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ORIGINAL

Creating exponential value and mapping entrepreneurial competencies: A methodological proposal from the classroom to the advanced public university

Creación de valor exponencial y mapeo de competencias emprendedoras: Una propuesta metodológica desde el aula a la universidad pública avanzada

José Luis Bravo Silva[1], Elba Martina Cortés Palacios[2], Guillermo José Navarro Del Toro[3]

[1]University Center of the Coast, University of Guadalajara, Mexico.
[2]University Center of the Lakes, University of Guadalajara, Mexico.
[3]University Center of the Altos, University of Guadalajara, Mexico.

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Corresponding author: Guillermo José Navarro Del Toro

ABSTRACT

The entrepreneurship is consolidating itself as a fundamental strategy to mitigate unemployment, growing structurally and driving economic development. This requires strengthening cross-cutting and specialized skills during university education to increase the probability of success in consolidating sustainable ventures. However, in the entrepreneurial ecosystem, young people face obstacles due to limited practical experience and the current skills gap, which compromises the viability and continuity of innovative projects. This research seeks to assess the level of development of entrepreneurial skills, focusing on the final year of degrees in Administration, Public Accounting and Finance, Management and Public Policy, Business, Marketing, and Sustainable Tourism at public universities, specifically those who actively participate in institutional programs on entrepreneurial development. It analyzes the presence of gender gaps among young entrepreneurs, highlighting the differences in skills between students with and without previous experience. A non-probabilistic quantitative design was applied to 210 students using a structured digital survey. Data analysis used two-stage clustering techniques, identifying five distinct groups that were statistically validated using analysis of variance (ANOVA). The findings show that public higher education has effectively institutionalized the entrepreneurial paradigm, facilitating the acquisition of professional, methodological, communicative, personal and collaborative skills for most students, revealing a superiority in skills among male participants and those with previous business experience, suggesting differentiating factors. Consequently, a curriculum reengineering is recommended to incorporate specialized modules in the identification, development, and materialization of business opportunities, promoting the successful labor market insertion of graduates, both in self-employment and in the traditional-market labor, contributing to strengthening of national entrepreneurial ecosystem.

Keywords: Entrepreneurship; Students; Professional Studies; Skills; Mexico.

RESUMEN

El emprendimiento se consolida como una estrategia fundamental para mitigar el desempleo, creciendo estructuralmente, e impulsando el desarrollo económico, esto exige fortalecer habilidades transversales y especializadas durante la formación universitaria, para incrementar la probabilidad de éxito en la consolidación de emprendimientos sostenibles. Sin embargo, en el ecosistema emprendedor, entre los jóvenes existen obstáculos derivados de la limitada experiencia práctica y la actual brecha de habilidades, lo que compromete

la viabilidad y continuidad de los proyectos innovadores. La presente investigación busca evaluar el nivel de desarrollo de habilidades emprendedoras, centrándose en el último año de las carreras de Administración, Contaduría Pública y Finanzas, Gestión y Políticas Públicas, Negocios, Marketing y Turismo Sostenible en universidades públicas específicamente los que participan activamente en programas institucionales sobre desarrollo emprendedor, analizando la presencia de brechas de género entre jóvenes emprendedores, destacando las diferencias de competencias con estudiantes con y sin experiencia previa; se implementó un diseño cuantitativo no probabilístico con 210 estudiantes mediante una encuesta digital estructurada. El análisis de datos empleó técnicas de agrupamiento mediante dos etapas, identificando cinco grupos distintos que se validaron estadísticamente mediante análisis de varianza (ANOVA). Los hallazgos muestran que la educación superior pública ha institucionalizado eficazmente el paradigma emprendedor, facilitando la adquisición de habilidades profesionales, metodológicas, comunicativas, personales y colaborativas para la mayoría de los estudiantes, revelando una superioridad en competencias entre participantes masculinos y aquellos con experiencia empresarial previa, lo que sugiere factores diferenciadores. En consecuencia, se recomienda una reingeniería curricular para incorporar módulos especializados en la identificación, desarrollo y materialización de oportunidades de negocio, promoviendo la inserción laboral exitosa de egresados, tanto en el autoempleo como en el mercado laboral tradicional, contribuyendo al fortalecimiento del ecosistema emprendedor nacional.

Palabras clave: Emprendimiento; Estudiantes; Estudios Profesionales; Habilidades; México.

INTRODUCTION

The contemporary labor ecosystem for young people shows systemic dysfunctions derived from experiential asymmetry, the disconnection between training competencies and the strong demands on organizational competencies, as well as structural limitations on the development of independent entrepreneurship.[1] This multidimensional problem positions youth employment—encompassing a population segment between 15 and 29 years of age[1]—as a cross-cutting axis of the United Nations 2030 Agenda, a strategic framework oriented towards integral sustainable development that contemplates the preservation and promotion of peace, distributive justice, inclusive prosperity, and anthropocentric harmonization with natural systems.

Specifically, the fourth Sustainable Development Goal, focused on quality education, establishes the commitment to exponentially increase "the number of young people and adults who possess the necessary skills, particularly technical and vocational skills, to access employment, decent work and entrepreneurship.[2] In this paradigm, entrepreneurship coexists with the mere generation of self-employment, constituting a multisectoral catalyst that synergistically contributes to the achievement of complementary objectives: creation of quality employment, increase in sustainable social well-being, eradication of hunger and structural poverty, and stimulation of endogenous economic growth.[3]

The construct of entrepreneurship transcends the mere creation of independent business entities, encompassing complex organizational modalities such as internal corporate entrepreneurship, university and business spin-offs, strategic joint ventures, and the development of specialized subsidiaries.[4] This typological diversification reflects the evolution of the entrepreneurial paradigm toward a multidimensional phenomenon that operates at various organizational levels and institutional contexts. From this perspective, entrepreneurship not only tends to be a process of generating new businesses but is also intended to be a mechanism for innovation, knowledge transfer, and value creation in different social and economic spheres. Similarly, its scope is closely linked to the capacity for technological absorption, access to collaborative networks, and the interaction within innovation ecosystems, where universities, businesses, governments, and civil society act as interdependent agents for each member; playing the role of driving competitiveness and sustainability, capable of adapting to changes in the global environment and responding to the challenges of the digital and knowledge economy.

Entrepreneurial Ecosystems and Development Policies

Contemporary empirical evidence demonstrates that the consolidation of robust business ecosystems is a determining factor in accelerating national economic growth, motivating the government to implement specialized public policies to foster their systematic development.[5] These initiatives are part of differentiated territorial development strategies, aimed at boosting the economy of specific regions by creating local competitive advantages.[6]

In parallel, higher education institutions have initiated curricular and structural transformation processes to adaptively respond to emerging societal demands, positioning themselves as agents of change in national development.[7] This academic reconfiguration has fostered the emergence of university entrepreneurial

ecosystems, which have been embodied in the articulation between academia, industry, and research, thus strengthening the regional business architecture.[8]

Institutional Impact and Competency Development

The institutionalization of entrepreneurship in university settings generates transformative dynamics for collective outreach that influence both institutional human capital and students.[9] Through this successive training cycle, transversal competencies are developed that enhance both independent entrepreneurial success and job placement in positions with higher added value and competitive remuneration,[10] systematically contributing to the reduction of structural unemployment.[11]

Classical Economic Perspective: The Cantillonian Foundations

The first systematic approach to entrepreneurship emerged in 1755 with Richard Cantillon, who, from a neoclassical economic perspective, conceptualized the entrepreneur as an economic agent who assumes systematic risks by acquiring products at known prices to market them in markets characterized by price volatility and uncertainty.[12] This pioneering conceptualization established present risk as a fundamental element of entrepreneurial behavior, anticipating subsequent theoretical developments on the management of business uncertainty.

Particularities of the Latin American Context

In the context seen in Latin America, entrepreneurship emerges predominantly as an adaptive strategy in the face of chronic unemployment, primarily oriented toward generating subsistence income Querejazu.[13] This reality demands that universities develop specialized training spaces that foster entrepreneurial skills in controlled environments that minimize the risks associated with the creation of new businesses Fischer et al.[14]

Kaniak and Teixeira identify specific institutional mechanisms that greatly contribute to fostering university entrepreneurship: establishing business incubators in addition to academic startups, consolidating strategic business alliances, and systematically promoting intellectual property.[7] However, given the emerging nature of this topic, there remains a lack of consolidated methodological frameworks for the effective promotion of entrepreneurship in university settings.[8]

The main objective of this research is to determine the level of entrepreneurial skills development among final-year university students, specifically those enrolled in programs with business components and active participation in institutional entrepreneurship initiatives. Additionally, competency differences are analyzed based on gender variables and prior entrepreneurial experience.

Theoretical Architecture and Disciplinary Perspectives

The growing advancement of entrepreneurial development in the contemporary socioeconomic sphere has fostered a strong consolidation as an object of transdisciplinary research, generating a diversified theoretical corpus that integrates economic, psychological, sociological, and organizational perspectives.[12] This epistemological plurality has resulted in the emergence of multiple conceptual frameworks with distinctive methodological approaches, reflecting the inherent complexity of the entrepreneurial phenomenon.

Psychosocial Dimensions of Entrepreneurship

The Schumpeterian theoretical framework recognizes intrinsic motivation, the desire for achievement, and social interaction as essential components of entrepreneurial nature. This perspective integrates dimensions of transformational leadership, characterizing the entrepreneur as an agent capable of creating social influence and mobilizing human resources toward the achievement of shared organizational goals, thus exercising catalytic leadership in the formation of high-performance teams.[15]

Entrepreneurial skills to be developed at the university

Specialized literature has highlighted that entrepreneurs need to possess a series of competencies to successfully carry out their activities, considering what has been observed in various classifications that present similarities between them, being the cognitive, technical, social and attitudinal capacities that favor changing contexts. According to the Royal Spanish Academy, competencies are defined as the aptitudes or skills that a person possesses to carry out a specific activity or participate in a certain matter.[16] In an entrepreneurial profile is composed of professional, methodological, communicative, personal and cooperative competencies, consequently, it allows the establishment of strategic networks and sustain continuous learning processes.[14]

In this research, this position is considered relevant for analyzing the promotion of entrepreneurship in Mexican public universities, as it seeks to identify whether these institutions contribute to a comprehensive education that promotes entrepreneurship through academic and extracurricular activities. This will allow us to characterize regional advances in the development of entrepreneurial profiles in university students.

Therefore, the fundamental competencies for entrepreneurship are defined below, adding processes to business ecosystems.

Professional Competence: Development of Sustainable Organizational Capabilities

From the perspective of university entrepreneurial education, pedagogical activities aimed at developing entrepreneurial skills constitute the fundamental core of specialized vocational training. This systemic approach demands that higher education institutions design curricular architectures that enable the acquisition of differentiated competencies for competitiveness in dynamic labor markets and the cultivation of entrepreneurial mindsets oriented toward the creation of innovative business entities Fayolle.[17]

The effective implementation of this educational philosophy requires the promotion of entrepreneurial spirit through a dual approach: curricular integration through specialized subjects in undergraduate and graduate programs, complemented by extracurricular activities that include advanced training workshops, keynote lectures by experts, and student events that generate synergy between students, academics, administrative staff, the business sector, and the community in general.[18]

Professional competence is conceptualized as the ability to develop sustainable skills in both the intellectual and social spheres to face complex situations in the contemporary professional environment.[19] DeWaters and Kotla demonstrate that the development of these competencies is optimized through pedagogies focused on an entrepreneurial mindset, implementing collaborative learning strategies, project-based methodologies, and complex case resolution.[20]

Empirical evidence provided for business administration students confirms superior skill acquisition when challenge-based methodologies are used, which integrate interdisciplinary collaboration, advice from sector experts, and the use of advanced technological resources.[21] The "Shark Tank" approach exemplifies this pedagogical approach, where student projects are evaluated and provided feedback by business experts, generating authentic and applicable learning experiences.

Methodological Competence: Procedural Architecture for Innovation

Methodological competencies comprise the systemic set of procedures, methods, and specialized techniques that students must internalize for effective professional performance.[22] Robledo conceptualize them as the ecosystem of skills, abilities, attitudes, and values that support efficient and ethically responsible professional performance.[23] These competencies acquire critical relevance in the face of contemporary social demands and emerging professional challenges, which position students in increasingly complex scenarios. Higher education requires the implementation of innovative pedagogical methodologies that transcend traditional rote paradigms, fostering active and creative entrepreneurial spirits through the transdisciplinary integration of knowledge to enhance advanced methodological skills.[24]

The current academic reality demands pedagogical transformations that incorporate active learning processes, promoting student autonomy and training competent professionals for dynamic business ecosystems.[25] It is recommended to include specialized courses in advanced semesters that provide tools for developing competencies related to the construction and execution of techniques, processes, and methodologies linked to entrepreneurship.[25]

The Global Entrepreneurship Monitor (GEM) provides specialized methodological frameworks for the study of entrepreneurship at the national level, constituting a knowledge platform that universities, academics, and entrepreneurs should strategically leverage.[26] Fostering methodological competencies involves developing skills in event research, systematic analysis, and complex case resolution.[27]

Communicative Competence: Relational Architecture and Strategic Connectivity

The development of communication skills is a critical component of student training, transcending natural communication skills to integrate strategic capabilities for establishing human, social, and business relationships.[28] Hu et al. establish that entrepreneurs must possess effective communication and networking skills to convene and align human resources toward shared business objectives.[29]

Higher education institutions must prioritize the development of critical thinking and the strengthening of communication skills through diverse teaching resources: visual and textual materials, interactive workshops, and social media platforms, ensuring the comprehensive development of the four essential communication skills: reading, writing, speaking, and active listening.[30]

Contemporary communicative competence demands mastery of foreign languages, particularly English, in the context of accelerated globalization, market diversification, and international competitiveness.[31] This multilingual competence is essential for successful development in commercial and intercultural relations.[32]

Personal Competence: Psychological Architecture of Entrepreneurial Leadership

From advanced psychological perspectives, personal competence requires individual capacities to detect

strategic opportunities, develop entrepreneurial intentions, and materialize ideas into viable business entities. This entrepreneurial intention manifests itself in behaviors determined by values, specific needs, desires, and belief systems.[33,34] complemented by acquired experiences and information from others, establishing the fundamental role of higher education in entrepreneurial training.

Theoretical model for developing university entrepreneurial competencies highlights entrepreneurial attitude, specialized skills, and creativity as personal competencies.[35] Fischer specify that personal competencies involve developing confidence, the courage to generate innovative projects, conflict management, strategic decision-making, and adaptability to achieve goals.[14]

Entrepreneurial personality is characterized by risk management skills, uncertainty tolerance, and decision-making under ambiguous conditions.[12] Self-regulation, intrinsic motivation, empathy, and emotional control are fundamental traits that should be cultivated in university students.[25]

Cooperation Competition: Collaborative Architecture and Social Capital

Cooperation competencies represent individual capacities to develop skills and attitudes that facilitate collaborative work, the implementation of action plans through strategic links with individuals who share similar goals and ideas, and the achievement of active stakeholder participation in business projects.[14] Position teamwork competencies as essential components of effective entrepreneurial leadership.[36]

From a sociological perspective, seminal contribution to the study of entrepreneurship and cooperative skills establishes the fundamental importance of social networks and collaborative work in business activities.[37] This network approach conceptualizes seemingly separate activities that, when integrated, generate strategic links benefiting companies, entrepreneurs, and related stakeholders.[38]

The Global Entrepreneurship Monitor, established in 1999 as a globally recognized center for entrepreneurship research, provides academic platforms to support collaboration between professors and young people, the formation of research teams, and the establishment of international networks to explore entrepreneurial dimensions tailored to specific country conditions.[26] In contemporary technological landscapes, universities must integrate theory and practice to foster innovative ways of creating and maintaining interpersonal connections. The current digital ecosystem, including platforms such as Facebook, Instagram, LinkedIn, TikTok, and video conferencing applications such as Zoom and Google Meet, has become essential for business and commercial activities, positioning itself as fundamental instruments for promoting and maintaining collaborative work.[29]

FORMULATION OF RESEARCH HYPOTHESES

- H1: Students at public universities enrolled in specialized business degree programs who actively participate in institutional entrepreneurship initiatives show greater development of the skills that make up the entrepreneurship profile.
- H2: There are statistically significant differences in the level of development of entrepreneurial skills based on gender.
- H3: The relationship between previous entrepreneurial experience and the level of development of entrepreneurial skills as compared to those without business experience is quite marked in terms of success upon graduation.

METHOD

Type of study, period, and location

To determine the degree of entrepreneurial skill acquisition and develop profiles among students at public universities, a quantitative, non-experimental, cross-sectional study was conducted using multivariate analysis with clustering techniques. This analysis was supplemented with nonparametric tests (Mann-Whitney U) to identify differences according to gender and entrepreneurial experience, in the target population was final-year students majoring in business and actively participating in institutional activities related to entrepreneurship. The sample consisted of 210 volunteers from five faculties: administration, accounting and finance, management and public policy, business, marketing, and sustainable tourism. The gender distribution was 67,6 % women and 32,4 % men, with an average age of 23 years.

Variables analyzed

Entrepreneurial competencies were analyzed in five dimensions: professional, methodological, communicative, personal, and cooperative. Gender and previous or current entrepreneurial experience were considered as comparative variables. The tool included six sections: one for sociodemographic data, five for measuring entrepreneurial competencies.

The items were adapted from Fischer, with a five-point Likert scale.[14] The application was in digital format, with permission from academic coordinators and institutional distribution. The reliability of the tool was verified with a Cronbach's coefficient (>0,700). Validity was confirmed with communalities above 0,500

and factor loadings above 0,400. A digital questionnaire was used, distributed through institutional channels, with prior permission from academic coordinators. Participation was voluntary and anonymous, with informed consent. The study complied with institutional ethical guidelines.

The study involved 210 volunteers from five faculties who were enrolled in bachelor's programs in administration, public accounting and finance, management and public policy, as well as business, marketing, and sustainable tourism. The selection of participants was non-random, as they were selected based on their affordability and their compliance with the inclusion criteria. using multivariate analysis, specifically cluster analysis techniques. This study was complemented with nonparametric tests using the Mann-Whitney U test to determine differences in population means based on participants' gender and entrepreneurial background. The design was non-experimental and cross-sectional.

Instrumentation and Methodological Protocol

The instrument consisted of six specialized sections: the first collected sample demographic data, while sections two through six addressed indicators of professional, methodological, communicative, personal, and cooperative competencies. The indicators were adapted from the instrument developed by Fischer, using five-point Likert scales (1 = strongly disagree, 5 = strongly agree), Fischer's instrument was adapted into the language, a sociodemographic segment was added, and it was validated again with the target population (students at a Mexican public university), using an approximate 20 questions consulted.[14] A digital survey technique was implemented, requesting authorization from the academic coordinators of the seven participating programs and their support for distributing electronic links through institutional contact channels.

A review of communalities determined high correlations with entrepreneurial competencies, indicating explanatory variance greater than 0,500.[39] Factor loadings met thresholds of 0,400 for sample sizes close to 200 observations.[40]

Table 1. Validation of constructs for entrepreneurship competencies

Qualified skills	Communities obtained	Factor loadings	Cronbach's alpha	Competencies	Communities obtained	Factor loadings	Cronbach's alpha
Professional				Cooperation			
PROF1	0,544	0,746	0,904	COOP1	0,511	0,685	0,908
PROF2	0,552	0,752		COOP2	0,709	0,865	
PROF3	0,626	0,833		COOP3	0,704	0,856	
PROF4	0,678	0,826		COOP4	0,753	0,898	
PROF5	0,726	0,886		COOP5	0,601	0,774	
Methodological				Staff			
METO1	0,630	0,836	0,902	PERS1	0,598	0,796	0,914
METO2	0,628	0,830		PERS2	0,565	0,788	
METO3	0,573	0,798		PERS3	0,733	0,872	
METO4	0,684	0,882		PERS4	0,726	0,866	
METO5	0,438	0,693		PERS5	0,602	0,799	
Communicative							
COMU1	0,565	0,778	0,925				
COMU2	0,741	0,900					
COMU3	0,628	0,817					
COMU4	0,741	0,888					
COMU5	0,661	0,834					

The determination of the degree of acquisition of entrepreneurial skills in final-year bachelor's students and the generation of their entrepreneurial profile was carried out through a cluster analysis, a method capable of classifying the sample into small groups whose elements share common characteristics among themselves,[41] although they are incompatible at the group level due to internal similarities.[41]

Cluster selection was performed using the two-step methodology proposed.[40] The first step involved a hierarchical approach, allowing the data to be freely integrated into the required number of clusters. The intergroup linkage method was used with the squared interval distance measure, resulting in five clusters that were visually verified using the dendrogram. The second step involved a non-hierarchical approach, specifying the five clusters previously identified, respecting the privacy of each participant, being an anonymous

compilation to achieve freedom of expression for each student

RESULTS

After completing the sample and verifying the comparison in the knowledge validation table, the clusters were obtained, a descriptive analysis was conducted to detail the characteristics and identify trends within the study group.[42] The study classifies the degree of acquisition of entrepreneurial competencies into five levels, ranging from a low weighting corresponding to the minimum possible value of five points, to a high value of a maximum of 25 points, as shown in table 2.

Table 2. Degree of acquisition of entrepreneurial skills

Possible score obtained	Degree of acquisition
05-08 points	Low
09-12 points	Medium low
13-16 points	Half
17-20 points	Medium high
21-25 points	High

Table 3 shows the results for the five clusters. In Cluster 1, the degree of acquisition of the five entrepreneurial competencies (professional, methodological, communicative, personal, and cooperative) was medium-low, with 14 observations. In Cluster 2, high competency acquisition was recorded, with a size of 47 observations. Regarding Clusters 3 and 4, the data were very similar, as in both cases the prevalence of competency acquisition was medium-high; a difference was only observed in the personal competency of Cluster 4, which was ranked high. For these clusters, sizes were 53 and 70, respectively. Finally, Cluster 5 showed a medium value for the acquisition of the five competencies, with a frequency of 26 observations.

Table 3. Final cluster centers

	Cluster				
Competencies	**1**	**2**	**3**	**4**	**5**
Professional	Medium low	High	Medium high	Medium high	Half
Methodological	Medium low	High	Medium high	Medium high	Half
Communicative	Medium low	High	Medium high	Medium high	Half
Staff	Medium low	High	Medium high	High	Half
Cooperation	Medium low	High	Medium high	Medium high	Half
Cluster size	14	47	53	70	26
Percentage	6,67 %	22,38 %	25,24 %	33,33 %	12,38 %

An ANOVA analysis was carried out (table 4), which allowed corroborating ($p < 0,05$) the adequate structure of the clusters by detecting significant differences in the mean values of a data group.[43] In addition, the squared ETA values were examined, since to explain the percentage of the variance of entrepreneurial competencies, it must be done based on membership in the already determined clusters.[44] It is recommended to use partial ETA squared; however, in the case of a one-way ANOVA, the effect size is the same for ETA squared and partial ETA squared.[45]

Additionally, figure 1 presents the self-perceptions of the degree of acquisition of entrepreneurial skills, which outline the profile of university students detailed in the table below:

Table 4. Analysis of variance (ANOVA)

Qualified skills		Sum of squares	Degrees of freedom GL	Mean square	Statistic F	Next.	ETA squared
Professional* Cluster case number	Between (set) groups	2762,063	4	690,516	202,290	0,000	0,798
	Inside of groups	699,765	205	3,413			
	Total	3461,829	209				

Methodological* Cluster case number	Between (set) groups	3263,607	4	815,902	258,521	0,000	0,835
	Inside of groups	646,988	205	3,156			
	Total	3910,595	209				
Communicative* Cluster case number	Between (set) groups	3072,486	4	768,121	214,421	0,000	0,807
	Inside of groups	734,371	205	3,582			
	Total	3806,857	209				
Staff* Cluster case number	Between (set) groups	3219,770	4	804,942	285,414	0,000	0,848
	Inside of groups	578,154	205	2,820			
	Total	3797,924	209				
Cooperation* Cluster case number	Between (set) groups	3411,963	4	852,991	252,018	0,000	0,831
	Inside of groups	693,852	205	3,385			
	Total	4105,814	209				

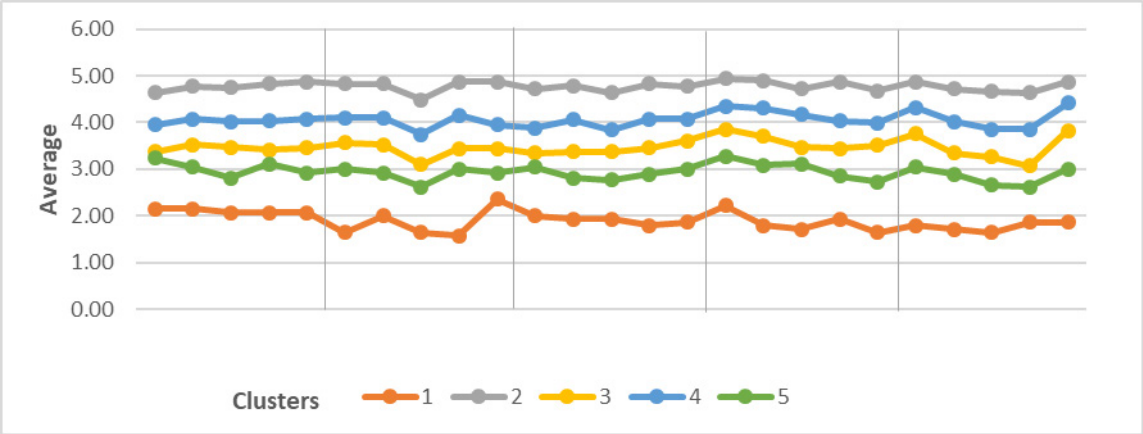

Figure 1. Entrepreneurial profile of the university student

Cluster 1: this first cluster has limited representation, representing only 6,67 % of the student sample. Its members reported the lowest levels of achievement in the five competencies analyzed being an estimated 4,76 % that their skills are not polished. Although they demonstrate greater strength in professional competencies, they fall short of the overall average observed in the entire sample. Their main weaknesses include difficulty making quick decisions, establishing new contacts for collaboration, generating project proposals, and insecurity in designing business ideas. Regarding gender composition, 78,57 % are women and 21,43 % are men. Furthermore, in this group, 71,43 % indicated they had not experienced entrepreneurial practices in their daily lives.

Cluster 2: the second cluster represents 22,38 % of the sample and presents the highest levels of entrepreneurial skills acquisition. Their perceptions of the degree of skill acquisition range between 94,96 % and 96,44 %. The distinctive characteristics of this cluster include a high capacity to resolve conflicts, identify opportunities, effectively manage information, organize ideas, apply techniques and procedures, communicate appropriately and timely, adapt to changes, make decisions, and collaborate in networks. The gender composition of this cluster is 55,32 % women and 44,68 % men. Furthermore, 72,34 % of the members have a history of having started a business, while 27,66 % have not.

Cluster 3: this cluster comprises 25,24 % of the study participants, whose entrepreneurial skills were slightly above average, indicating medium-high development. It is comprised of 81,13 % women and 18,87 % men. Regarding experience in practical entrepreneurial activities, 32,08 % reported having had such experience, while 67,92 % had no prior experience in this field.

Cluster 4: this cluster is the most represented in the sample (33,33 %). Its level of acquisition of entrepreneurial skills was second among the five clusters, with levels between 83,4 and 79,8 %. Its best results are observed in personal and cooperation skills, specifically in identifying the importance of teamwork, adapting to change, and developing, organizing, and communicating ideas. The gender distribution is 65,71 % women and 34,29 % men. It was identified that 41,43 % have or have had some form of entrepreneurship, while 58,57 % do not have

this experience.

Cluster 5: the fifth cluster represents 12,38 % of the sample and shows average acquisition of entrepreneurial skills, although its weighting is below the average for all participants. It is composed of 61,54 % women and 38,46 % men. Regarding entrepreneurship development, only 34,62 % have applied it in practice, while 65,38 % have never engaged with this approach.

As a final step in the descriptive analysis, differences in entrepreneurial competencies were investigated based on participants' sex and prior experience in entrepreneurship. Nonparametric tests were applied, as the entrepreneurial competencies did not follow a normal distribution ($p < 0,05$).

Table 5 shows that the means for both grouping variables were different, with significance levels less than 0,05. Specifically, the results showed that men reported greater acquisition of entrepreneurial skills compared to women. The greatest difference was recorded in the cooperation skill, while the smallest difference was observed in the personal skill. For both women and men, the personal skill was the most developed.

However, when looking at the least developed skill, it was identified that for women it was communication (mean = 3,80) and for men, methodology (mean = 3,95). Those who have or have had an entrepreneurial business reported having acquired more skills than those who have not. The most marked differences between the two groups were found in methodology (4,10 vs. 3,75; $\Delta = 0,35$; $p = 0,018$) and cooperation (4,00 vs. 3,70; $\Delta = 0,30$; $p = 0,022$), and the smallest difference was observed in professional skills (4,20 vs. 3,85; $\Delta = 0,35$; $p = 0,015$). Personal skills were more developed among those who had already had experience in the business world (4,25) and among those who had not (4,10); however, those who had already embarked on a business venture perceived themselves as having weaker communication skills (4,05), while those who had not had that experience reported greater weakness in methodological skills (3,75).

Table 5. Test statistics grouped by sex and entrepreneurship background

	Grouping variable	PROF	METO	COMMU	COOP	PERS	Final profile of the entrepreneur
Mann-Whitney U	Sex	3782,500	3777,500	3812,500	3829,500	3738,000	3718,500
	Background in entrepreneurship	3651,000	3469,500	3763,000	3664,500	3479,500	3483,000
Z	Sex	-2,547	-2,558	-2,476	-2,435	-2,654	-2,693
	Background in entrepreneurship	-4,107	-4,522	-3,853	-4,080	-4,498	-4,477
bilateral asymptotic significance	Sex	0,011	0,011	0,013	0,015	0,008	0,007
	Background in entrepreneurship	0,000	0,000	0,000	0,000	0,000	0,000
Acquired averages				Sex			
	Female	18,479	18,246	18,176	18,887	18,296	18,417
	Male	20,000	19,765	19,838	20,324	19,985	19,982
	Total	18,971	18,738	18,714	19,352	18,843	18,924
				Background in entrepreneurship			
	Yeah	20,097	20,118	19,946	20,634	20,226	20,204
	No	18,077	17,641	17,735	18,333	17,744	17,906
	Total	18,971	18,738	18,714	19,352	18,843	18,924

Note: PROF = Professional, METO = Methodological, COMU = Communication, COOP = Cooperation, PERS = Personal

The results of the Mann-Whitney U test show significant differences in the acquisition of entrepreneurial skills by gender and entrepreneurial experience ($p < 0,05$ in all dimensions). By gender, men show higher averages in all skills: professional (20,000 vs. 18,479), methodological (19,765 vs. 18,246), communicative (19,838 vs. 18,176), collaborative (20,324 vs. 18,887), personal (19,985 vs. 18,296), and in the final entrepreneur profile (19,982 vs. 18,417), indicating that they tend to develop the full range of entrepreneurial skills more solidly. In terms of entrepreneurial experience, students with a background in entrepreneurship show higher averages in all dimensions: professional (20,097 vs. 18,077), methodological (20,118 vs. 17,641), communication (19,946 vs. 17,735), collaboration (20,634 vs. 18,333), personal (20,226 vs. 17,744), and final entrepreneurial profile (20,204 vs. 17,906). The largest differences were observed in methodological and collaboration skills, while the smallest difference was recorded in professional skills.

These results suggest that both gender and prior entrepreneurial experience are factors that make a difference

in developing entrepreneurial skills and highlight the need for educational interventions that strengthen areas where performance is lower, especially among women and students with no prior entrepreneurial experience.

DISSCUSION

Contextualization of the University Entrepreneurial Problem

The systematic promotion of entrepreneurship in university ecosystems constitutes a strategic imperative for addressing multidimensional challenges in contemporary social and commercial spheres, where competency development emerges as a fundamental catalyst for the successful materialization of business initiatives.[14] The main objective of this research was to determine the levels of entrepreneurial competency acquisition in final-year students, specifically those enrolled in curricular programs with a business specialization and active participation in institutional entrepreneurship promotion initiatives, analyzing differentiations based on gender variables and prior entrepreneurial experience.

Entrepreneurial Profile Architecture: Competency Segmentation

The characterization of the entrepreneurial profile of students close to graduation represents a strategic opportunity to strengthen successful methodologies and identify areas requiring specialized interventions to promote the development of critical entrepreneurial skills. The results showed a five-year segmentation using cluster analysis, revealing significant competency heterogeneity in the study population.

The profile architecture identified three segments with levels above the population average, with the cluster with the highest skill development accounting for 22,38 % of participants, demonstrating a core of students with consolidated entrepreneurial skills. Two additional clusters, representing much of the population (58,57 %), reported medium-high levels, while an intermediate segment (12,38 %) demonstrated moderate skill development. Finally, a minority cluster (6,67 %) was positioned at medium-low levels, requiring specialized training interventions. Forty-four percent reported experience in entrepreneurial development. The gender distribution was 67,6 % women and 32,4 % men, with an average age of 23 years.

Effectiveness of Curricular and Extracurricular Architectures

These findings suggest that the implemented curricular architectures and designed extracurricular activities contribute significantly to the development of student entrepreneurial profiles, constituting a positive indicator of the effectiveness of entrepreneurship management at the public higher education institution analyzed. This empirical evidence supports the hypothesis that the systematic integration of entrepreneurial content generates differentiated, but generally positive, impacts on competency development.

Differentiated Competency Analysis

Dimensional analysis revealed that personal competencies obtained the highest acquisition results in the entire sample, while professional, methodological, communication, and cooperation competencies exhibited similar evaluations with consistently positive ratings,[46] the majority of students from foreign trade and administration were identified with entrepreneurial profiles characterized by creativity and innovation capabilities, risk management skills, and self-determination traits, aspects considered fundamental indicators of entrepreneurial competencies in this research.

Gender Differences and Entrepreneurial Experience

The analysis based on gender variables showed greater entrepreneurial skills development in male participants compared to female participants, also identifying that individuals with prior or current entrepreneurial experience possess superior skills compared to those without business experience. Although the survey was conducted with a higher percentage of women, it was evident that men mostly presented greater skills in the areas of business and sales. These data contrast with previous research, such as the study by Ortiz and Olaz in a Spanish youth population, where both men and women demonstrated limited interest in entrepreneurship and low acquisition of skills related to business opportunity recognition and risk management.[47]

Implications for Curriculum Reengineering

The results suggest the critical importance of implementing adjustments to university curricular architectures to incorporate specialized content that fosters the identification, development, and application of entrepreneurial opportunities. This pedagogical reconfiguration can facilitate graduates' job placement through the creation of independent ventures, as well as optimize skills demanded by employers when they choose to join established business entities.

Contextual Limitations

It is important to highlight that these results were obtained in the specific context of a public university

located in north-central Mexico, with students pursuing business-related undergraduate programs. Therefore, generalization to other higher education institutions requires additional empirical validation and consideration of specific contextual variables.[48,49]

Entrepreneurial profile architecture: segmentation by competencies

Summary of main findings the study sought to determine the levels of entrepreneurial skill acquisition among students in their final year of studies who are enrolled in programs with an emphasis on entrepreneurship, considering gender differences and prior experience. The results show that the population studied exhibits heterogeneity in its skills, with three main segments identified: a group with established skills (20 %), a group with developing skills (30 %), and a group with no skills (40 %). The results show that the population studied exhibits heterogeneity in its skills, with three main segments identified: a group with established skills (22,38 %), a majority with medium-high levels (58,57 %), and a minority group with medium or medium-low development (19,05 % combined). This pattern indicates the existence of strategic nuclei of entrepreneurial talent and areas that need to be strengthened through specific interventions.

Interpretation of the findings

The dimensional analysis indicates that personal skills are the most developed, while professional, methodological, communication, and collaboration skills receive positive but slightly lower scores. This finding is consistent with international studies such as those by Fischer and Ochoa Hernández, which emphasize that creativity, innovation, and self-definition are key skills in the entrepreneurial profiles of students.[13,46] The observed heterogeneity can be explained by the interaction between academic training and non-academic experience, reinforcing the idea that the acquisition of entrepreneurial skills is not uniform and depends on active exposure to comprehensive learning environments.

Gender analysis reveals greater development of entrepreneurial skills among men, while previous experience in entrepreneurship is positively correlated with higher skills. This finding contrasts with international studies, which found less pronounced gender differences and limited overall entrepreneurial interest.[47] The gap in our study may be due to cultural factors, the structure of the curriculum, or the practical approach of initiatives to promote entrepreneurship at the institution studied, which encourages active participation and the practice of business skills.

Analysis of differentiated competencies

These findings suggest that the curricular architectures implemented, and the extracurricular activities designed contribute significantly to the development of students' entrepreneurial profiles, constituting a positive indicator of the effectiveness of entrepreneurship management in the public higher education institution analyzed. This empirical evidence supports the hypothesis that the systematic integration of entrepreneurial content generates differentiated but generally positive impacts on the development of competencies.

The dimensional analysis revealed that personal competencies obtained the best acquisition results across the sample, while professional, methodological, communication, and cooperation competencies exhibited similar evaluations with consistently positive ratings. These results converge with the findings of Ochoa Hernández who identified mostly foreign trade and administration students with entrepreneurial profiles characterized by creativity and innovation skills, risk management abilities, and self-determination traits, aspects considered fundamental indicators of entrepreneurial competencies in this research.[46]

CONCLUSIONS

Implications for curriculum redesign

The results suggest the critical importance of implementing adjustments to university curriculum architectures to incorporate specialized content that promotes the identification, development, and application of entrepreneurial opportunities. This pedagogical reconfiguration can facilitate the entry of graduates into the labor market through the creation of independent businesses, as well as optimize the skills demanded by employers when choosing to join established commercial entities.

Contextual limitations

It is important to note that these results were obtained in the specific context of a public university located in north-central Mexico, with students enrolled in business-related undergraduate programs. Therefore, generalization to other higher education institutions requires additional empirical validation and consideration of specific contextual variables.

Development of Entrepreneurial Experimentation Ecosystems

The creation of specialized spaces is proposed where students can practically develop the entrepreneurial

concepts emerging from their academic training. As the results showed, individuals with opportunities to experience real-life ventures achieve higher levels of entrepreneurial skills, validating the importance of practical application platforms.

Contributions to Scientific Knowledge

This research contributes to the theoretical framework of university entrepreneurship by identifying distinct competency patterns and empirically validating determining factors in student entrepreneurial development. The findings provide grounds for reengineering training programs and designing institutional policies aimed at strengthening university entrepreneurial ecosystems.

Future Research Directions

Future research directions should include longitudinal studies to assess the persistence of entrepreneurial competencies post-graduation, comparative analyses between public and private institutions, and the exploration of additional moderating variables that influence the development of entrepreneurial competencies. It is also relevant to investigate the effectiveness of different pedagogical modalities in developing specific competencies and their transfer to the real-life business environment.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTION

Conceptualization: José Luis Bravo Silva, Elba Martina Cortés Palacios, Guillermo José Navarro Del Toro.
Validation: José Luis Bravo Silva, Elba Martina Cortés Palacios, Guillermo José Navarro Del Toro.
Visualization: José Luis Bravo Silva, Elba Martina Cortés Palacios, Guillermo José Navarro Del Toro.