, unstable world with greater technological inclusion (Vargas et al., 2001). From an educational perspective, competencies arose to promote student learning, based on comprehensive education that includes a series of elements related to quality education. However, the discussion on competencies is based on the link between university education and the work environment through practical training, topics that have been developed by international institutions and organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), which has sought to link theory with practice.

In the university world, the issue of competencies has been revisited by questioning whether fundamental notions for effective professional practice are learned in this space (United Nations Educational, Scientific and Cultural Organization, 1998). However, a current concern is the detachment between professional knowledge and the competencies demanded in the workplace.

When considering the nature of the connection between the labor and educational worlds, the need for a theoretical review of the competencies acquired by graduates emerges from higher education institutions in order to identify which competencies employers demand for efficient and productive work. Spencer and Spencer (2008) define competence as, "An underlying characteristic in an individual that is causally related to an effectiveness standard and/or superior performance in a job or situation." Additionally, they propose the existence of five types of competencies. The first is motivation, understood as the interests that a person consistently considers or desires; thereby, directing, involving, and selecting behaviors towards certain actions or goals and distancing it from others. The second refers to physical characteristics. The third is self-concept, which is related to a person's attitudes, values, or self-image. The fourth is knowledge, which belongs to the information a person possesses about specific areas, and the fifth refers to the ability to perform certain physical or mental tasks.

On the other hand, Agut and Grau (2001, cited in Charria Ortiz et al. 2011), have proposed four categories according to the elements that form a competence in order to guide its conceptualization: behavior, knowledge, skills, and other individual characteristics.

In the report of the Secretary's Commission on Achieving Necessary Skills [SCANS] (1993, cited in Charria Ortiz et al. 2011), it is stated that academic competencies are associated with fundamental knowledge acquired in general education, and they classify them into basic skills: reading, writing, mathematics, speaking, and listening. Development of thinking, consists of creative thinking, problem-solving, decision-making, assimilation and comprehension, ability to learn and reason; and personal qualities: self-responsibility, self-esteem, sociability, self-direction, and integrity.

It is worth mentioning that most research agrees with the assumption that competencies are related to good job performance and involve communication skills, leadership, customer orientation, understanding, and emotional sensitivity (Levy Leboyer, 2000). From the same point of view, Cotton (2001, cited in Charria Ortiz et al. 2011) defines competencies as the skills that a person has to perform the functions assigned according to the position or job, and by this be more competitive in the face of organizational demands, thereby securing entry and permanence in the workforce. He also emphasizes teamwork, communication skills, problem-solving, and aptitudes acquired through experience or formal education as the main competencies demanded by most employers.

Additionally, several classifications were found aiming to distinguish competencies according to their origin. Most of them propose the existence of general or generic competencies, and specific or technical competencies, according to the particularities of each profession and field of application.

Ruiz, Jaraba, and Romero (2005, cited in Charria Ortiz et al. 2011) classify competencies into intellectual, interpersonal, personal, organizational, technological, and business competencies; Aneca's proposal (2005, cited in Charria Ortiz et al. 2011) suggests general instrumental, personal, systemic competencies, and other competencies, while Charria, Sarsosa, Uribe, and López (2009) and Charria and Sarsosa (2010, cited in Charria Ortiz et al. 2011) classify generic competencies as academic, professional, and labor competencies.

It should be noted that upon reviewing the literature, an overabundance of competency classifications focused on specific areas can be found.

For instance, in the industrial sector, competencies are classified into labor and professional categories; the first one refers to skilled workers who undergo technical education studies for employment and are trained for very specific tasks, while the professional ones are those performed by individuals who have completed higher education studies (Tobón, 2005).

According to the OECD (2002, cited in Figueroa Rodríguez, 2013), through Working Group B, competencies are classified as interpretive (based on understanding information, seeking its meaning), argumentative (based on a set of knowledge, skills, and attitudes aimed at explaining certain processes), and propositional (involving the proposition of hypotheses to explain certain facts or construct solutions to problems).

On their part, Auburn and Orifiamma (1990, cited in Zabalza Beraza, 2007), identify four major classifications: 1) Competencies related to professional and social behaviors (which include technical actions along with others related to management, decision-making, or shared work); 2) Competencies related to attitudes (personal motivation, commitment, ways of treating others, and adaptability); 3) Competencies related to creative abilities (risk-taking, originality, search for new solutions); and 4) Competencies related to existential and ethical attitudes (self-criticism, personal project, humanistic values, and social and ethical commitment). On the other hand, Figueroa Rodríguez (2013) maintains a distinction based on four fundamental areas: 1) Specific competencies (individual cognitive requirements for professional development); 2) Generic competencies (cross-cutting competencies, suitable for different professions); 3) Reflective competencies (critical judgment and intuitive knowledge); and 4) Academic competencies covering both professional aspects or products to be achieved, as well as intellectual habits or processes to be developed. These competencies refer to both students in training and the Professor responsible for the teaching process. As a complement to everything mentioned before, Iriarte (2005, cited in Figueroa Rodríguez, 2013), points out the existence of six traditional personal competencies: 1) specialization; 2) lifelong learning; 3) confidence and collaboration; 4) creativity; 5) assembly; and 6) self-management. However, he adds a new one called the seventh competence: "The management of complexity". This competence has four distinctive features: bipolarity as a method (the ability to analyze from different perspectives), the logic of collaboration and autonomy, the interconnection between knowledge and action and between what is particular and collective, as well as the butterfly effect (individual actions that can have multiplier effects).

For Bunk (1994, cited in Figueroa Rodríguez, 2013), he distinguishes up to 4 classifications of competencies; however, Echeverría, Isus, Sarasola (1999, cited in T. de Zan et al., 2011), manage to adapt these categories, indicating that a professional must have: technical competence (knowledge and skills required to address professional tasks in a broad work environment); methodological competence (analysis and problem-solving, as well as the transfer of solutions to other contexts); participative competence (collaboration in work and teamwork); personal competence (active participation in work, decision-making, and acceptance of responsibilities). To complement this classification, basic labor competencies are added (which constitute the basis for the development of other competencies), and were used in the present research to evaluate graduates. To complement the research, the theoretical definitions of the study variables are presented:

- 1) Regarding the variable "level of competency fulfillment," Spencer and Spencer (2008) define competency as, "An underlying characteristic in an individual that is causally related to a standard of effectiveness and/or superior performance in a job or situation." This definition is complemented by that established by the Tuning project, which expresses it as, "A dynamic combination of attributes, related to procedures, skills, attitudes, and responsibilities, that describe those in charge of learning from an educational program or what students are capable of demonstrating at the end of an educational process" (Bravo Salinas, 2007, p. 13). Since this study examines the competencies of graduates at the professional level in their work performance, the idea of competencies in the workplace is combined with those competencies expected as a result of professional training.

In addition to these main variables, information was obtained from five secondary variables:

- 1) Type of company: This variable considers public and private companies. Public companies are those that provide essential goods and services to the population, where government participation is total or majority.

On the other hand, private companies are owned by private investors, non-governmental, shareholders, or owners, constituting the private sector of the economy. Their main objective is to generate profits for the owners or shareholders.

- 2) Main activity of the company: This category considers industrial, commercial, and service companies. The first are those that buy goods or extract raw materials for transformation. Commercial companies are intermediaries between producer and consumer, with their main function being the purchase and sale of finished products. Finally, service companies are those that direct, organize, and facilitate the productive activity of the primary and secondary sectors. One of their main functions is to offer an intangible service with the aim of satisfying a need.
- 3) Size of the company: Companies can be classified as micro, small, medium, and large, based on the amount of their capital and the criterion of the employed personnel. A microenterprise is one in which 0 to 10 employees work; a small business has 11 to 50 employees; a medium-sized business has 51 to 100 employees, and finally, a large business has 101 employees and above (National Institute of Statistics and Geography, 2020).
- 4) Number of graduates currently working in the company.
- 5) Educational programs to which the graduates working in the company belong.

Methodology

The methodology implemented in this research is of an applied and non-experimental nature. Hernández, Fernández, and Baptista (2014) define non-experimental research as research conducted without deliberately manipulating variables, where only phenomena is observed in their natural environment and then analyzed.

For these authors, non-experimental design is divided taking into account the time during which the data is obtained.

This research is cross-sectional because data is collected at a single point in time, in a unique timeframe, aimed at describing variables and their interrelationship at a given moment.

Additionally, this research is descriptive and correlational with a quantitative approach, as these designs describe the existing relationships between two or more variables at a certain moment. The primary purpose of correlation studies is to understand how a concept or variable may behave given the behavior of other related variables, while descriptive studies aim to specify the important properties of individuals, groups, communities, or any other phenomenon subjected to analysis.

A survey instrument will be used, which is a technique that incorporates a set of standardized research procedures where a series of data is collected and analyzed from a representative sample of cases from a larger population or universe. The aim is to explore, describe, predict, and/or explain a series of characteristics (García, 1993). Furthermore, the questionnaire is the basic instrument used in the survey research, defined as a "Document that systematically collects indicators of the variables involved in the survey objective" (Casas et al., 2003, pp. 527-538).

For this purpose, a survey was designed to gather information on the opinions that employers hold regarding the graduates of the Polytechnic University of Zacatecas, having as a reference various instruments from other institutions of higher education where they have already been applied within both national and international contexts.

The questionnaire begins with a presentation directed to the employers about the purpose of the survey pointing out that the information given is of a confidential and reserved character, and the results obtained are strictly used for scientific purposes. The questionnaire is divided in two parts:

Part 1. General information of the company, organization or institution. This part identifies the company with its corporate name, the position of the employer, type, size and main activity of the organization, number of graduates who are currently working, and what program and areas they belong to.

Part 2. This part identifies the employers' perception of the basic labor, methodological, participatory, personal and technical competencies of graduates. These competencies were measured through the Likert scale defined in five levels, ranging from low, average, sufficient, high and even excellent. Basic work competencies include 18 items, methodological competencies 8 items, participatory competencies 9 items, personal competencies 13 items, and technical competencies 6 items. With this information, the aim is to know the attitudes, skills, knowledge, competencies and capabilities of the graduates, which will allow us to know the opinions of employers regarding the qualification of skills and their job performance.

Instruments and strategy for collecting information

The survey was carried out using the Microsoft Forms application, which is an intuitive, accessible and open tool for conducting online surveys that allows you to create questionnaires with multiple choice, open-ended questions, classifications, etc. in a very short time. Furthermore, the application allows you to answer all the mandatory questions and thereby reduce the percentage of rejected or incomplete questionnaires. As a complement, the results are shown with detailed statistics in the form of very visual graphs with all the relevant information. The results can be consulted immediately and downloaded into Excel for data processing.

Once this option was considered for the application of the questionnaire, the following steps were carried out:

1. Several tests were carried out on the Microsoft forms application to measure response times, trying to make it agile and easy to respond to employers. The questionnaire could be completed on a computer or mobile device, organized into sections, upon completion, by only pressing the "submit" button, the employer's provided information would appear automatically.
2. A pilot test was carried out by sending the web link to 8 employers for corrections before final implementation. In this case, only a modification was made to an open question that was not explicit enough to answer.

3. Once the questionnaire was approved, the web link generated was distributed to the head of the Department of Linkage and Academic Exchange at the Polytechnic University of Zacatecas, as they have the employers' database, as well as their personal information.
4. The survey was distributed through social networks such as WhatsApp, Facebook and Instagram to teachers, administrators and alumni of the Polytechnic University of Zacatecas. They were encouraged to share the survey with employers within their networks to gather the necessary information.
5. In the application of the instrument, the problem encountered was that according to the database of the Linkage department, there was outdated personal information of employers, businesses that had closed due to the pandemic, or companies where graduates were no longer working.

It is worth mentioning that information was obtained from 94 out of the 120 registered employers, including companies or organizations of various types, sectors, and sizes, representing a response rate of 78.33%. The questionnaire application took approximately one month to collect information for the current research, starting on January 7, 2021, and ending on January 25 of the same month. Furthermore, due to the functionality of the digital application, no rejected or incomplete questionnaires were recorded, resulting in a percentage of incomplete or invalid questionnaires of 0%.

Instrument reliability

Various techniques were employed for statistical analysis, as described below. Descriptive analyses were conducted using the statistical program SPSS (Statistical Package for the Social Sciences) version 24 to calculate the mean and the results of the statistical techniques to be employed. The Mann Whitney U test was used to test the difference in means of these indicators. This test is non-parametric and is used to identify differences between two populations based on the analysis of two independent samples (Johnson, 2000). In other words, this type of non-parametric test is used to measure the statistical significance of observed differences between two sets of data.

It involves comparing the totals of categories corresponding to the two conditions based on joint classification (Gómez, 2003). If there are approximately the same categories for both conditions, then the differences between the classified correlations are random, and the null hypothesis should be accepted. However, if there is a significant predominance for one of the conditions in the expected direction, this significant difference between the totals of the categories for the two conditions allows rejecting the null hypothesis and accepting the research hypothesis (Miller & Freud, 2021). To determine if the difference between the means is statistically significant, the p-value must be compared with the significance level. Typically, a significance level (denoted as alpha) of 0.05 works adequately. A significance level of 0.05 indicates a 5% risk of concluding that there is a difference when there is no real difference, meaning it is the probability of committing a type 1 or type 2 error. In the present research, the comparison of means is made among the type of organization, main activity, and size of the organization.

On the other hand, goodness-of-fit tests are used to determine if sample data can be considered to come from a specific distribution or probability model. Ultimately, goodness-of-fit tests allow us to verify what type of distribution our data follows and, as a consequence, what tests (parametric or non-parametric) can be conducted in statistical analysis. The Kolmogorov-Smirnov test, known as the K-S test, is a non-parametric statistical significance test that measures the degree of agreement between the distribution of a set of data and a specific theoretical distribution (Gómez Gómez, 2003). This test is used when the sample size is larger than 50. The null hypothesis in the K-S test indicates whether the observed frequency distribution is consistent with the theoretical distribution (good fit), while the alternative hypothesis tests whether the frequency distribution observed is not consistent with the theoretical distribution (poor fit).

Furthermore, to assess its normality, it is important to consider the level of significance. So, if the data is normally distributed, meaning the assumption of normality is met, the significance level should be higher than 0.05 (p-value > 0.05).

If the data is not normally distributed, meaning the assumption of normality is not met, the significance level will be less than 0.05 ($p < 0.05$) (García Bellido et al., 2010). Moreover, to evaluate the correlation between dimensions, the Spearman's rank correlation coefficient (Rho) technique was employed. Spearman's rank correlation is a bivariate technique that does not assume normality and is used to observe representations of information, allowing for the establishment of similarities or dissimilarities between variables to highlight joint variability and therefore typify what happens with the data. The interpretation of the Spearman's rank correlation coefficient agrees at values close to 1, indicating a strong association between rankings; as one rank increases, so does the other. While values close to -1 indicate a strong negative association between rankings, meaning that as one rank increases, the other decreases. When the value is 0.0, there is no correlation (Hair J. et al., 2008). The interpretation of the values has been expressed by various authors on scales, with one of the most commonly used being presented in Table 1.

Box 1

Table 1

Degree of relationship between variables according to the Spearman's rank correlation coefficient (Rho)

Coefficient Range	Relationship
-0.91 a -1.00	Perfect negative correlation
-0.76 a -0.90	Very strong negative correlation
-0.51 a -0.75	Considerable negative correlation
-0.11 a -0.50	Moderate negative correlation
-0.01 a -0.10	Weak negative correlation
0.00	No correlation
+0.01 a +0.10	Weak positive correlation
+0.11 a +0.50	Moderate positive correlation
+0.51 a +0.75	Considerable positive correlation
+0.76 a +0.90	Very strong positive correlation
+0.91 a +1.00	Perfect positive correlation

Source: Own elaboration based on Hernández et al. 2014, Page 305

Results Obtained

The following table shows the descriptive results comparing each of the indicators belonging to the competence variable dimensions, considering the type of company (whether it is public or private), the sector (industrial, commercial, services, or multisector), and size (micro, small, medium, and large), as well as an overall rating for each indicator and dimension.

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Box 2

Table 2

Competence Ratings by Type, Sector, and Size of the Surveyed Companies

Variable	Dimension	Indicator	Type		Sector			Size			Overall rating for indicator	Overall rating for dimension		
			Public Company	Private Company	Industrial Sector	Commercial Sector	Service Sector	Multisector	Micro Company	Small business			Medium business	Big company
Competencies	Basic Competency	Knowledge	4.2	4.0	3.8	4.2	4.2	4.0	4.0	4.3	3.9	4.0	4.1	4.0
		Time and resource management	4.0	4.0	3.5	4.1	4.3	3.7	4.2	4.1	3.9	3.9	4.0	
		Reasoning	4.3	4.0	3.9	4.1	4.2	3.9	4.1	4.2	3.8	4.0	4.0	
		Leadership	4.4	4.0	3.9	4.1	4.2	4.0	4.0	4.3	4.0	4.1	4.1	
		Communication	4.3	4.0	3.7	4.1	4.1	3.9	3.9	4.2	3.7	4.0	4.0	
	Methodological Competency	Execution	4.5	4.2	4.0	4.4	4.3	3.9	4.1	4.4	4.0	4.1	4.2	4.1
		Forecast	4.2	4.0	3.8	4.1	4.2	3.7	4.1	4.2	3.8	3.9	4.0	
		Diagnosis	4.1	4.0	3.8	4.1	4.1	3.8	4.0	4.2	3.7	4.0	4.0	
	Participative Competency	Integration	4.4	4.1	3.9	4.3	4.3	3.9	4.1	4.3	3.9	4.1	4.1	4.2
		Beginning	4.5	4.2	4.0	4.4	4.3	4.1	4.0	4.4	4.0	4.2	4.2	
Personal Competency	Decision making	4.2	4.0	3.9	4.0	4.2	3.9	3.8	4.1	3.9	4.1	4.0	4.1	
	Responsibility	4.4	4.2	4.1	4.4	4.3	4.0	4.0	4.4	4.0	4.2	4.2		
Technical Competency	Initiative	4.5	4.1	3.9	4.2	4.3	3.9	4.0	4.4	3.8	4.1	4.1	3.9	
	Skills	4.1	3.9	3.8	4.1	4.0	3.8	3.8	4.1	3.8	3.9	3.9		
Overall rating			4.3	4.0	3.9	4.2	4.2	3.9	4.0	4.3	3.9	4.1	4.1	

Source: Own elaboration based on the analysis of the extracted data

Regarding the analysis by type of company, in the public sector, it can be observed that the indicator with the highest average rating is the application of principles in the company or organization (CP), while the lowest-rated indicator with a mean of 4.0357 is time and resource management (CBL). However, it can be concluded that in public companies, graduates are well-rated by employers, as all indicators are above the value of 4 (High). It should be noted that the total number of public companies that evaluated graduates is 14. On the other hand, the total number of private companies that rated graduates is 80, therefore they are evaluated with lower ratings than in public companies, as several values with a mean below 4 (High) can be observed. In private companies, the results show that the lowest-rated indicator is technical competence skills (CT) with a mean of only 3.8938, while the highest is responsibility (CPe) with a mean of 4.1813. By analyzing the mean ratings by sector, it can be concluded that the industrial sector (which consists of 23 companies) and the multisector (which consists of 11 companies) are the worst-rated sectors.

Only 2 indicators out of all reach the value of 4 (High), indicating that all others are below this value and well below the overall average. Regarding the ratings of graduates, concerning the size of the company, it is observed that the small-sized companies (consisting of 26 companies or organizations) are where employers are most satisfied with the various competencies acquired by graduates. This is because the ratings of graduates in all indicators are above the value of 4 (High).

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In contrast, to test whether the differences found in the means of competency fulfillment levels among different groups of companies (type, sector, and size) are significant or not, the Mann Whitney U test was applied. Ranks were created to calculate the asymptotic significance (bilateral) according to the type, size of the company, and sector. Regarding the size of the company, the difference in means was tested between micro and small, micro and medium, micro and large, small and medium, small and large, and finally medium and large.

However, concerning the sector to which companies belong, the difference in means was calculated between industrial and commercial, industrial and services, industrial and multisector, commercial and services, commercial and multisector, and finally, services and multisector. To conclude, the difference in means considering the type of company is calculated, where the only possible range is private and public. To simplify the results, only the significance of the Mann Whitney U test for each of the comparisons is presented in Table 3.

Box 3

Table 3

Significance of the Mann Whitney U test for difference in means between groups of companies

Groups Compared	Asymptotic (bilateral)	Significance
Micro-Small	0.590	
Micro-Medium	0.727	
Micro-Large	0.335	
Small-Medium	0.659	
Small-Large	0.680	
Medium-Large	0.342	
Public-Private	0.575	
Industrial-Commercial	0.151	
Industrial-Services	0.155	
Industrial-Multisector	1.000	
Commercial-Services	0.957	
Commercial-Multisector	0.295	
Services-Multisector	0.282	

Source: Own elaboration based on the analysis of the extracted data

As stated earlier, to determine if there is a difference between the means, the p-value is compared with the significance level. Therefore, since the adopted significance level is 0.05, and upon comparing this value with the data obtained, it is concluded that there are no significant differences between the mean ranks.

Therefore, evaluations between categories behave in the same way. In other words, comparing the size of the company or organization, does not illustrate any significant differences, as well as in the comparison between sectors and type of company.

Furthermore, the correlation between the five dimensions of the variables is calculated, which are: labor basic competencies (CBL), methodological competencies (CM), personal competencies (CPe), participative competencies (CP), and technical competencies (CT). The results of applying the Spearman's rank correlation test are presented in the following table:

Box 4

Table 4

Spearman's Rank Correlation Coefficient (Rho) between the dimensions of the variable Rating of the overall level of competency fulfillment (CG) and its significance level.

	Basic Competencies	Methodological Competency	Participative Competency	Personal Competency	Technical Competency
Basic Competencies	1.000				
Methodological Competency	.857**	1.000			
Participative Competency	.774**	.723**	1.000		
Personal Competency	.870**	.889**	.790**	1.000	
Technical Competency	.672**	.670**	.655**	.704**	1.000

** . The correlation is significant at the 0.01 level (2-tailed).

Source: Own elaboration based on the analysis of the extracted data

The correlation between personal competence and methodological competence is 0.889, a value that can be interpreted according to established parameters as a very strong positive correlation, while the dimensions in which the correlation is only 0.655 are technical skills with participatory skills, interpreted as a considerable positive correlation. Normality tests were carried out to verify what type of distribution the data follows, and, therefore, determine what tests, whether parametric or not, would be carried out for the statistical analysis.

For this reason, in order to estimate the normality of the distributions, the Kolmogorov-Smirnov test is calculated to determine the significance level of the test for the level of compliance with the general competencies, their dimensions, and the promotion potential, which are the variables under study. The results are shown in the following table.

Box 5

Table 5

Results of the Kolmogorov-Smirnov test for the variables and their dimensions

	Statistic	gl	Sig
Average overall competency score	.152	94	.000
Basic competencies	.159	94	.000
Methodological competence	.169	94	.000
Participative competence	.132	94	.000
Personal competence	.103	94	.015
Technical competence	.121	94	.002

Source: Own elaboration based on the analysis of the extracted data

In the Kolmogorov-Smirnov test, the assumption of normality is met when the significance level is greater than 0.05. In this case, the values obtained from the total results are lower than the said value, indicating that the assumption of normality is not satisfied. Therefore, it can be concluded that the data from the variables and dimensions do not follow a normal distribution. This conclusion requires that the treatment of these data for statistical correlation tests should be conducted using non-parametric analysis methods (M.H., Guillen et al. 2014).

Discussion and conclusions

As a conclusion, it was found that the term "competence" constitutes a complex and multifaceted concept from which a wide variety of definitions and theoretical classifications have been constructed. That is why, it is emphasized that competence is a set of skills and aspects of personality, knowledge, and behaviors that, in a given context, allow for both the resolution of a particular situation and the achievement of successful performance in a task or role in a job position.

It is important to mention that the different classifications found allow us to see that there is no single standard for defining and classifying competencies. This situation makes this topic continue to be a subject of discussion and further exploration in the literature, as there is a diversity of approaches to define it. However, even though it is a concept in development with multiple approaches, the classifications made, despite their differences, seek to cover the competencies that must be developed in professional training and in the workplace.

In addition to the above, there has been a great interest in understanding and identifying the competencies that allow for adequate academic training and professional success. However, an appropriate strategy must be implemented within educational models since, nowadays, graduates from different Higher Education Institutions depend not only on academic training or knowledge but also on learning experiences in real contexts and variables such as motivation, behavior, or attitudes. This implies a challenge and a paradigm shift in institutions that makes the curriculum more flexible based on students' interests and conceives dialogical learning forms and teaching methodologies through which students develop as comprehensive, competent, dynamic professionals capable of responding to the needs of the context (Aguilar Gordón, 2016).

Finally, it is concluded that the concept of competencies and their classification are focused on improving the quality of higher education and its ability to develop strategies that allow professionals to perform adequately in the workplace. Precisely because of this, the topic must continue to be researched and implemented to the extent that it leads to an understanding of the training and development needs of future professionals and in line with the demands of the job market.

On one hand, the level of competency performance of the graduates evaluated by employers, within the Likert scale, is high, meaning it is close to excellent. This indicates that the academic level of the Polytechnic University of Zacatecas is good and reaffirms its status as one of the best universities in the state. Even though the dimensions of the competency variable received favorable evaluations, participative competencies received the highest ratings.

This suggests that employers appreciate collaboration, adaptation, and integration in the workplace for adequate job performance. On the other hand, areas for improvement were identified that allow UPZ to enhance its academic processes, such as deficiencies in English language proficiency primarily. The evaluation makes it clear that the ratings of graduates by employers are acceptable and highlights the strengths and weaknesses of graduates in the workplace. It can be mentioned that a significant part of this study focuses on determining the competencies that students acquire during their professional and work performance, and through their development, the satisfaction levels of employers are known.

Based on the statistical techniques applied in the present research, it is concluded that the correlation between personal competence and methodological competence is 0.889, a value that can be interpreted according to the established parameters as a very strong positive correlation. Meanwhile, the dimensions in which the correlation is only 0.655 are technical competencies with participative competencies, interpreted as a considerable positive correlation.

Regarding the Kolmogorov-Smirnov test, the assumption of normality is not satisfied, and therefore, the data from the variables and dimensions do not follow a normal distribution. Consequently, it is concluded that there are no significant differences between the mean ranks. In other words, the evaluations between categories behave in the same manner. Specifically, when comparing the size of the company or organization, there are no significant differences, as well as in the comparison between sectors and types of companies.

It is worth mentioning that this work is by no means conclusive but should be considered as a foundational element for further in-depth study of professional competencies and promotion potential. In other words, it serves as an indication to understand competencies and their relationship with promotion potential. However, it's important to note that the employer's opinion or perception does not directly influence the decisions or planning of educational programs at the Polytechnic University of Zacatecas. Nonetheless, it serves as a foundational document to understand the needs of employers with current information.

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Furthermore, it represents an initial study on the relationship between graduates and employers within the Polytechnic Universities of the country. However, from a perspective aimed at improving the quality of higher education, the evaluation of competencies must be complemented with comprehensive student training to address both theoretical and practical knowledge, as well as attitudes or personal commitments, ranging from knowing and doing to knowing how to be. The training of graduates should integrate a set of transversal or generic learning experiences that guarantee a smooth integration into the job market, enabling good performance and, consequently, the likelihood of promotion within the company or organization.

In the present study, it is evident that employers generally express satisfaction with the job performance of graduates from the Polytechnic University of Zacatecas. Nonetheless, there are deficiencies that require attention and improvement to enhance the educational quality of the institution.

Declarations

Conflicts of interest

The authors declare that they have no conflicts of interest.

Contribution of the authors

Lara-Torres, Claudia Guadalupe: Contributed to the bibliography search for the elaboration of the background and theoretical framework. I supported in the writing of the article as well as in the elaboration of tables and graphs, and in the systematization of the results and revision of the bibliographic citations.

Velázquez-Macias, Jesús: Contributed to the preparation of the summary, introduction, discussion of the results and conclusions. He also participated in the drafting of the article and revision of the bibliography.

González-Hernández, José Roberto: Contributed to the idea of the project, methodology, elaboration of the strategies and instruments. He supported the application of the instrument as well as the analysis of results and the final revision of the research.

Article

Guirette-Barbosa, Omar Alejandro: Contributed to the translation of the article and final revision.

Availability of data and materials

The data collected for this study were obtained survey prepared for employers.

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Abbreviations

CBL	Labor basic competencies
CG	Competency fulfillment
CM	Methodological competencies
CPe	Personal competencies
CP	Participative competencies
CT	Technical competencies
KS	Kolmogorov-Smirnov
OECD	Organization for Economic Cooperation and Development
RHO	Spearman's rank correlation coefficient
SPSS	Statistical Package for the Social Sciences
SCANS	Secretary's Commission on Achieving Necessary Skills
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPZ	Universidad Politecnica de Zacatecas

References

Background

Bravo Salinas, N. (2007). *Competencias proyecto Tuning-Europa, Tuning-América Latina*. 1-27.

Figuroa Rodríguez, B. (2013). *Evaluación de competencias en programas de formación en el sector rural: el caso de la maestría tecnológica para prestadores de servicios profesionales (PSP) en México*. Tesis doctoral, Madrid. Recuperado el 5 de Agosto de 2021

Instituto Nacional de Estadística y Geografía. (2020). *Micro, pequeña y mediana empresa*.

Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura. (1998). *Documento de política para el cambio y el desarrollo en educación superior*. París Francia: UNESCO.

Spencer, L., y Spencer, S. (2008). *Competence at work, models for superior performance*. John Wiley and sons editores.

Tobón, S. (2005). *Formación basada en competencias. Pensamiento complejo, diseño curricular y didáctica (2da. ed.)*. Bogotá: ECOE Ediciones.

Vargas, F., Casanova, F., y Montanaro, L. (2001). *El enfoque de competencia laboral: manual de formación*. Montevideo Uruguay: OIT/Cinterfor.

Basic concepts

Charria Ortiz, V., Sarsosa Prowesk, K., Uribe Rodríguez, A., López Lesmes, C., y Arenas Ortiz, F. (2011). *Definición y clasificación teórica de las competencias académicas, profesionales y laborales. Las competencias del psicólogo en Colombia*. *Psicología desde el Caribe. Revista del Programa de Psicología Universidad del Norte* (28), 133-165.

Hernández Sampieri, R., Fernández Collado, C., y Baptista Lucio, P. (2014). *Metodología de la investigación*. Mc Graw Hill.

Supports

Casas Anguita, J., Repullo Labrador, J., y Donaldo Campos, J. (2003). *La encuesta como técnica de investigación. Elaboración de cuestionarios y tratamiento estadístico de los datos*. *Revista Atención primaria*, 31(8), 527-538.

García Bellido, R., González Such, J., y Jornet Meliá, J. (2010). *SPSS: Pruebas no paramétricas Kolmogorov Smirnov*. *Revista de Innovación Educativa*, 1-5.

García, F. M. (1993). *El análisis de la realidad social. Métodos y técnicas de investigación*. Madrid: Alianza universitarios textos.

Article

Gómez Gómez, M. (2003). [Sinopsis de pruebas estadísticas no paramétricas. Cuándo usarlas.](#) Revista Mexicana de pediatría, 70(2), 91-99.

Hair J., A., Tatham, R., y Black, W. (2008). [Análisis multivariante.](#) México: Prentice Hall.

Johnson, D. (2000). [Métodos multivariados aplicados al análisis de datos.](#) México: Thomson.

Differences

M.H., B., Guillen, A., Lugo Serrato, O., y Aguilar Garnica, J. (2014). [Correlación No-Paramétrica y su Aplicación en la Investigaciones Científica.](#) International Journal of Good Conscience, 9(2), 31-40.

Miller, I., y Freund, J. E. (2021). [Probabilidad y estadística para ingenieros.](#) Reverté.

Discussions

Aguilar Gordón, F. (2016). [El currículo basado en competencias profesionales integradas en la universidad ecuatoriana.](#) REXE. Revista de Estudios y Experiencias en Educación, 16(31), 129-154.

Levy Leboyer, C. (2000). [Gestión de las competencias: cómo analizarlas, cómo evaluarlas y cómo desarrollarlas.](#) Barcelona: Gestión.

T. de Zan, A., Paipa G., L., y Parra M., C. (2011). [Las competencias: base para la internacionalización de la educación superior.](#) Revista Educación en Ingeniería, 11, 44-54.

Zabalza Beraza, M. (2007). [El trabajo por competencias en la enseñanza universitaria.](#) Santiago de Compostela.