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Analysis of academic competencies and their relationship with the satisfaction of recent university graduates. Case Colombia

Análisis de competencias académicas y su relación con la satisfacción de recién graduados universitarios. Caso Colombia

Análise de competências académicas e da sua relação com a satisfação de recém-licenciados. Caso Colômbia

学术能力分析及其与大学毕业生满意度的关系—哥伦比亚案例

تحليل الكفاءات الأكاديمية وعلاقتها برضا الخريجين الجامعيين الجدد: حالة كولومبيا

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Abstract

The purpose of this article is to analyze the relationship between instrumental, systemic, and interpersonal competencies of graduates in the university training process, in order to identify students' satisfaction with their preparation for future job performance and professional development. Through a quantitative methodological approach and using statistical techniques such as structural equation models, the information recorded by 519 graduates in surveys designed and conducted by the Labor Observatory for Education in various programs of the Pedagogical and Technological University of Colombia is analyzed. It was found that there is a greater correlation between instrumental and interpersonal competencies, which in turn influence systemic competencies. Regarding the most important factors that positively impact job insertion and performance, teacher training to develop critical, reflective, and problem-solving skills in students is influential. Likewise, the content of the program's subjects and the inclusion of a second language are indispensable for professional development.

Keywords: Higher education, education, graduate, competency analysis.

Resumen

El propósito de este artículo es analizar la relación entre competencias de tipo instrumental, sistémico y de relaciones interpersonales de los graduados en el proceso de formación universitario, que permita identificar la satisfacción de los estudiantes con su preparación para el futuro desempeño laboral y profesional. A través de un abordaje metodológico cuantitativo y a partir de técnicas estadísticas mediante modelos de ecuaciones estructurales se analiza la información que registran 519 graduados en las encuestas diseñadas y aplicadas por el Observatorio Laboral para la Educación, en varios programas de la universidad Pedagógica y Tecnológica de Colombia. Se encontró que existe mayor correlación entre las competencias instrumentales e interpersonales y que a su vez, éstas inciden en las sistémicas. Con respecto a los factores más importantes que repercuten positivamente en la proyección y desempeño para la inserción laboral, influye la formación de los docentes para desarrollar en los estudiantes competencias y destrezas de pensamiento crítico, reflexivo y resolutorio de problemas sociales. Así mismo, en los contenidos de las asignaturas del programa y la inclusión de un segundo idioma, son ineludibles para el desarrollo profesional.

Palabras clave: Enseñanza superior, educación, graduado, análisis de competencias.

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Resumo

O objetivo deste artigo é analisar a relação entre as competências do tipo instrumental, sistémico e de relações interpessoais dos licenciados no processo de formação universitária, que permita identificar a satisfação dos estudantes com a sua preparação para o futuro desempenho laboral e profissional. Utilizando uma abordagem metodológica quantitativa e técnicas estatísticas baseadas em modelos de equações estruturais, analisa-se a informação registada por 519 licenciados nos inquéritos concebidos e aplicados pelo Observatório Laboral para a Educação em vários programas da Universidade Pedagógica e Tecnológica da Colômbia. Verificou-se que existe maior correlação entre as competências instrumentais e interpessoais e que estas, por sua vez, têm um impacto nas sistémicas. No que diz respeito aos fatores mais importantes que se repercutem positivamente na projeção e no desempenho para a inserção laboral, na formação dos docentes para desenvolver nos estudantes competências e capacidades de pensamento crítico, reflexivo e de resolução de problemas sociais. Do mesmo modo, nos conteúdos das matérias do programa e na inclusão de uma segunda língua, são essenciais para o desenvolvimento profissional.

Palavras-chave: Ensino superior, educação, licenciado, análise de competências.

摘要

本研究旨在探讨大学毕业生在本科学习阶段所获得的工具性能力、系统性能力与人际交往能力之间的关系，并据此评估毕业生对其未来职业和专业发展的准备满意度。研究采用定量研究方法，基于结构方程模型等统计技术，对哥伦比亚教育与技术大学多个专业519名毕业生在教育劳动力观察站设计并实施的问卷调查数据进行分析。结果显示，工具性能力与人际交往能力之间具有较高的相关性，且这两类能力对系统性能力具有显著影响。进一步分析发现，教师在培养学生批判性思维、反思能力及社会问题解决能力等方面的作用，是促进毕业生就业能力提升和职业发展的关键因素。此外，课程内容的完善及第二语言的引入也被证实为专业成长不可或缺的要素。

关键词：高等教育，教育，毕业生，能力分析。

ملخص

الهدف من هذه المقالة هو تحليل العلاقة بين الكفاءات من النوع الأداتي، والنظامي، وكفاءات العلاقات الشخصية لدى الخريجين في سياق عملية التكوين الجامعي، بما يسمح بتحديد مدى رضا الطلاب عن إعدادهم المستقبلي للأداء المهني والوظيفي. ومن خلال نهج منهجي كمي، وبالاعتماد على تقنيات إحصائية باستخدام نماذج المعادلات الهيكلية، تم تحليل البيانات التي سجلها 519 خريجًا في الاستبيانات التي صممها وطبقها المرصد العمالي للتعليم، في عدة برامج تابعة للجامعة التربوية والتكنولوجية في كولومبيا. وقد تبين أن هناك ارتباطًا أقوى بين الكفاءات الأداتية وكفاءات العلاقات الشخصية، والتي تؤثر بدورها على الكفاءات النظامية. وفيما يتعلق بالعوامل الأهم التي تؤثر إيجابيًا على التوجه والأداء للاندماج في سوق العمل، فقد تبين أن تأهيل الأساتذة لتطوير مهارات التفكير النقدي والتفكير التأملي وحل المشكلات الاجتماعية لدى الطلاب له تأثير واضح. وكذلك، فإن مضامين المقررات الدراسية ضمن البرنامج وإدراج لغة ثانية تُعدّ من العناصر الأساسية التي لا غنى عنها للتنمية المهنية .

المفتاحية الكلمات : الكلمات المفتاحية: التعليم العالي، التربية، الخريجون، تحليل الكفاءات .

Introduction

The relationship between university education and labor market demands has gained critical importance, motivating universities to adapt and align their educational programs to drive economic development through the specific competencies of their graduates. Studies such as those by Cabrera et al. (2016) and, Iqbal and Hakaraia (2020) emphasize the need to bridge the gaps between the competencies taught and those required by employers, which is reflected in the quality and relevance of higher education (Pujol-Jover et al., 2022).

The development of competencies not only affects labor productivity and individuals

quality of life, as suggested by Barnes et al. (2022), but also the satisfaction of graduates with their education, especially when these competencies translate into professional and personal success (Hilario-Flores et al., 2022; Espinoza-Narcizo, 2020). In Latin America, particularly in Colombia, these competencies also contribute to institutional strengthening and social well-being, being evaluated through accreditation processes that demand high quality and verifiable results (Gómez-Velasco et al., 2020; Consejo Nacional de Acreditación, 2021).

Graduate follow-up studies have shown that there is a significant direct connection between the development of competencies acquired during university education and the level of graduates satisfaction with their subsequent professional and labor performance. This allows higher education institutions to identify areas for improvement in their academic programs to align them with labor market needs, thus increasing the satisfaction of their alumni (Sierra y Velásquez, 2022; Hilario-Flores et al., 2023; Espinoza – Narcizo, 2020).

In this regard, graduate follow-up surveys, such as those in Colombia designed by the Labor Observatory of the Ministry of National Education of Colombia, serve as an important tool to explore the present demands of society, institutions, and the productive sector, helping to support and drive the necessary changes and the implementation of relevant policies and strategies for improvement in various areas (Benavides Paz, 2017). These aspects allow for exploring the relationship between the education received and the current demands of the productive sector, helping universities identify areas for improvement and adjust their programs (Sierra & Velásquez, 2022).

According to Nakaizumi (2020), from a microeconomic perspective, the competencies acquired in a professional training program are crucial for economic growth through knowledge accumulation. This knowledge fosters technological progress, which in turn enhances the quality of the workforce and raises wages. Uddin (2021) argues that, to acquire high skills and knowledge during the academic process, it is essential to involve quality teachers, update curricula, and foster collaboration between universities and the productive sector.

The Tuning Project, launched in 2007, provides a fundamental framework for identifying generic structural competencies, still relevant today, classified into three main categories. Instrumental competencies include cognitive, methodological, technological, and linguistic skills. Interpersonal competencies encompass the ability to express social skills, work in teams, and maintain social commitment. Finally, systemic competencies are defined by the ability to integrate and apply knowledge in a way that articulates the whole through its parts. This approach is contrasted with that of the Labor Observatory of the Ministry of National Education in Colombia, which evaluates the competencies acquired by graduates upon completing their academic training, preparing them for the labor or professional field.

This study uses the evaluation of capabilities and aptitudes developed in higher education programs as a basis for analyzing their effectiveness and their reflection on educational quality. Such quality is measured against the standards of the Colombian Institute for the Promotion of Higher Education (ICFES, 2018) and the findings of Yañez (2020), which examine learning processes and competitive strategies. These elements relate to meeting academic requirements and addressing users needs.

Examining educational reforms in Ibero-America, Tobón et al. (2015), argue that academic competencies applied in the labor field are reflected in individuals actions when they develop knowledge with a creative and reflective purpose, ethically addressing change and transcending well-founded knowledge through the use of new information and communication technologies. This transformation leads to a new knowledge society capable of addressing cross-cutting problems. These topics remain a subject of

both theoretical and methodological research (Stepus, 2024).

In various contexts, such as Chile, Asia, Shanghai, and some private companies, the analysis of academic competencies at the undergraduate level and their relationship to graduate satisfaction has revealed a complex interaction among educational administrators, teachers, and students. These studies explore individual characteristics, teaching strategies, professional success, and productivity enhancement (Abidin 2021; Kim & Baek, 2020; Espinoza et al., 2024).

Similar studies in other regions, such as Italy, reveal that professional competencies indirectly influence professional success through activities that improve employability (Presti et al., 2022). Satisfaction not only stands out as a crucial determinant of student loyalty and evaluations but also research productivity emerges as a significant factor in the labor and professional performance of graduates, as indicated by Berbegal-Mirabent et al., (2020) and Verdú et al., (2016).

In Colombia, as in other countries, institutional organizations monitor graduates as an improvement strategy. These organizations collect information to evaluate academic competencies integrated into the labor market and the level of satisfaction with the institution and the program studied. This task falls to the Labor Observatory, responsible for designing such surveys to be administered through the graduate offices of each university, aiming to analyze and obtain results for decision-making processes (MEN, 2022).

While surveys can be an effective means of gathering information, the data obtained from them is often underutilized, resulting in superficial or merely descriptive reports without in-depth analyses that significantly influence professional training and its alignment with the labor market. Moreover, appropriate statistical techniques are not always employed to enable a detailed analysis of the collected data, such as the competencies acquired and the level of satisfaction with the academic program and institution. This is crucial for identifying strengths and weaknesses that could contribute to improving the quality of graduates.

Part of the solution to these issues is proposed in this study, which employs valid instruments for processing perception-based data, such as the structural equation modeling (SEM) technique. SEM combines multiple causal relationships between observed and latent variables, as explained in works like Medrano and Muñoz-Navarro (2017) and Ruiz et al. (2010) among others.

Structural equation models represent an adaptable approach to analyzing academic competencies due to their ability to handle multiple simultaneous causal relationships between observed and latent variables. Unlike more traditional statistical analyses, SEM provides a robust framework to understand how specific competencies interactively contribute to success in the labor market. This technique is particularly useful in education, where competencies may have both direct and indirect effects on labor outcomes, offering a more precise view of educational factors that influence graduates workforce integration. SEM is especially suitable for social sciences research due to its ability to specify complex constructs and measure their interactions accurately (Grace & Bollen, 2005).

To conduct this study, the research framework focuses on questions concerning the formation of individuals being, thinking, knowing, and doing, linking general capacities of the social and productive environment with the specific skills

reflected in the observable behaviors and abilities inherent to a professional discipline. This approach drives the formulation of a hypothesis aimed at establishing the relationship between instrumental competencies—facilitating essential technical and methodological skills—and interpersonal and systemic competencies, which promote effective and adaptive integration into diverse labor contexts.

Additionally, the study explores the dependency of systemic competencies on the former two. In light of this, the objective of this research is to analyze the relationship between academic competencies instrumental, systemic, and interpersonal acquired by university graduates and to determine how these competencies are perceived as influential factors in their successful integration into the labor market. This study aims to provide insights into the relationship between academic competencies and graduates employability and to offer a foundation for guiding future interventions and potential improvements in university educational programs.

Method

Methodological Approach

The research follows an exploratory, descriptive, and inferential methodological approach, employing univariate and multivariate analyses with data collected cross-sectionally (Hair et al., 2019).

Population and Sample

The population consisted of 2595 young adults aged 18 to 24 who recently completed undergraduate programs at the Pedagogical and Technological University of Colombia within the last two years. The sample was selected using a stratified probabilistic sampling design to ensure representativeness across various academic programs and genders. The calculated sample size was 519 participants, based on a 95% confidence level and a 5% margin of error. The gender distribution was 60% female and 40% male, representing socioeconomic strata I (38%), II (42%), and III or higher (10%).

Instrument

The instrument used was the graduate follow-up survey from the Labor Observatory for Education (OLE) conducted between 2018 and 2021, developed by the Colombian Ministry of National Education. The survey can be accessed at: https://encuestasole.mineducacion.gov.co/hecaa-encuestas/c/consultarEncuestasEstudiantes.

The survey is divided into three sections, with the latter two being the most relevant to this research. For the purposes of this study: Section 1, includes sociodemographic and economic characteristics, Section 2 addresses education and labor market requirements. Section 3, assesses the relevance of the academic program and institution. The measurement scales for the variables are predominantly ordinal (90%), using a Likert scale ranging from 1 (very dissatisfied) to 4 (very satisfied), with the remaining variables employing qualitative scales.

Procedure

The OLE survey was administered at time zero, defined as six months before graduation and up to three months afterward. This timeline was established and validated by the National System of Information on Higher Education (SNIES) to capture the participants perceptions as they approach graduation or shortly thereafter, regarding their university education and its alignment with labor market insertion. The survey was not anonymous, as participants were required to provide their names and identification numbers.

To process the information, the variables from Section 2 of the OLE survey were organized and classified into the three competencies outlined in the Tuning Project: instrumental, systemic, and interpersonal. These competencies are defined as generic skills applicable to any program or degree, representing learning outcomes.

Additionally, data from Section 3 of the survey was analyzed to evaluate the graduates level of satisfaction with their academic program and institution. This was deemed significant because general competencies reflect the skills, knowledge, and attitudes acquired, which are essential for achieving success in life (Pálvölgyi, 2017).

This study does not involve specific ethical standards, as it exclusively analyzes data from the labor market education survey,

designed and administered by government entities. The information used was collected such that participants identities remain anonymous, and the data was publicly available for research purposes, ensuring compliance with ethical principles of confidentiality and implicit informed consent.

Statistical Analysis

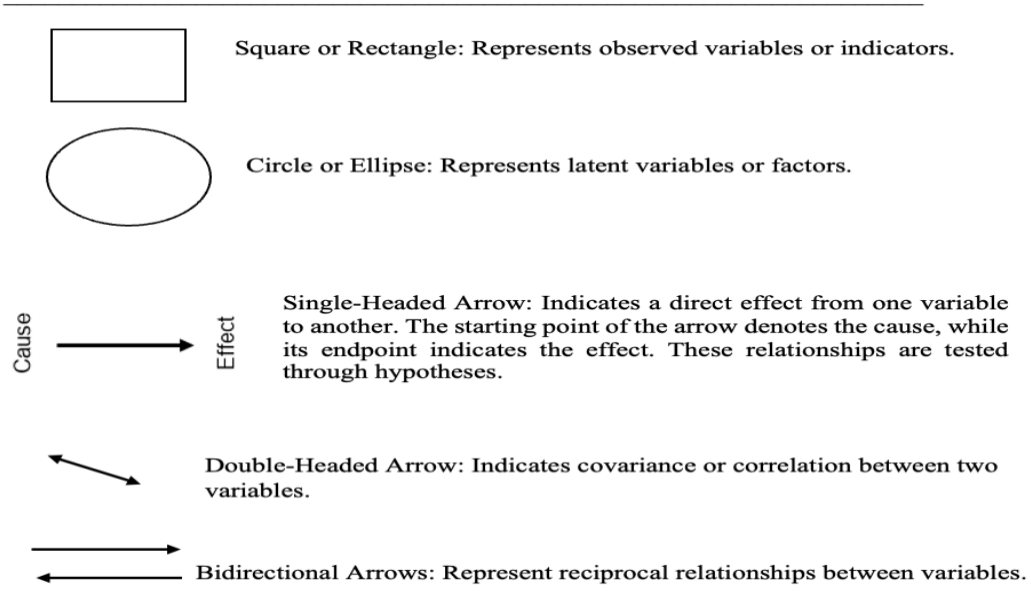
In the first phase, exploratory statistical techniques were applied, including the identification of outliers, absolute frequencies, percentages, and ratios. The variables were grouped into the three competencies outlined in the theoretical framework of the Tuning Project. Subsequently, in the second phase, a structural equation modeling (SEM) approach was implemented. This method evaluates hypotheses regarding causal relationships, represented through pathways or trajectories that reveal different effects, as illustrated in Figure 1.

Structural equations are decomposed either directly or indirectly, much like linear regression models constructed with observed data. A model is formalized to encapsulate the various causal chains hypothesized to explain the knowledge, skills, and attitudes developed during the learning process. The effects are examined in relation to observed and latent variables to evaluate the degree of association, as well as the presence of dependency and independence among them (Wang & Rhemtulla, 2021).

SEM modeling provides parameter and evaluation indicator estimates. Model validation is performed using the global chi-square statistic divided by degrees of freedom, with an acceptance criterion of $\chi^2/df < 3$, and the Root Mean Square Error of Approximation (RMSEA) < .05. The Comparative Fit Index (CFI) is calculated to assess the fit between the theoretical model and the observed data, indicating a strong fit with values close to 1 (Niemand & Mai, 2018); or an acceptable fit with values between .6 and .7 (Rodríguez *et al*., 2018; Hermida, 2015).

The results of the SEM modeling are presented in a path diagram (Buitrago-Rodríguez et al. 2023). Data processing was conducted using the SPSS (IBM) software with the AMOS extension, which facilitated the visualization of relationships and values in a structured schema (Medrano y Muñoz-Navarro, 2017; Grace & Bollen, 2005).

Figure 1. Conventions Used in SEM Construction.



Note: Adapted from Buitrago-Rodríguez et al. (2023) y Escobedo et al (2016)

Results

The results are presented in two sections. Initially, the identification and validation of the theoretical proposal based on the Tuning Project are analyzed. This framework classifies competencies into three dimensions: instrumental, interpersonal, and systemic. These categories help direct students development in key areas critical to their holistic growth and were validated using structural equation modeling (SEM). The second section examines graduates satisfaction with their institution and academic program. The results are visualized through graphical representations that showcase the causal effects between variables, highlighting one of the strengths of SEM (Byrne, 2016).

Classification and Validation of Competencies through SEM

To process the information using SEM, 23 survey items related to competencies were identified and coded, as illustrated in Table 1. The items correspond to observable variables distributed among three competency types: eight instrumental competencies, seven systemic competencies, and eight interpersonal competencies, classified in alignment with the Tuning Project guidelines.

In detail, three latent factors were derived and labeled as follows: instrumental competencies, systemic competencies, and interpersonal competencies

Table 1. Observable Variable Codes by Competency Type.

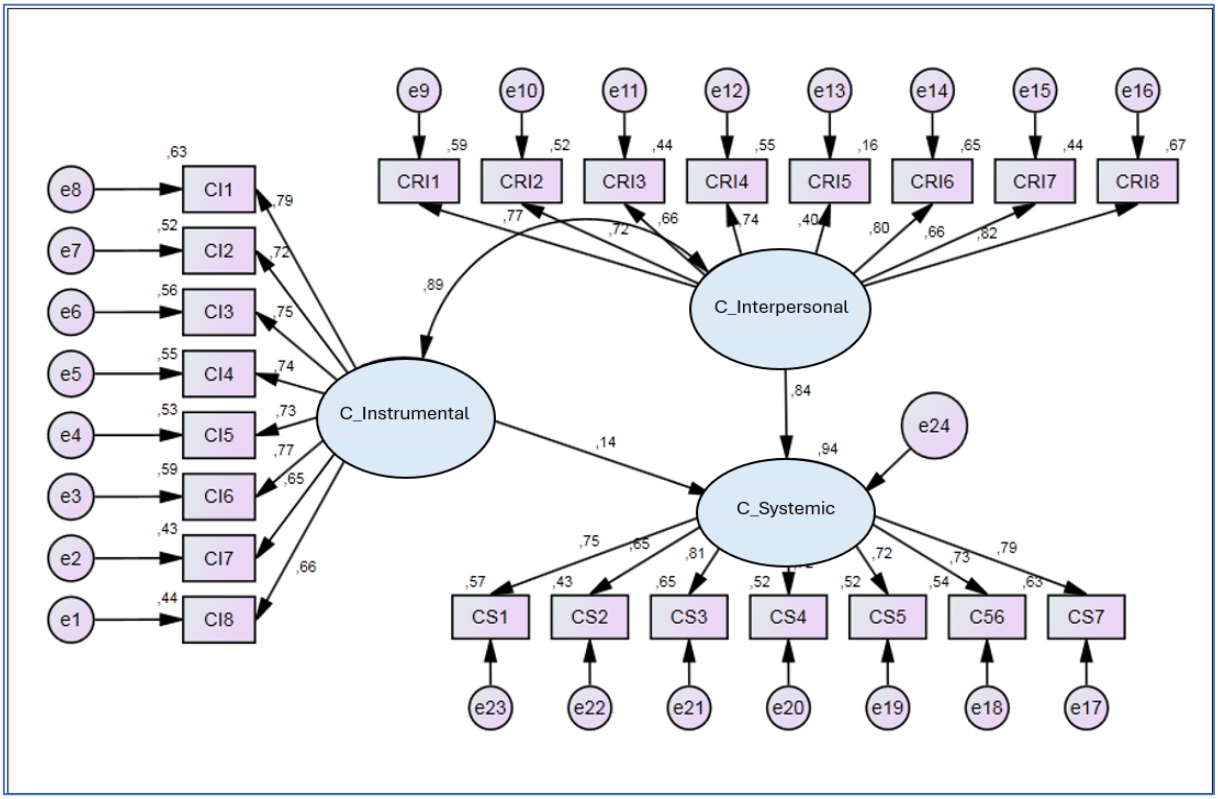
Instrumental competencies	Systemic competencies	interpersonal competencies
Clearly and effectively presents ideas orally: CI1	Stays updated: CS1	Work in a team: CRI1
Uses basic IT tools: CI2	Is creative and innovative: CS2	Demonstrates ethical values: CRI2
Searches, analyses, manages, and shares information: CI3	Possesses leadership skills: CS3	Shows the ability to understand and negative multicultural contexts: CRI3
Clearly and effectively communicates ideas in writing: CI4	Has the ability to apply techniques in the labor market: CS4	Resolves interpersonal conflicts effectively CRI4
Reads and understands academic material:CI5	Has a knowledge and skills related to job market integration: CS5	Takes responsibility and makes decisions: CRI5
Uses and understands: reasons through quantitative methods: CI6	Has the skills to design, execute, and evaluate research or projects: CS6	Demonstrates critical and analytical thinking: CRI6
Understands and applies qualitative methods: CI7	Acquires knowledge across diverse areas: CS7	Identifies, formulates, and solves problems: CRI7
Masters a second language: CI8		Possesses argumentative skills: CRI8

Note: The items correspond to the questions in the OLE survey. (MEN, 2022).

The analysis begins with an examination of the theoretical model, identifying both causal and non-causal relationships, as suggested by Medrano and Muñoz-Navarro (2017). Based on structural equation modeling (SEM), the variables are linked across the three types of competencies, represented as circles or ellipses to denote latent variables. This approach aims to understand academic processes by verifying the skills acquired during academic life.

The first model conceptualizes the hypothesis regarding competencies: a high correlation is expected between instrumental and interpersonal competencies, which consequently impacts the development of systemic competencies. The structural equation modeling (SEM) representation is shown in Figure 2, which illustrates the factor loadings for each variable within each competency and the relationships between them. The estimation converges on parameter values ranging from .4 to .79, most of which are acceptable. These results indicate a high degree of influence between the competencies and their associated variables (O'Rourke & Hatcher, 2013). Furthermore, a high correlation of .89 is confirmed *between instrumental and interpersonal competencies*, with a direct effect on *systemic competencies.*

Figure 2. Structural Equation Model - Relationship between competencies: interpersonal, instrumental, and systemic.



Note: The data corresponds to the responses from the Labor Observatory Survey by the Colombian Ministry of Education (MEN, 2022).

The high positive correlation of .89 between instrumental and interpersonal competencies indicates that the greater the development of instrumental competencies, the better the interpersonal relationships. The interpersonal competencies factor presents a significant direct causal relationship with an effect on systemic competencies of .84. Additionally, there is a weak but significant correlation between the instrumental competency factor as an incident factor in the systemic competency, with a value of .14.

This could be associated with a paradigm shift in this new generation of graduates, where the incorporation of competencies is not necessarily centered on a linear approach from teacher to student, despite the continued appreciation of the teacher's update in teaching methodologies and evaluation.

For the variables associated with instrumental competencies, the competency that most influences or loads the factor is the ability to orally present ideas clearly and effectively (CI1), with a value of .79. For the interpersonal variables, the highest load comes from the argumentative capacity (CRI8), with a value of .82. For the systemic variables, the competency that most loads the factor is argumentative capacity (CS3), with a value of .80. The previous model is validated with the goodness-of-fit indices listed in Table 2.

Table 2. Fit Indices in the Model

Fit Index	Index Value	Description	Criterion
GFI	.673	Explains 67.3% of the variance.	.6 < GFI < 1 Good fit
TLI	.769	Unnormalized fit index.	.6 < TLI < 1 Good fit
RMSEA	.067	Mean square error of approximation.	.05 < RMSEA < .08 Goodfit
CMIN/DF	2.78	Minimum value of the discrepancy function divided by degrees of freedom.	< 4 Acceptable fit

Note: Processed data obtained from SPSS. Criterion: Acceptable values according to Medrano and Muñoz-Navarro (2017)

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In contrast to the responses obtained from the survey, a satisfaction scale was issued based on a value judgment according to the perception of the participants. According to De la Rosa-Alzate and Morales (2020) and Loaiza-Aguirre and Andrade-Abarca (2021), in professional development programs, competencies foster the development of basic academic skills, which allow the identification of cognitive, methodological, and linguistic capabilities.

Descriptively, Tables 3, 4, and 5 display aspects related to the graduate's opinion on the competencies acquired during their academic life, expressed in four satisfaction levels according to the survey: very low, low, medium, and high. These are classified into two categories: satisfied (high and medium categories) and dissatisfied (low and very low categories), associated with the general competencies of instrumental, interpersonal, and systemic types.

Table 3. Percentage of Satisfaction Levels in Instrumental Competencies.

Instrumental Competencies	Satisfaction Levels	Dissatisfaction Levels
Presenting ideas orally in a clear and effective manner	96.8%	4.2%
Using basic computer tools	96.6%	3.4%
Searching, analyzing, managing, and sharing information	98.3%	1.7%
Presenting ideas clearly and effectively in writing	97.5%	2.5%
Reading and understanding academic material	99.2%	0.8
Use and understanding of reasoning and quantitative methods	94.1%	5.9%
Use and understanding of qualitative methods	98.3%	1.7%
Proficiency in a second languages	64.7	35.3%

Note: The percentages correspond to the responses from recent graduates - OLE Survey.

Regarding the competencies of the instrumental prototype, as seen in Table 4, most graduates express a favorable perception, evaluated as satisfied and very satisfied, with values above 90%, except for the variable associated with the mastery of a second language. Although the majority of graduates are satisfied with this competency (64.7%), there is a considerable percentage (35.3%) associated with a range of values between *dissatisfied* and *very dissatisfied*. Table 4 shows the general *competencies of*

interpersonal relations, which consist of social cooperation, associated with communicative and critical skills (Bartram & Roe, 2005).

The table 5 shows systemic competencies with percentages exceeding 80%, among which the highest values are highlighted: the ability to learn and stay updated (97.5%), argumentative ability (95.8%), and the ability to acquire knowledge from different areas, with the same percentage.

Table 4. Percentage of Satisfaction Levels in Interpersonal Competencies.

Interpersonal Competencies	Satisfaction Levels	Dissatisfaction Levels
Teamwork	95.8%	4.2%
Formation of Ethical Values	96.6%	3.4%
Ability to Function in Multicultural Contexts	96.8%	4.2%
Ability to Resolve Interpersonal Conflicts	97.5%	2.5%
Taking Responsibility and Making Decisions	99.2%	0.8%
Critical and Analytical Thinking	96.6%	3.4%
Identify, Address, and Resolve Problems	95.8%	4.2%

Note: Response percentage from recent graduates - OLE Survey. (MEN, 2022).

Table 5. Satisfaction Levels in Systemic Competencies.

Systemic Competencies	Satisfaction Levels	Dissatisfaction Levels
Learn and stay updated	97.5%	2.5%
Be creative and innovative	88.2%	11.8%
Leadership skills	95%	5%
Ability to use techniques for labor market insertion	80.6%	19.4%
Knowledge and skills related to labor market insertion	82.3%	17.7%
Ability to formulate, execute, and evaluate a research or project	94.2%	5.8%
Argumentative skills	95.8%	4.2%
Acquire knowledge from different areas	95.8%	4.2%

Note: Percentage of responses from recent graduates - OLE Survey. (MEN, 2022).

In general, observing the three dimensions of competencies in percentage values, the graduates perception is that most of the competencies acquired have satisfaction values above 90%. In skills and abilities to use techniques for insertion into the labor market, satisfaction percentages are 82% and 81%, respectively. The mastery of a second language obtained a satisfaction percentage of 65%, a situation that highlights a focus for improvement in the academic process.

Graduate Satisfaction Analysis with the Institution and Program

In a similar manner to the previous analysis, the information describing the observable variables associated with the satisfaction of the program and the institution (latent variables) is processed, as listed in Table 6, which constitute the elements influencing the graduate's formation. When establishing the influence of program satisfaction in relation to institution satisfaction, the structural equation model (SEM) is constructed. It is proposed that the latent variable termed program satisfaction (Sprograma) has an effect on the latent variable institution satisfaction (Sinstitución), and in turn, affects the 21 exogenous (independent) observable variables coded in Table 6.

Table 6. Codes for Observable Variables Relating to Program and Institution Satisfaction.

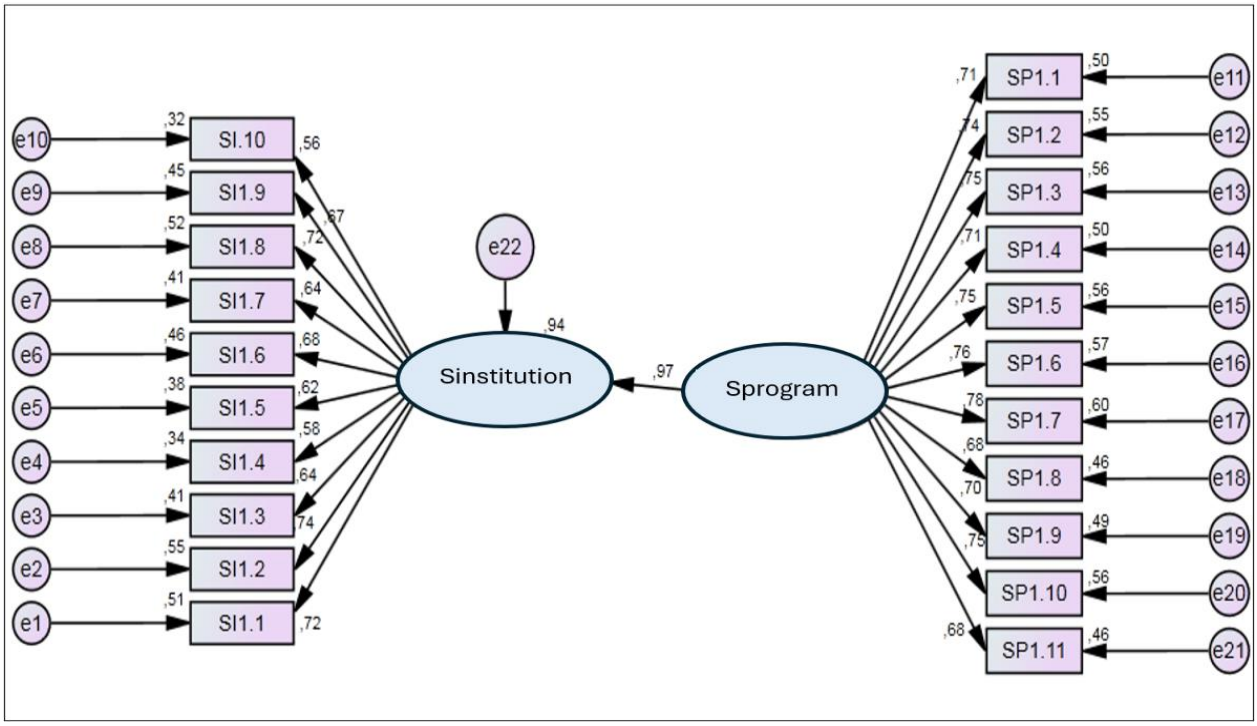
Observable Variables Related to Program Satisfaction	Observable Variables Related to Institution Satisfaction
Satisfaction level with the academic program attended: SP1.1	Satisfaction level with the institution: SI1.1
Effectiveness of teaching by professors: SP1.2	Attribute of the integral training received at the institution: SI1.2
Availability of professors time: SP1.3	Availability of professors time: SI1.3
Interpersonal relationships with professors: SP1.4	Opportunities to participate in extracurricular activities: SI1.4
Level of professors training: SP1.5	Interpersonal relationships within the institutional community: SI1.5
Availability of courses in the academic program: SP1.6	Opportunities for personal growth and development: SI1.6
Quality of course content in the academic program: SP1.7	Availability to take courses in other programs: SI1.7
Flexibility of schedules within the academic program: SP1.8	Academic support: SI1.8
Availability of tutoring or other assistance: SP1.9	Research activities: SI1.9
Quality of academic advising or counseling: SP1.10	Support in finding job opportunities: SI1.10
Service provided by department or program staff: SP1.11	

Note: The items correspond to questions from the OLE survey (MEN, 2022**)**

When establishing the influence of program satisfaction in relation to institution satisfaction, the structural equation model (SEM) is constructed. It is proposed that the latent variable termed program satisfaction (Sprograma) has an effect on the latent variable institution satisfaction (Sinstitución), and in turn, affects the 21 exogenous (independent) observable variables coded in Table 6.

The model in Figure 3 is estimated using maximum likelihood, and it is observed that each of the latent variables is significant at the 5% level. Furthermore, the satisfaction of the recent graduate with respect to the institution is explained by the graduate's satisfaction with the program by 97%.

Figure 3. Structural Equation Model. Satisfaction Level: Institution and Program.



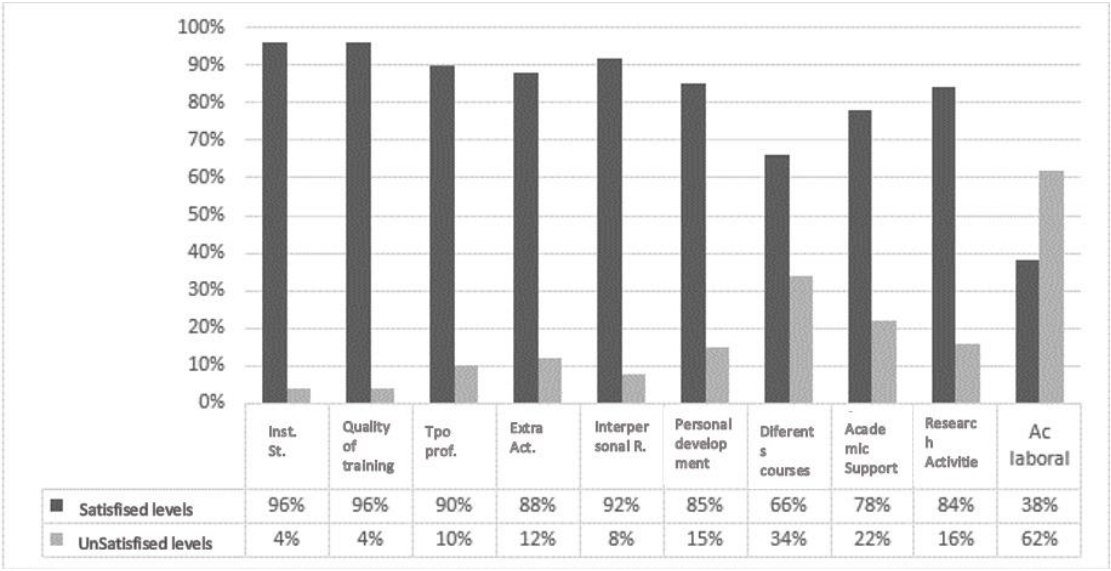
Note: The data are obtained from the responses to the OLE survey (MEN, 2022).

It can also be noted that, in the case of the variable associated with program satisfaction, the item that has the most influence or loading is the quality of the topics covered in the classes (SP1.7) with a value of .78, and for the institution, the item related to the effectiveness of the integral training received at the university (SI1.2) with a value of .74. Additionally, random variables are linked and represented by the error term ei, with values ranging from .01 to .6, representing other factors not accounted for in the model.

The confirmatory statistics according to Ruiz et al. (2010) meet optimal parameters for good fit with indicators: CMIN/DF of 2.06, which, as previously specified, is less than 4; GFI of .75, a non-normalized adjustment index of .85, close to 1; and RMSEA of .05, a mean approximation error per degree of freedom.

Descriptively, in Figure 4, a favorable overall picture emerges. In other words, high levels of satisfaction are revealed in all the aspects evaluated, such as institutional aspects, quality of education and professors, extracurricular activities, interpersonal relationships, personal development, research activities, labor activities, and academic support.

Figure 4. Graduate satisfaction with the institution



Note: Data obtained from the responses to the OLE survey (MEN, 2022).

Although most of the data indicate that satisfaction levels with the institution fall within the ranges of satisfied and very satisfied (values of 3 and 4), certain variables reveal present dissatisfaction. This is the case for the item: "support in the search for job opportunities", which scored a value of 2, reflecting, according to the Likert scale, a perception of dissatisfaction. In percentage terms, approximately 61% of recent graduates expressed discontent on this matter.

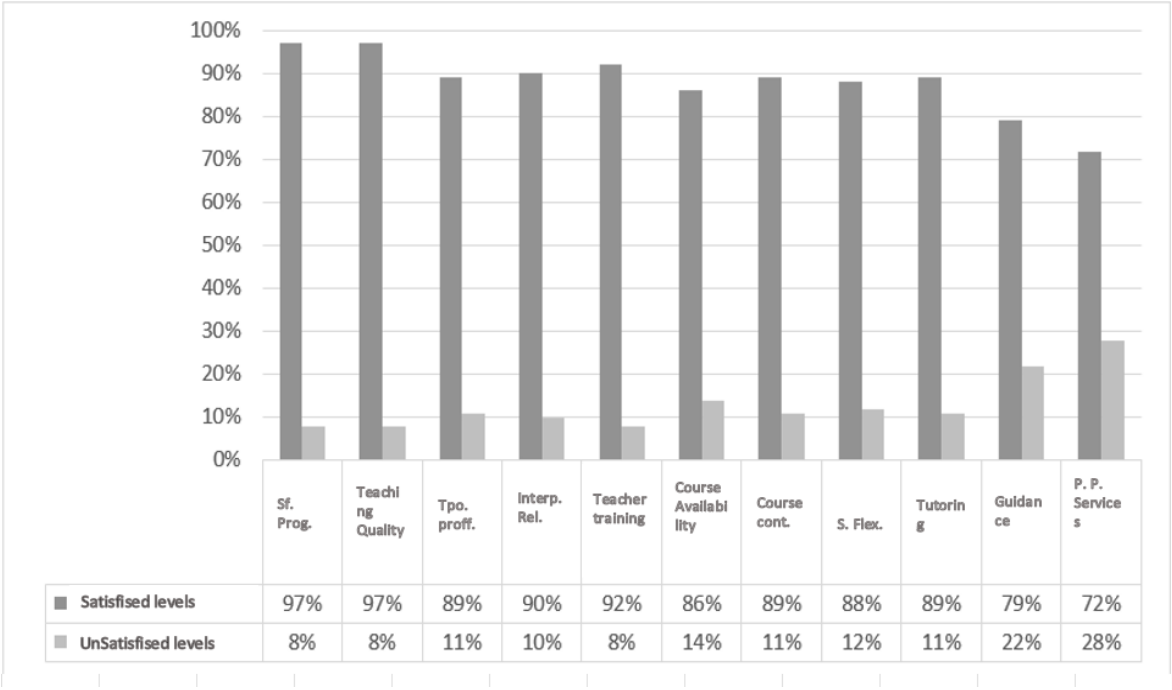
Similarly, it is essential to address the importance of the perception of the academic program, a factor strongly associated with the perception of the institution. The following results were found in this regard: graduates reported a high level of satisfaction with the quality of faculty training, satisfaction with the academic program, and the availability of courses within their academic program.

This was followed by the quality of teaching provided by professors, the time professors make available to assist students, and the quality of the topics covered in the program's courses. These parameters stand out within the positive perception of graduates regarding the

Economics program and its level of competitiveness and quality of training at the institution, as evidenced in Figure 5.

These descriptive measures underscore the need to develop strategies that prioritize supporting recent graduates in identifying opportunities to access the labor market.

Figure 5. Graduate Satisfaction with the Economics Program.



Note: Data obtained from the responses to the OLE survey (MEN, 2022).

Discussion and Conclusions

The results obtained in this study expand on theoretical principles discussed in prior research, such as Grosemans and Cuyper (2021), who argued that professional competencies generally improve during education and stabilize upon entering the labor market. This study highlights a strong correlation between systemic, instrumental, and interpersonal competencies.

General competencies are crucial because they encompass the skills, knowledge, and attitudes students need to succeed academically, professionally, and personally. According to the Tuning Project (Bravo, 2007), these competencies are categorized into three dimensions: the cognitive dimension, which develops intellectual abilities such as critical thinking, problem-solving, and creativity; the instrumental dimension, which focuses on practical skills like technology use, effective communication, and teamwork; and the attitudinal dimension, which fosters responsible citizenship and positive contributions to society.

The findings reveal that instrumental competencies significantly influence interpersonal competencies. Together, they strengthen systemic competencies, which are essential for the successful and adaptive labor market integration of graduates (Tejeiro et al., 2013). These competencies also enhance leadership skills critical for STEM organizations (Akdere et al., 2018).

The results indicate that graduates generally exhibit high to medium levels of satisfaction with the competencies acquired. This suggests that they feel equipped to meet the demands of the labor, economic, and social environment, aligning with the skills outlined in the International Standard Classification of

Occupations, by the National Apprenticeship Service (SENA, 2019). Moreover, studies like (Hui et al., 2021), emphasize that these skills are not only acquired through formal education but are also significantly supplemented by extracurricular activities.

However, the lack of strong second-language skills, particularly English, emerges as a weak area that requires reinforcement. This is increasingly necessary in various productive sectors and remains a focal point for graduates aiming to address global labor market challenges (Qerimi et al., 2022). From the students perspective, second-language proficiency is critical for employability. This is consistent with the findings of Cabrera et al (2016) and Gilbert et al., (2022), which highlight the value of English competency in selection processes and its association with higher graduate quality.

An optimistic perception was noted among graduates regarding their development of leadership skills for research or project execution, aligned with business demands. This underscores the importance of academic programs in organizing, planning, and providing theoretical training, a responsibility attributed to the institution (Bravo, 2007).

The positive perception of graduates about their skills and capacities could, according to the International Labour Organization (OIT, 2009), impact workplace performance and regional economic growth. However, dissatisfaction with "support for job-seeking opportunities" highlights a pressing concern for graduates struggling to enter the labor market. Institutions should prioritize strategies to address this issue, potentially adopting project-based active methodologies, as suggested by Sologuren et al. (2019).

In response to other negative perceptions about labor market integration, academic programs should implement improvement strategies to strengthen systemic, instrumental, and interpersonal competencies. These aspects have gained prominence recently as universities and organizations adapt to prepare students and graduates for labor market entry in the wake of the COVID-19 pandemic (Donald et al., 2022; Zakkariya et al., 2021).

The structural equation modeling (SEM) analysis identified significant associations between graduates professional profiles and the strong correlation between instrumental and interpersonal competencies with systemic ones. This highlights an integrated relationship between learning tools, relational capacities, and performance management within their fields. These findings align with Awan, et al. (2021), who reported a positive association between interpersonal competencies, such as communication and teamwork skills, and academic performance. While this study did not directly measure participants academic performance, it noted that all courses and final projects were completed successfully.

This research contributes to identifying competencies that enhance graduate quality and labor market integration, which in turn support high-quality accreditation processes. Methodologically, the use of structural equation modeling offers a reference framework for analyzing students perceptions and beliefs about the quality of their university education. These findings can inform evaluation processes and quality assessments across all programs, as highlighted by Paz and Estrada (2022).

Limitations of the study include that although structural equation modeling provides comprehensive insights into variable relationships, the cross-sectional nature of the data limits strict causal inferences between acquired competencies and labor market integration. Additionally, the study sample was restricted to recent graduates from the Universidad Pedagógica y Tecnológica de Colombia, which may not represent other universities, particularly in diverse cultural or economic contexts. Furthermore, the study relied on self-reported data, which may be subject to social desirability bias or memory recall inaccuracies.

Future studies should expand to include educational institutions with diverse demographic and academic characteristics to

generalize findings more broadly. Longitudinal research designs could evaluate the evolution of academic competencies and their long term impact on labor market integration. Additionally, incorporating qualitative methods, such as interviews or focus groups, could complement quantitative data and provide deeper insights into the relationships between competencies and professional success, exploring graduates personal experiences and detailed perceptions.

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This article includes data organized in Excel, obtained from the Graduate Surveys conducted by the Labor Observatory for Education (OLE) between 2018 and 2021. The survey data, developed by the Colombian Ministry of National Education, are publicly accessible at https://encuestasole.mineducacion.gov.co/hecaa-encuestas/c/consultarEncuestasEstudiantes.

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