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Entrepreneurial Competences in Higher Education: A Gender-Based Analysis of University Students

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Abstract

The development of entrepreneurial competences has become established as a strategic learning outcome in higher education. However, shortcomings persist in students' competency profiles, which have led institutions to design training programs aimed at strengthening entrepreneurial mindsets and improving the employability of their graduates. This study examines entrepreneurial competences among university students from a gender perspective within digitally mediated learning contexts. To this end, a quantitative methodology was employed, using a non-experimental, cross-sectional design with a sample of 705 students (77% women and 23% men), with a mean of 4.56 years of professional experience. Entrepreneurial competences were assessed using a validated questionnaire measuring five dimensions: self-awareness and self-confidence, vision of the future, achievement motivation, planning, and persuasion. The results show moderately high levels of entrepreneurial competences, with achievement motivation emerging as the strongest dimension. Gender differences were limited, except in self-awareness and self-confidence, where men obtained higher scores, while women showed a stronger positive tendency in achievement motivation, suggesting differentiated patterns of competence development. Sociodemographic variables such as gender, age, and early work experience showed a modest but statistically significant predictive effect on entrepreneurial competences, highlighting the relevance of integrating psychological, cultural, and contextual factors in future research. The study highlights the potential of inclusive and personalized pedagogical strategies to strengthen self-efficacy, motivation, and equity in the development of entrepreneurial competences in higher education, and the results are discussed in relation to their relevance for current digitally mediated educational contexts, labour market competence demands, and their alignment with international frameworks such as the 2030 Agenda for Sustainable Development.

Keywords: higher education; entrepreneurial skills; gender differences; inclusive education; AI-mediated learning

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1. Introduction

In the current context of increasing globalisation, interest in entrepreneurship and in capitalising on the opportunities offered by the labour market has intensified, making it necessary to consider a range of factors that foster the development of an entrepreneurial mindset (Fuentes Pardo, 2021).

Among the strategies proposed to strengthen labour marked dynamism in society, beyond merely fostering favourable attitudes, the promotion of entrepreneurship stands

out, particularly through university education, which plays a fundamental role in the development of entrepreneurial competences among students (Guillén Tortajada et al., 2020).

In this regard, UNESCO, in its World Declaration on Higher Education for the Twenty-First Century, highlights the relevance of entrepreneurship education and encourages higher education institutions to promote initiatives that enhance young people's opportunities for integration into the labour market (Aledo, 2024). Consequently, the Spanish National Entrepreneurship Strategy calls for the active participation of society as a driving force for progress, grounded in three fundamental pillars: improving education for inclusive development, consolidating an R&D&I-based economy tailored to specific contexts, and promoting innovative entrepreneurship as a driver of transformation. Within the educational sphere, the GEM Report 2023–2024 notes that institutions have strengthened the promotion of entrepreneurial competences in the economic, social and technological domains. However, entrepreneurship education remains insufficient, highlighting the ongoing need to further strengthen it through innovative approaches and actions aimed at creating more sustainable environments for innovation (Reimers, 2024).

In the university context, discussing entrepreneurship requires prior conceptual clarification, given that, as noted by Guillén Tortajada et al. (2020), it is a complex and hard-to-define concept. The specialised literature reveals a notable diversity of approaches: some authors interpret it as an attitude, a personality trait, or an intention; others associate it with entrepreneurial orientation, self-efficacy, or entrepreneurial activity. There is also a strand of research that conceptualises entrepreneurship in terms of entrepreneurial capacity, skills, or competence (Caballero-García et al., 2019). The latter is the focus of our analysis. A frequency analysis of the use of this term allows us to state that entrepreneurial competence, together with entrepreneurs' personality traits, constitutes one of the most extensively studied and researched aspects in the field (Caballero-García et al., 2017, 2019).

From an analytical perspective, the term "entrepreneurial competence" has been interpreted primarily through two approaches: on the one hand, as the mastery of entrepreneurial capabilities and attitudes, and on the other, as the capacity for business creation (Sobrado Fernández & Fernández Rey, 2010). Within this context, entrepreneurial attitude assumes a central role within the construct, as it integrates a set of psychological and behavioural characteristics that directly influence individuals' inclination toward entrepreneurial behavior. Consequently, entrepreneurial competence is conceived as a multidimensional construct in which variables such as resilience, achievement motivation, self-efficacy and the ability to identify and exploit new opportunities converge (Fontaines-Ruiz et al., 2016).

From a more functional perspective, entrepreneurial activity has traditionally been associated with the process leading to business creation (Lazear, 2005). However, this view has been progressively broadened through contributions such as those of Minga et al. (2024), who, drawing on Toledano (2006), acknowledge that university students may adopt diverse intentions, including commercial entrepreneurship, social entrepreneurship, or even paid employment. Within this framework, entrepreneurial intention is defined as a construct influenced by factors such as desirability, feasibility and entrepreneurial knowledge (Liñán, 2004), with education being a key driver in the development of these attitudes and intentions (Maharana & Chaudhury, 2022).

This conceptual diversity, reflecting the inherent complexity of the entrepreneurial phenomenon, justifies the need to pay attention to the personal qualities underpinning entrepreneurship. In this line, Fuentes Pardo (2021), drawing on Alcaraz-Rodríguez (2011), points out that the act of entrepreneurship involves a set of attributes that enable individuals to act with determination and to mobilise their competences to clearly defined goals. Complementarily, Pulla et al. (2020) emphasise that vision, creativity and determination are indispensable elements for undertaking entrepreneurial endeavours.

Thus, the entrepreneur is configured as an individual capable of creating and launching projects, optimising resources, solving problems innovatively, and identifying opportunities that others overlook, all of which is undertaken with perseverance and goal-oriented persistence (Alcaraz-Rodríguez et al., 2014).

These qualities, far from being innate, can be enhanced in educational contexts that promote active learning and the strengthening of entrepreneurial competences (Alcaraz-Rodríguez et al., 2014; Ferreras-Garcia et al., 2021; Ratković et al., 2022).

In this regard, university environments offer an ideal framework for fostering these qualities, particularly in the context of current debates on higher education, in which the specialised literature frequently indicates that emerging digital technologies, such as Artificial Intelligence (AI), form part of broader transformations in the ways of learning and engaging in economic and social activities.

From a theoretical perspective, such transformations are associated with processes including more precise personalisation, automated feedback, and the identification of training needs, and are linked to more flexible, adaptive, and student-centred learning environments, within which the development of entrepreneurial attitudes may be situated. In the present study, these technologies are not examined as empirical variables but are intentionally considered as part of the broader educational context in which the development of entrepreneurial competences in higher education should be understood.

Universities play a key role in the development of entrepreneurial competences. Authors such as Astudillo et al. (2021) argue that the university environment constitutes one of the strongest influences on entrepreneurial intention. Hence, the study of entrepreneurial skills among university students has gained increasing relevance in scholarly research for its contribution to sustainable economic development, innovation, and social equity. As Pulla et al. (2020, p. 24) state, "entrepreneurship has long been identified as a key factor for job creation, innovation, growth, and economic development."

In this sense, the university not only fulfils a compensatory role in response to the lack of social support often faced by entrepreneurs in the early stages of their projects but also emerges as a key formative space for nurturing the entrepreneurial spirit. It acts as an authentic incubator of entrepreneurship by promoting an institutional environment characterised by a culture, values, and climate conducive to entrepreneurial initiative. This role makes it a strategic tool for fostering both entrepreneurial thinking and its practical application (Bretones & Radrigán, 2018), driving policies of inclusion, training, and equity, particularly relevant at a stage that directly precedes entry into the professional world.

Moreover, authors such as Vallejo et al. (2024) find significant correlations between entrepreneurial orientation and educational programmes, concluding that fostering entrepreneurship through higher education is crucial for the economic and social development of young people. From this perspective, academic training emerges as a central element in the development of these skills, providing not only theoretical knowledge but also practical tools that facilitate the acquisition of key competences for entrepreneurship.

Within the educational sphere, it is essential to promote capacities such as creativity, collaboration, innovation, effective communication, risk management, business administration, and strategic thinking (Attipoe, 2024; Stek et al., 2025). In this process, university teaching staff play an essential role in the comprehensive education of students, acting as mediators between disciplinary knowledge and the development of transversal competences.

In line with the guidelines of the European Commission, the Spanish education system recognises entrepreneurial competence as one of its eight key competences, regarded as essential for preparing students to meet the challenges of the contemporary labour market (Priede-Bergamini et al., 2025). This underpins our interest in its assessment.

Among the key determinants of entrepreneurial competence, the specialised literature highlights, among other factors, the influence of sociodemographic variables. Over the past decade, academic interest in analysing the role of gender in entrepreneurial intention and in the development of entrepreneurship-related competences has intensified (Leyva-Osuna et al., 2023), thereby underpinning the analysis of gender differences undertaken in the present study.

Our review of specialised literature on the gender–entrepreneurship relationship has revealed diverse findings. Gender role orientation and associated stereotypes directly affect self-perception of capabilities and the way men and women approach entrepreneurship (Langowitz & Minniti, 2007; Mueller & Conway Dato-On, 2008).

Some studies identify significant gender differences in variables such as intention, perceived skills, and entrepreneurial motivations. In this regard, Astudillo et al. (2021) and García-Río et al. (2020) indicate that entrepreneurial intention tends to be lower among women, especially with increasing age. However, this difference should not be interpreted as lower capability but rather as a distinct motivational architecture: while men base their intention on a sense of control and the expectation of stability, women transform their perception of competence into motivation and intention, with a greater inclination towards social entrepreneurship (Fernández-Guadaño & Martín-López, 2023; Moreira et al., 2016; Sánchez Tovar et al., 2021), which represents a pathway for economic impact and, at the same time, a key driver in achieving the Sustainable Development Goals (SDGs).

Barrientos-Báez et al. (2022) found that men tend to value entrepreneurial action more, whereas women prioritise aspects linked to security and personal values. Similarly, Sánchez-Cañizares and Fuentes-García (2013) observed that men exhibit higher motivation towards entrepreneurship, although women tend to consider themselves slightly more competent to start a business. Margaça et al. (2021) reinforce this trend by indicating that women stand out in entrepreneurial intention, while men excel in psychological well-being.

Along the same lines, Sánchez-Cañizares and Fuentes-García (2013) highlight differences in perception and self-confidence regarding entrepreneurial skills: men perceive themselves as more prepared and confident to undertake entrepreneurial ventures, whereas women display lower entrepreneurial intention and self-assessment in certain key competences. Regarding the distribution of entrepreneurial potential, Gonzalez and Mocha (2017) observed that men tend to concentrate in the "high" entrepreneurial capacity range, while women stand out at an intermediate level.

These differences in motivational architecture are linked to how men and women perceive the determinants of entrepreneurial success. For men, entrepreneurial intention is often supported by a sense of control and the expectation of stability, which translates into a positive attitude towards opportunities and the appreciation of prior contacts with entrepreneurs. For women, the starting point is the perception of competence, which transforms into motivation and intention. This motivation is channelled towards acquiring knowledge, skills, and experience, as well as overcoming fear of failure (Sánchez Tovar et al., 2021).

These findings suggest that, although gender differences exist, they do not necessarily reflect lower capability but rather a divergence in motivations, perceptions, and approaches to entrepreneurship. These conditioning factors transcend academic training, as despite women's massive incorporation into the labour market, their presence in leadership positions, and their numerical predominance in the university sphere, significant differences persist in how their relationship with entrepreneurship is perceived (Sánchez-Cañizares & Fuentes-García, 2013).

Other studies offer a more neutral perspective. Authors such as Gonzalez and Mocha (2017) argue that within the range of "very high entrepreneurial skill", gender differences

tend to disappear, suggesting that with adequate development, both men and women can achieve equivalent levels of excellence in this field. Complementarily, Garza Sáenz (2013) found that in other dimensions such as achievement capacity, planning, commitment, or responsibility, no gender gaps were identified. Previous research has likewise failed to demonstrate that gender constitutes a differentiating factor in students' entrepreneurial capacity (Barreiro et al., 2013; Tinoco Gómez, 2008). Both genders may attain equivalent potential in this competence, highlighting the need for further empirical evidence to provide greater clarity on this issue.

Alongside gender, entrepreneurial capacity also appears to be influenced by other sociodemographic factors, such as professional experience and age. Various studies have demonstrated that early work experience fosters entrepreneurial potential and improves the ability to take risks (Almeida, 2021; Chukhray et al., 2021; Ferreras-Garcia et al., 2021; Loli et al., 2011). This trend is reflected in the growing number of university students who combine their studies with work, thereby strengthening their practical competences, improving their understanding of organisational dynamics, and developing skills useful for future ventures. This impact of professional experience underscores the importance of integrating real-world environments into university training programmes.

Age also emerges as a relevant variable in entrepreneurship, particularly when related to professional experience (Almeida, 2021). Some studies indicate that older students tend to exhibit greater self-confidence, risk propensity, and a more strategic vision of entrepreneurship (Loli et al., 2009; Priede-Bergamini et al., 2025). However, other authors have not found conclusive evidence of this relationship (Ferreras-Garcia et al., 2021; Fuentes-García & Sánchez-Cañizares, 2021; Ratković et al., 2022), highlighting the lack of consensus regarding the influence of age on entrepreneurship.

The existing literature therefore highlights the complexity of the relationship between gender, age, professional experience and entrepreneurial development. In the university context, specific research examining this interaction remains limited (Fuentes Pardo, 2021). Consequently, there is a need for a greater body of empirical evidence that enables a deeper understanding of how these factors interact in the development of entrepreneurial competence, and how they can be addressed from an educational perspective aimed at designing more inclusive, contextualised and effective training strategies.

In order to contribute to this field of research, the present study is organised around the following research questions:

(1) What is the level of entrepreneurial competences among university students?
(2) Are there statistically significant gender-related differences in these competences?
(3) To what extent do gender, age and professional experience contribute to predicting the development of the entrepreneurial competences assessed?

In line with these research questions, the primary objective of this study was to explore the level of entrepreneurial competences among the university students assessed and to analyse the presence of gender-related differences, with a view to identifying potential inequalities in their development.

A secondary objective was established to examine the predictive value of sociodemographic variables—such as gender, age and professional experience—on these entrepreneurial competences.

This approach is particularly relevant in learning environments mediated by digital technologies, including AI, where opportunities to personalise learning, reduce gaps and promote a more equitable and inclusive higher education system are expanded. In the present study, these contextual features do not constitute variables of analysis but serve to situate the research within current educational environments.

2. Materials and Methods

In line with the objectives set out, the research was conducted using a quantitative, cross-sectional approach, adopting a non-experimental (ex post facto) research design (Campbell & Stanley, 1963).

2.1. Participants

The sample comprised 705 university students, of whom 543 (77%) were women and 162 (23%) were men, with a mean age of 27.8 years and a mean professional experience of 4.56 years. Participants were selected through non-probability purposive sampling, applying the following inclusion criteria: being of legal age; being enrolled in undergraduate or postgraduate programmes at public or private higher education institutions; having voluntarily agreed to participate in the study by providing informed consent; and having access to educational environments mediated by digital technologies or AI. Access to environments in which digital tools, including AI-based technologies, may be present was considered only as a general contextual condition and was not operationalised or analysed as a study variable. All participants completed the questionnaire voluntarily and provided their informed consent.

2.2. Instruments

Entrepreneurial competences were assessed using the Entrepreneurial Ability Questionnaire developed by Tinoco Gómez (2008), adapted from Flores (2003). The instrument comprises 20 Likert-type items, rated on a five-point response scale ranging from 1 (never) to 5 (always), designed to assess five key dimensions of the entrepreneurial profile: Self-awareness/self-confidence, Future vision, Achievement motivation, Planning and Persuasion, in addition to a global score. In the original study, the questionnaire demonstrated adequate psychometric properties, including high content validity established through expert judgement and strong internal consistency ($\alpha = 0.92$). In the present study, these results were replicated, yielding high reliability coefficients for both Cronbach's alpha ($\alpha = 0.898$) and McDonald's omega ($\omega = 0.901$), thereby confirming the internal consistency of the instrument and supporting the robustness of the between-group analyses conducted. Furthermore, the instrument has been used in university contexts to examine differences in entrepreneurial capacity according to variables such as gender, type of institution, or academic level, as is the case in the present study, providing evidence of its discriminant validity (García-Río et al., 2020; Jordán Aguirre et al., 2016; Tinoco Gómez, 2008).

2.3. Procedure

Data collection was carried out online via the Google Forms platform. The questionnaire was administered in a single session of approximately one hour, under two modalities: synchronous and asynchronous. In the synchronous modality, the questionnaire was administered in scheduled sessions, following the intact-class system and in the presence of the researcher, which facilitated real-time clarification of participants' queries and contributed to a higher response rate. In the asynchronous modality, students completed the questionnaire independently, at the time that best suited their availability, within a previously established deadline.

Prior to completing the questionnaire, participants were fully informed about the study objectives, assured of anonymity and data confidentiality, and invited to participate voluntarily. This information was clearly presented at the beginning of the form, together with an informed consent section that required explicit agreement before proceeding. Participants were reminded that they could withdraw from the study at any time without any negative consequences.

The research procedure was conducted in accordance with Organic Law 3/2018 on the Protection of Personal Data and the Guarantee of Digital Rights, Regulation (EU) 2016/679 of the General Data Protection Regulation (GDPR), the ethical principles for research involving human beings set out in the Declaration of Helsinki (WMA, 2023), and the International Ethical Guidelines for Health-related Research Involving Humans (CIOMS, 2021). Ethical approval was granted by the Research Ethics Committee of Camilo José Cela University under the Vice-Rectorate for Research, Science and Doctoral Studies.

2.4. Data Analysis

Data analysis was conducted in several stages. First, descriptive statistics (frequencies, percentages, means, standard deviations, medians, and minimum and maximum values) were calculated for both sociodemographic variables and those related to entrepreneurial competence, considered at both the global level and by dimensions. These analyses made it possible to characterise the sample and to explore students' levels of entrepreneurial competence.

Second, tests of normality (Kolmogorov–Smirnov) and homoscedasticity across gender groups (Levene's test) were performed. All competence dimensions, including the overall score, showed $p > 0.05$ in each case (see Table 1).

Table 1. Tests of Normality and Homogeneity of Variance for Entrepreneurial Competences.

Entrepreneurial Competences	Normality		Homoscedasticity	
	Kolmogorov–Smirnov		Levene	
	Z	*p*	F	*p*
Self-awareness/Self-confidence	1.11	0.17	0.26	0.61
Future Vision	0.52	0.95	0.04	0.85
Achievement Motivation	0.82	0.52	0.82	0.37
Planning	0.80	0.55	0.13	0.71
Persuasion	0.308	1.00	0.65	0.42
Total	0.29	1.00	0.03	0.87

From this point, we applied parametric statistical tests (Student's *t*-test for independent samples) to identify significant differences in entrepreneurial skills by gender.

In cases where statistical significance was observed, and in order to assess the magnitude of these differences, effect sizes were calculated using Cohen's d index. The interpretation of the results followed the criteria proposed by Cohen (1988): small effects (0.20–0.50), medium effects (0.50–0.80), and large effects (>0.80).

Finally, a multiple linear regression analysis was conducted to examine the predictive capacity of gender, age and professional experience in relation to participants' entrepreneurial competences. For this purpose, both the overall entrepreneurial competence score and the five underlying dimensions were considered as dependent variables: self-awareness/self-confidence, future vision, achievement motivation, planning and persuasion, as well as an overall entrepreneurial competence score.

All analyses were performed using IBM SPSS Statistics (version 29), with a 95% confidence level and a 5% significance level ($\alpha = 0.05$).

3. Results

3.1. Entrepreneurial Competence

Table 2 presents the descriptive statistics of our students' entrepreneurial competences.

Table 2. Descriptive Statistics for Entrepreneurial Competences.

Entrepreneurial Competences	M	SD	Median	Minimum	Maximum
Self-awareness/Self-confidence	14.22	2.63	14.00	6	20
Future Vision	14.05	2.73	14.00	6	20
Achievement Motivation	15.96	2.70	16.00	8	20
Planning	14.86	2.86	15.00	5	20
Persuasion	13.83	2.69	14.00	6	20
Total	14.58	2.19	14.80	8	20

The results indicate that the dimension with the highest mean score was Achievement Motivation, followed by Planning and Self-awareness/Self-confidence. The dimensions Future Vision and Persuasion showed slightly lower mean scores.

The overall mean score for entrepreneurial competence was 14.58 (SD = 2.19), with a median of 14.80 and minimum and maximum scores of 8 and 20, respectively.

These results suggest that students exhibit moderately high levels across the dimensions assessed. This finding is consistent with Tinoco's original study, in which first-year students displayed a consistently high levels of entrepreneurial ability. The predominance of higher scores in achievement motivation and planning indicates that students tend to demonstrate initiative, goal orientation, and the ability to organise resources-key aspects in the development of entrepreneurial competences within contemporary professional and educational environments.

3.2. Entrepreneurial Competences by Gender

Table 3 analyses gender differences in the entrepreneurial competences assessed.

Table 3. Independent-Samples *t* Tests of Entrepreneurial Competences by Gender.

Entrepreneurial Competences	Gender						
	Men		Women		Statistics		
	M	SD	M	SD	*t*	*p*	Cohen's *d*
Self-awareness/Self-confidence	14.64	2.55	14.1	2.64	2.33	0.02 *	0.21
Future Vision	14.12	2.71	14.03	2.74	0.37	0.71	
Achievement Motivation	15.62	2.79	16.07	2.67	−1.83	0.06	−0.16
Planning	14.6	2.87	14.94	2.85	−1.31	0.19	
Persuasion	13.81	2.83	13.83	2.65	−0.08	0.94	
Total	14.56	2.23	14.59	2.18	−0.16	0.87	

Note: * $p < 0.05$.

The results show that, among the entrepreneurial competences analysed, only self-awareness/self-confidence demonstrates statistically significant gender-based differences ($t = 2.33$, $p = 0.02$, $d = 0.21$). This competence encompasses the ability to identify one's own talents, act proactively, assess risks, and attribute consequences to one's own actions. In this case, men obtained a slightly higher mean score (M = 14.64) than women (M = 14.10), which may be interpreted as indicative of a higher subjective perception of personal security and emotional control among male participants.

However, the effect size was small, suggesting that the difference, although statistically significant, is limited in practical relevance. The observed differences may be mediated by sociocultural factors related to self-perception and gender socialisation processes, as well as by social norms and expectations that shape the expression of confidence and personal security.

For the remaining competences assessed—Future vision, Achievement Motivation, Planning, and Persuasion, including the overall entrepreneurial skills score—no statisti-

cally significant differences were observed ($p > 0.05$). This finding suggests a relatively homogeneous distribution of these dimensions between men and women. These competences comprise essential components of the entrepreneurial profile, such as the ability to anticipate outcomes and propose alternatives (Future vision), the drive to achieve goals and overcome obstacles (Achievement Motivation), the systematic organisation of resources and actions (Planning), and the capacity to influence others and build support networks (Persuasion). The absence of significant differences in these variables supports contemporary perspectives that challenge the existence of substantial gender differences in socio-emotional competences when analysed within comparable educational contexts.

Finally, a marginal effect was identified in the Achievement Motivation dimension, with a difference close to the threshold of statistical significance in favour of women (M = 16.07 vs. M = 15.62 for men; $p = 0.06$, $d = -0.16$). This competence, associated with the desire for personal improvement, perseverance and commitment to goals, has been widely recognised in the scientific literature as a key predictor of entrepreneurial success.

Although these findings should be interpreted with caution, the observed pattern suggests a greater performance orientation among female students, an aspect that is particularly relevant from an educational perspective. Strengthening this dimension would therefore constitute a strategic objective within university education. The results obtained provide useful insights for the design of gender-sensitive entrepreneurship education programmes, aimed both at fostering the development of self-awareness and self-confidence among women and at leveraging their high achievement motivation as a key resource for promoting entrepreneurial engagement.

3.3. Gender, Age and Teaching Experience as Predictors of Entrepreneurial Competences

Table 4 presents the results of the multiple linear regression analysis conducted to examine the impact of sociodemographic variables—gender, age, and professional experience—on university students' entrepreneurial competences.

Table 4. Multiple Regression Analysis Predicting Entrepreneurial Competences from Gender, Age, and Professional Experience.

Effect	F	p	R^2	Adjusted R^2	β	Standard Error	95% CI		p
							LL	UL	
Self-awareness/Self-confidence	3.053	0.028 *	0.013	0.009	−0.081	0.235	−0.542	0.38	0.031 *
Future Vision	1.455	0.226	0.006	0.002	−0.01	0.246	−0.492	0.472	0.79
Achievement Motivation	3.704	0.012 *	0.016	0.011	0.08	0.242	−0.394	0.554	0.035 *
Planning	6.621	<0.001 ***	0.028	0.023	0.065	0.254	−0.432	0.562	0.082
Persuasion	2.787	0.04 *	0.012	0.008	−0.006	0.241	−0.478	0.466	0.87
Total Entrepreneurial Ability	1.182	0.316	0.005	0.001	0.013	0.197	−0.373	0.399	0.73

Note. CI = confidence interval; LL = lower limit; UL = upper limit. * $p < 0.05$, *** $p < 0.001$.

The results show that, overall, the explanatory power of the models is limited, with low R^2 values across all competences analysed. Only gender showed a significant effect on some specific dimensions of entrepreneurial competences.

For Self-awareness/Self-confidence, the model was statistically significant ($F_{(3, 701)} = 3.053$, $p = 0.028$), with an R^2 of 0.013. This indicates that the model explains 1.3% of the variance in this competence. Gender had a significant negative effect ($\beta = -0.081$, $p = 0.031$), suggesting that women scored marginally lower than men.

For Future Vision, the model was not significant ($F_{(3, 701)} = 1.455$, $p = 0.226$), with an R^2 of 0.006. The effect of gender was also non-significant ($\beta = -0.010$, $p = 0.790$), indicating no meaningful differences between men and women in this dimension.

Regarding Achievement Motivation, the model was significant ($F_{(3, 701)} = 3.704$, $p = 0.012$), with an R^2 of 0.016. Gender showed a significant positive effect ($\beta = 0.080$, $p = 0.035$), suggesting that women tend to score slightly higher in this competence.

For Planning, the model was significant ($F_{(3, 701)} = 6.621$, $p < 0.001$), with an R^2 of 0.028. Although the effect of gender did not reach statistical significance ($\beta = 0.065$, $p = 0.082$), a positive tendency in favour of women was observed.

In the case of Persuasion, the model was also significant ($F_{(3, 701)} = 2.787$, $p = 0.040$), with an R^2 of 0.012. However, gender did not have a significant effect ($\beta = -0.006$, $p = 0.870$), indicating no substantial differences between men and women.

Finally, for overall entrepreneurial ability, the model was not significant ($F_{(3, 701)} = 1.182$, $p = 0.316$), with an R^2 of 0.005. Gender also showed no significant effect ($\beta = 0.013$, $p = 0.730$), suggesting no statistically significant differences between men and women in the global entrepreneurial competence score.

The coefficients of determination (R^2) obtained were low across all models, ranging from 0.005 to 0.028, indicating that the independent variables considered account for only a limited proportion of the variance in entrepreneurial competences. Overall, these results provide evidence of a partial influence of gender on the development of entrepreneurial competences in the university context. This finding suggests the importance of considering other contextual, pedagogical, or personal factors that may have a more substantial impact on the development of these competences.

Gender alone has limited predictive power for entrepreneurial competences, as evidenced by the low R^2 value in the baseline model ($F_{(3, 701)} = 5.427$, $p = 0.020$, $R^2 = 0.008$). However, when age and professional experience are incorporated into the multiple model ($F_{(3, 701)} = 3.053$, $p = 0.028$, $R^2 = 0.013$), the explained variance improves for some competences, suggesting that the effect of gender may be mediated and/or moderated by other variables.

4. Discussion and Conclusions

The aim of this study was to explore the entrepreneurial competences among university students and to analyse the existence of potential gender-related differences considering their relevance for AI-mediated contemporary learning environments. The findings indicate that, overall, entrepreneurial competences are distributed in a relatively homogeneous way between men and women, thereby reinforcing the view, previously advanced in earlier research (Barreiro et al., 2013; Gonzalez & Mocha, 2017; Tinoco Gómez, 2008), that these skills are transversal in nature and are not exclusively determined by gender.

The only statistically significant difference was observed in the Self-awareness/Self-confidence dimension, with marginally higher scores among men. Nevertheless, the small effect size indicates that this difference should be interpreted with caution, as its practical significance is limited. This competence, linked to perceptions of personal security, confidence in one's own abilities, autonomous decision-making, initiative and emotional control, may be influenced by sociocultural and educational factors that perpetuate certain gender stereotypes (Köpke & Schmitt-Rodermund, 2025; Langowitz & Minniti, 2007; Mueller & Conway Dato-On, 2008).

Recent studies have found that men report somewhat higher levels of personal self-efficacy than women, without this necessarily translating into differences in academic performance (Moraga-Pumarino et al., 2025). Some meta-analyses confirm that these gaps in technical self-confidence are progressively narrowing and are largely dependent on cultural and educational contexts (Christensen, 2023). Variables associated with educational and institutional environments have also demonstrated predictive value for university students' entrepreneurial intention, thereby reinforcing the role of sociocultural and formative factors

in these processes (Omotajo et al., 2024). From this perspective, the differences observed should not be interpreted as competence deficits, but rather as distinct expressions of self-perception, mediated by sociocultural norms and by educational contexts that may either reproduce or challenge such stereotypes (Yu & Deng, 2022).

On the other hand, although no statistically significant gender differences were found in Future vision, Achievement Motivation, Planning, Persuasion, or in overall entrepreneurial competence, it is notable that women obtained slightly higher scores in Achievement Motivation. This pattern suggests an entrepreneurial profile characterised by a greater orientation towards effort, perseverance and personal striving for improvement within this group. This finding aligns with recent studies emphasising gender-based differences in motivational structures, where women transform perceived competence into entrepreneurial intention, particularly in social entrepreneurship initiatives (Barrientos-Báez et al., 2022; Fernández-Guadaño & Martín-López, 2023; Mahendran & Rahman, 2025; Moreira et al., 2016; Sánchez Tovar et al., 2021).

The results derived from the regression analysis incorporating the sociodemographic variables of gender, age and professional experience confirm the findings previously described, insofar as they show that only gender exerts a differentiated and statistically significant effect on certain dimensions of entrepreneurial competence, particularly self-awareness/self-confidence and achievement motivation.

Nevertheless, gender accounts for only a marginal proportion of the total variance in entrepreneurial competences ($R^2 \leq 0.028$), with a small effect size ($\eta^2 = 0.032$), thus highlighting its limited explanatory capacity.

Even so, this finding is educationally relevant, as it supports the conception of entrepreneurship as a multidimensional phenomenon influenced by personal, educational, contextual and technological factors (Fuentes-García & Sánchez-Cañizares, 2021; Priede-Bergamini et al., 2025), the integrated examination of which should guide future research.

These findings are consistent with previous research indicating that, while there may be isolated differences in certain dimensions of the entrepreneurial profile, gender is not a primary determinant of entrepreneurial potential in educational contexts. Other factors-such as prior experience, family environment, type of training received, or personal motivations-may play a greater role in the development of these competences (Hamdan, 2025).

Current studies have reported statistically significant mean differences, albeit associated with small effect sizes. Specifically, men tend to exhibit higher entrepreneurial intention, greater perceived behavioural control, and stronger influence of subjective norms. Women, on the other hand, stand out in entrepreneurial motivational factors (perceived self-efficacy). This does not imply that women have less desire to undertake entrepreneurial activities; rather, it highlights a distinct "motivational architecture": while women perceive themselves as competent (believing they have the necessary skills), this self-perception translates into motivation ("I can, I want to do it") and, subsequently, into actual entrepreneurial intention. In contrast, men's entrepreneurial intention depends less on feeling competent and more on perceived control over the situation (believing they can manage risks) and the expectation that entrepreneurship will provide future stability and security outcomes, whether economic or personal (Moreira et al., 2016; Ward et al., 2019).

Strengthening self-awareness and perceived self-efficacy among women, alongside fostering achievement motivation in both genders, may contribute to a more balanced development of entrepreneurial potential (Bretones & Radrigán, 2018; Sánchez-Cañizares & Fuentes-García, 2013).

These gender nuances, while not constituting clear structural disparities, may influence the development of entrepreneurial competences and have relevant practical implications

for the design of entrepreneurship-oriented training programmes. Several studies show that women tend to exhibit lower levels of self-confidence and entrepreneurial self-efficacy, as well as lower entrepreneurial intention, which is associated with limited exposure to role models and positive feedback (Pimpa, 2021).

These motivational orientations may be shaped by prior experience, confidence and perceived barriers in learning environments mediated by digital technologies and artificial intelligence, an area in which the literature has highlighted the persistence of gender disparities in the use and appropriation of such tools (UNESCO, 2025). In this regard, the pedagogical design of learning environments plays a pivotal role, as the intentional transformation of educational spaces can contribute to the creation of more equitable, personalised and competence-oriented contexts, fostering students' self-efficacy and active participation (Teba-Fernández et al., 2020).

In university environments enhanced by AI technologies, these differences become more apparent: female students acknowledge the potential of AI to strengthen their competences but also report greater technical and ethical barriers, which hinder its effective adoption (El-Salhi et al., 2025b). Furthermore, global research indicates that women are approximately 20% less likely to use generative AI tools, even when access is equal, reinforcing the gap in leveraging technological resources for entrepreneurship (Otis et al., 2024).

These technological and perceptual disparities support the need to implement more inclusive and personalised educational strategies that integrate artificial intelligence training and targeted support in order to reduce gender gaps in entrepreneurial competences (World Economic Forum, 2025). In this vein, the adoption of actions such as strengthening self-awareness and perceived self-efficacy among women through pedagogical strategies that promote autonomous decision-making; fostering achievement motivation, particularly among female students, as a means of enhancing entrepreneurial intention; and incorporating AI-based technologies that enable personalised learning, provide automated feedback and identify specific training needs is strongly recommended (Bell & Bell, 2023; Park et al., 2025).

Universities are increasingly called upon to strengthen their role as spaces of equity and innovation by promoting inclusive learning environments that foster entrepreneurial initiative among all students (CISE, 2024). Within this framework, the promotion of institutional policies that explicitly integrate a gender perspective into entrepreneurship education is particularly relevant, with specific attention to teacher education and the ethical use of emerging technologies (Orser et al., 2019).

Although this study provides valuable empirical evidence for the analysis of entrepreneurial competences and potential gender inequalities within the context of higher education, it is not without several limitations that should be taken into account when interpreting the results.

First, the use of non-probabilistic sampling and the lack of representativeness of the sample, largely restricted to universities in the Community of Madrid and characterised by a marked overrepresentation of women (77% of participants), limit the generalisability of the findings to other institutional or sociocultural contexts and reduce the external validity of the results, particularly with regard to gender comparisons. Consequently, the findings related to gender differences, although statistically significant, should be interpreted with caution.

Second, the cross-sectional design prevents the establishment of causal relationships and prevents the examination of the evolution of entrepreneurial competences over time or across different stages of academic and professional development. Furthermore, the use of self-report instruments for the assessment of competences may introduce cognitive or social biases, such as social desirability or the overestimation of one's own abilities. These limitations, common in exploratory and quantitative studies, should be considered when interpreting the results and planning future research (Rodeffer, 2022; Strawser et al., 2021).

Looking ahead, several avenues for future research and action can be outlined. Taken together, the findings reinforce the view that the development of entrepreneurial competences in higher education is a complex and multifactorial phenomenon, in which gender plays a relevant role only in certain dimensions, without functioning as a unique or universal predictor, much like age or professional experience. From this perspective, future research could incorporate qualitative or mixed-methods designs to gain deeper insights into the underlying mechanisms involved in the development of these competences; alternatively, multivariate models could be proposed that include psychological, contextual and technological variables, thereby contributing to a more comprehensive understanding of how gender, age, professional experience and the use of artificial intelligence interact in shaping the entrepreneurial profile.

Similarly, the inclusion of factors such as professional experience, family background, type of training and institutional context would contribute to a more comprehensive and nuanced understanding of these processes (Hou et al., 2022), allowing for a more systematic examination of how sociocultural and educational factors interact in shaping self-perception, self-efficacy and the development of entrepreneurial competences.

Along these lines, longitudinal studies would be especially valuable, as they would make it possible to examine the evolution of entrepreneurial competences throughout the higher education cycle and during the transition into the labour market.

Complementarily, the adoption of intersectional approaches would enable an examination of how gender intersects with other identity-related factors (such as race, class or sexual orientation) in shaping the entrepreneurial profile, thereby moving beyond reductive and unidimensional approaches to entrepreneurial competence (Evans-Winters, 2021; Wingfield & Taylor, 2016). From this perspective, it is also necessary to attend to the broader educational contexts in which these intersections are constructed and negotiated, particularly in increasingly digitalised learning environments.

Within this framework, the specialised literature indicates that AI-based technologies offer opportunities to personalise learning, facilitate automated tutoring, and adapt content to learners' individual needs. From a theoretical and prospective standpoint, these features are associated with the potential to strengthen self-efficacy and support entrepreneurial decision-making in educational settings. Consequently, AI is commonly framed in current debates as a resource of strategic interest for competence-based, inclusive, and gender-sensitive entrepreneurship education, especially when its design and implementation are guided by ethical and equity-oriented criteria (Bell & Bell, 2023; Park et al., 2025; OECD, 2025; UNESCO, 2025; UN Women, 2024).

In the context of the present study, AI has not been considered as an empirical variable of analysis. Rather, it is integrated as part of the contemporary educational scenario in which the development of entrepreneurial competences is situated.

From this position, it is proposed as a relevant prospective avenue for future research and pedagogical innovation aimed at exploring how the use, experience, and perception of AI-based tools may contribute to the development of entrepreneurial competences, creativity, and educational equity, as well as to understanding their possible role in reproducing or mitigating gender gaps in learning processes (Alpürk et al., 2025; Park et al., 2025). This approach would allow progress towards a more complex and integrative understanding of entrepreneurship in contemporary educational contexts.

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