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# Effectiveness of the *PElEO* program to develop the entrepreneurial potential of Spanish students in Secondary Education and Vocational Training

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ABSTRACT

The general aim of the investigation was to determine the effectiveness of the PElEO program (educational program for the development of entrepreneurial potential in adolescents) in Spanish students (males and females). It was carried out with a pre-test and post-test design in a sample divided into a control group and an experimental group of students registered in the educational stages of Secondary Education and Vocational Training in order to test the hypotheses related to participation in the *PElEO* program and its effectiveness in formative dimensions considered. The program was effective and promoted the development of entrepreneurial potential and each of its five dimensions (Creativity, Personal Control, Goal Orientation, Leadership and Intuition for Problem Solving) in the group of individuals who participated. However, its impact was more pronounced among men than women, revealing potential entrepreneurial dimensions already present in women, establishing the bases for future entrepreneurial education proposals, and building upon those delineated in the European model Entrecomp. The originality of this study lies in the combination of three elements: 1) the analysed concept (entrepreneurial potential) and the terms associated with it; 2) entrepreneurship education in Spain currently conceived as the means for its development; and 3) the design, implementation, and analysis of the results of an entrepreneurship education program (*PElEO*), which provides relevant data about the differences between women and men.

## 1. Introduction

The term entrepreneurship is a broad and polysemic concept that is identified as a way of thinking, reasoning, and acting, primarily centred on opportunities, although also considering needs, approached with a global and multidisciplinary vision (Azqueta, 2019; Fernández-Salinero & De la Riva, 2014). It is a concept that integrates knowledge, skills, and attitudes, which we identify as entrepreneurial competence, necessary to develop entrepreneurial projects, whether internal (intrapreneurship) or external (entrepreneurial), and thus achieve "learning to undertake" enhancing entrepreneurial talent. It also encompasses entrepreneurial activity (change management and strategic renewal) and attitude, conceived as the personal disposition to act proactively and generate innovative ideas. Within the framework of the European Union, it is a key competence (Recommendation 2006/962/EC of the European Parliament and of the Council and Recommendation 2018/C189/01 of the Council), which is cross-cutting, dynamic, comprehensive, considered generic, and common to all professional profiles.

It is currently integrated into a conceptual model of competencies called EntreComp (Bacigalupo, 2019; Bacigalupo et al., 2016), which is structured into three interrelated areas of competence encompassing a set of competency units, with some entrepreneurial elements considered particularly relevant for the development of entrepreneurial competence mediating between them. The model is structured as follows (Fernández-Salinero, García-Mora, et al., 2023): ideas and opportunities, whose objective is to detect opportunities and generate business

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ideas; resources, whose objective is to acquire the resources necessary to generate ideas; and actions, whose objective is to execute the generated ideas while minimizing risks.

From this perspective, following Shapero's Entrepreneurial Event Theory (Shapero, 1985), in the face of an entrepreneurial event, a connection is established between the desirability (internal and external motivation, i.e. interest and potential benefits) of starting an entrepreneurial project and the viability of the latter (personal and socioeconomic motivation, i.e. actual willingness to act and market situation), whose positive correlation promotes an entrepreneurial attitude that facilitates the intention to act (Krueger & Brazeal, 1994). This intention is conceived as cognition that guides the entrepreneur's action toward the creation of a company (Moriano et al., 2007). This is a fundamental component of Entrepreneurial Potential (hereinafter EP). Thus, the intention emerges as a precedent of behaviour, and the stronger the intention to implement a behaviour, the greater the possibility of carrying it out effectively (Ajzen, 1991).

This study is contextualised in the Spanish education system. Furthermore, this research takes into account a broad concept of entrepreneurial education, conceiving it as *an education for entrepreneurship,* which responds to the natural aspiration of the person for growth that favours the development and improvement of both the individual and society. And not so much, although it is also an *education for entrepreneurship* or entrepreneurial education, which refers to an instrumental knowledge that focuses on the development of practical skills aimed at economic growth and productivity (Azqueta, 2019) and seeks to develop entrepreneurship (Bernal & Cárdenas, 2014). In the following, the aim is to clarify the concept of EP, in order to focus the analysis on the PEIEO Entrepreneurship Program. This will allow us to answer the following research questions: How do PEIEO program influence the development of EP in the adolescent population in Spain? Is the PEIEO program effective in developing the EP of Spanish students (male and female) in Secondary Education and Vocational Training?

## 2. Theoretical framework

This study's theoretical framework is divided into three sections. First, the proposal is contextualised in the Spanish education system. Second, the conceptualisation of EP and related concepts is explored in depth. Third, a specific educational program for entrepreneurship, *PElEO*, is presented. Finally, this section concludes with a conceptual map that graphically illustrates the interconnection between the different concepts analysed.

### 2.1. Entrepreneurial education in the Spanish context

The activity of Spanish legislation in terms of entrepreneurship has been intense and motivated by the context of an economic crisis characterised by a low growth rate and a high rate of youth unemployment. Specifically, during the second trimester of 2023, the Spanish Institute of Statistics (INE-SIS - Spanish Institute of Statistics, 2023) reported a total national unemployment rate of 11.60% (10.19% unemployed men and 13.16% unemployed women in the total active population of Spain). Separating these data by age group, the distance between sexes expands from the age of 25 years onwards in favour of men.

Regarding the active population, in the first trimester of 2023, there were 2,020,919 self-employed people (9.6% of the active population), with men and women representing 63.5% and 36.5%, respectively (Ministerio de Trabajo y de Economía Social, 2023). In this regard, the development of entrepreneurial education in Spain has generated significant interest in the design of formative programs aimed at potentiating EP, although the population integrated in levels of formal education, specifically in non-university levels, has not been thoroughly analysed to date (Bernal et al., 2021).

Given this situation, the phenomena of entrepreneurship, creativity, and innovation in the education system will be habitual elements in propositions to overcome the crisis. In this sense, current educational legislation, which has a national character with a more specific development from the different Autonomous Communities of the Spanish State that have transferred educational competencies, takes as a reference Recommendation 2006/962/CE of the European Parliament and Recommendation 2018/C189/01 of the European Council on the key competencies for Permanent Learning. The latter includes entrepreneurship and is conceived as those that every person requires for their realisation and personal growth, as well as for active citizenship, social inclusion, and employment. There are currently eight key competencies in Spanish educational law, including "entrepreneurial competency." To attain this competency, it is necessary to incorporate, in the curriculum of the Spanish educational system, specific content related to career opportunities and the world of working, as well as notions of economic and financial education and knowledge of organisational and business processes. Three approaches allow for the integration of entrepreneurship education into the curriculum (Eurydice, 2016; Fernández-Salinero, 2021): indirect inclusion in the curriculum (early childhood), integration in extant subjects (Primary Education), and creation of specific subjects (Second Education, Baccalaureate, and Vocational Training).

In this sense, entrepreneurship becomes more business-oriented with advancement along the educational stages, with a focus not only on the development of skills and attitudes related to entrepreneurship, as is the case of Basic Vocational Training, but also on the attainment of valuable knowledge regarding professional, labour, economic, and business aspects. In this respect, in Secondary Education, there is a specific subject aimed at providing students with precise knowledge of entrepreneurship without disregarding the above-mentioned, which prevails throughout the entire span of compulsory education. This approach favours the training of intra- and interpersonal skills, as well as the development of collective entrepreneurship over individual entrepreneurship, with the help of the administration, which provides support both legally and with specific resources and with the interest of the students themselves for their professional future. However, there are some inconveniences in this stage, such as the lack of educational leadership in terms of entrepreneurship, poor investment in specialised teacher training on entrepreneurial pedagogy, the absence of autonomy among many centres to adapt subjects and contents, and the existence of some bureaucratic obstacles (Núñez-Canal, 2017, pp. 122868–122953). The Baccalaureate stage has some subjects related to entrepreneurial training, in which the specific teaching of entrepreneurship acquires particular relevance; likewise, there is a cross-sectional development of skills and abilities linked to entrepreneurship, as in previous stages. Nevertheless, the particularity of a baccalaureate as a bridge to university and the weight of preparing the exams to access it leaves little room for educational teams to implement new strategies far from the contents demanded by current regulations. It provides teachers with few alternatives for methodological innovation due to insufficient training and the lack of adequate material and schedule resources (Batista et al., 2015, pp. 125–145). Lastly, in Vocational Training (Post-Secondary and Advanced), the curriculum is rather oriented to business, since all courses include training aimed at acquiring knowledge on the opportunities of learning and employment, particularly addressing the creation and management of companies and self-employment, as well as the organisation of labour and relationships in the company. Depending on the professional profile, this training is incorporated into one or several specific professional courses without jeopardising their cross-sectional treatment. This is where entrepreneurship education acquires greater meaning, although not everything is positive, since teachers trained in entrepreneurial topics are still required, as well as greater involvement of the collaborating companies in the practicum in labour centres (Batista et al., 2015, pp. 125–145).

Specific entrepreneurship propositions in the case of Secondary Education and Vocational Training in Spain, those educational levels in which entrepreneurship is most promoted, are designed to develop the

creation of collaborative and cooperative business projects. This is the case for the following programs (Donoso, 2017; Fernández-Salinero, Martín-Gutiérrez, & Montoro-Fernández, 2023):

- Business Simulation Program for Educational Purposes: Promotes the design of business projects in Cataluña.
- Embarka: Facilitates the launch of the regional entrepreneurial ecosystem in Murcia.
- Emprende-FP: Promotes entrepreneurial initiative for self-employment in Cataluña.
- European Young Enterprise: Promotes the creation of mini-companies in the classroom in Asturias.
- Iemprénjove: Enables the transformation of entrepreneurial ideas into actions in Islas Baleares.
- Sortzearen Abentura: Develops real entrepreneurship projects in Bilbao.
- Urratsbat Business Projects: Accompanies the creation of companies in País Vasco.
- Young Social Entrepreneurs: Favours the design and implementation of social projects at a national level.

To these national programs are added, others promoted by the European Union in collaboration with its Member States. We highlight the following points (Fernández-Salinero, Martín-Gutiérrez, & Montoro-Fernández, 2023):

- Entrepreneurial Cooperative Experience (ECOOPE): Provides cooperative entrepreneurship experience.
- Entrepreneurship Educational Program: Promotes Soft Skills for practical entrepreneurship.
- Erasmus for Young Entrepreneurs: Facilitates the connection between young entrepreneurs and established entrepreneurs for business creation.
- Green Entrepreneurship Europe (GEE): Fosters ecosystemic and sustainable entrepreneurship.
- Innicia Entrepreneurial Culture: Enhances personal, social, and productive entrepreneurship.
- Innovation Cluster for Entrepreneurship Education (ICEE): Provides practical experiences in business creation.
- Scoopconss-Social Cooperative Contest for Secondary Schools: Favours project-based learning in solidarity.
- Young Entrepreneurship Strategies (YES): Compiles entrepreneurial educational best practices in a guide.

All these programs are proposals that combine social and sustainable entrepreneurship with business entrepreneurship. They aim to develop EP through interactions with the environment, working with others (external transactions), and learning from one's experience (internal transactions). They rely on active and agile methodologies and target a young audience studying within the formal system, primarily in Secondary Education and Vocational Training, promoting networking that varies temporally in each of the identified programs (Fernández-Salinero, Martín-Gutiérrez, & Montoro-Fernández, 2023).

The previous analysis encourages the promotion of training of EP from the scope of education, essentially in Secondary Education and Vocational Training, where, as was previously indicated, there are specific subjects related to entrepreneurship, such as the optional subject of Economy and Entrepreneurship in Year 11 (Organic Law 3/2020, of 29 December which modifies Organic Law 2/2006, of 3 May on Education), as well as Professional Entrepreneurship Classrooms, and Professional Courses of Business and Entrepreneurial Initiative (with the current change in legislation, is now called Personal Itinerary for Employability II), Projects, and Training in Labour Centres in Vocational Training. Similarly, current educational legislation in Spain considers entrepreneurship as a key competence, as was previously mentioned, emphasizing the potentiation of creativity, innovation, and initiative, which agrees with the Sustainable Development Goals of the 2030 Agenda. This is based on the fact that innovation, creativity, and entrepreneurship may boost the attainment of Sustainable Development Goals, favouring economic growth and job creation while expanding the range of opportunities for everyone, especially for women and young people. Human creativity and innovation, both at the individual and group levels, have become true values for countries in the 21st century (Terzieva et al., 2022). This allows attaining a more significant margin of action in the face of the future vicissitudes of an uncertain future world of working, although full of opportunities to explore (Cárdenas & Athayde, 2022), which requires the use of specific programs focused on concrete actions that contribute to what is normally established. Therefore, the intention to undertake a new project or the favourable and necessary internal process to carry out the action that is set in the mind of the person will be enhanced (Osorio & Londoño, 2015).

### 2.2. Entrepreneurial potential (EP)

EP, a fundamental element of entrepreneurship, can be defined as a complex and dynamic reality inherent to individuals, a framework encompassing the set of aptitudes and capacities apt for development and education, fostering entrepreneurial behaviour (Azqueta et al., 2024). It is linked to the act of undertaking a new project in certain contexts and constitutes the combination of personal and socio-productive capacities that an individual develops through her/his interaction with the environment, working with other people (external transaction), and building personal narratives from her/his own experience (internal transaction), which allows the individual to create her/his entrepreneurial identity with self-awareness and self-efficacy through a dynamic and evolutionary process of leadership, planning, creation, and development of meaningful labour projects (Bernal, 2021; Bernal & Cárdenas, 2014, 2017; Cárdenas & Athayde, 2022). This term is based on attitudinal theory (Allport, 1935), which states that attitude is a valid and reliable predictor of entrepreneurship (García-Rodríguez et al., 2019) identified with the learned predisposition to respond favourably to an object in a multidimensional manner (Ajzen, 1991; Ajzen & Fishbein, 1975); that is, from a cognitive dimension based on rationalisation, an affective dimension founded on emotions, and an active dimension based on behaviour.

Therefore, EP enables a clear line of action related to its development through entrepreneurial education (Luis-Rico et al., 2020), which can be defined as the connection with a humanising education project in which students are trained on initiative, autonomy, responsibility, and personal maturity in order for them to evaluate, think, imagine, and create specific projects that face the broad challenges of humanity, including those related to the world of work (Mayor-Zaragoza, 2009). This educational approach allows potentiating EP in students and contributes to their integral growth, fundamentally the intellectual, societal, and moral dimensions of the person, going beyond mere socioeconomic and labour aspects (Azqueta & Naval, 2019; Suárez-Ortega et al., 2020).

Entrepreneurial intention is a critical component of EP, representing an individual's readiness to initiate entrepreneurial endeavours. This intention serves as a cognitive driver that motivates individuals to strategically plan and make decisions in pursuit of their entrepreneurial objectives (Liñán & Fayolle, 2015). Without intention, entrepreneurial skills and competencies may remain dormant or underutilised. Intention serves as a catalyst for transforming EP into action. EP can reciprocally influence intentions. Individuals equipped with the necessary skills, knowledge, and access to resources (financial, social, and intellectual) are more likely to cultivate strong entrepreneurial intention. The relationship between entrepreneurial intention and potential is best understood as a dynamic and iterative process in which intention activates potential, while the development of potential reinforces and sustains intention. Consequently, there is a potential fuel intention. Therefore, it is crucial to enhance specific skills to translate intention into effective entrepreneurial actions.

In this sense, it seems convenient to promote the training of EP from the formal scope of education, fundamentally in Secondary Education and Vocational Training in the Spanish education system, where there are specific subjects related to entrepreneurship. This will favour the increase of students' personal and social-productive capacities, improving their predisposition at the cognitive, affective, and behavioural levels, i.e. their entrepreneurial attitude, with the entrepreneurial intention of valuing opportunities, conceiving propositions, and creating projects, especially in situations of uncertainty (Vázquez-Rodríguez et al., 2023). Consequently, education is vital for the training of active, self-confident, curious, and innovative entrepreneurs, and it supports the teaching of adequate and cross-sectionally transmitted competencies as well as the development of EP and its most significant dimensions (Creativity, Personal Control, Goal Orientation, Leadership, and Intuition for Problem Solving) at different education levels, specifically Secondary Education and Vocational Training. Undoubtedly, education is an adequate means for the transmission of new information, especially in countries such as Spain, where entrepreneurial culture is not a tradition (Fernández-Salinero, 2021).

### 2.3. The PElEO program

In this context, we propose the design of an entrepreneurship education program (*PElEO*) based on the *Attitude Toward Enterprise Test* (ATE), which evaluates EP in young people (women and men in Secondary Education and Vocational Training). The ATE is inspired by the theory of attitude (Athayde, 2009, 2012), which, in our opinion, has proven effective, as validated in several countries, including the UK, Italy, South Africa, and Spain (Bernal et al., 2021). The obtained results allow us to identify the extent to which the *PElEO* program favours the acquisition of specific dimensions that are considered essential (Athayde, 2009, 2012) for the promotion of EP (Creativity, Personal Control, Goal Orientation, Leadership, and Intuition for Problem Solving), identifying the possible differences between men and women after completing the entrepreneurship program designed specifically for the development of those entrepreneurial dimensions. These results may provide interesting data that will impact entrepreneurship education propositions differentiated by gender.

Therefore, the *PElEO* program emerged from these concerns and has been established as a proposition that aims to educate the set of capacities and dispositions for undertaking a new business project. To this end, the project aims to generate and promote an educational model developed through activities that contribute to configuring the EP of students' personal identity in Secondary Education and Vocational Training in the Spanish education system.

This program aims to develop different dimensions of EP that are integrated in the entrepreneurial competence, which, from the framework of the European Union (Recommendation 2006/962/CE and 2018/C189/01), is currently included in a conceptual model of competences known as EntreComp (Bacigalupo, 2019; Bacigalupo et al., 2016), to which we have previously referred, and is structured in three areas and fifteen dimensions (Fernández-Salinero, 2021): 1) *ideas* and opportunities, which include the dimensions of opportunity detection, creativity, view, idea assessment, and ethical and sustainable thinking; 2) *resources*, which integrate the dimensions of self-confidence and self-efficacy (personal control), motivation and perseverance (goal orientation), resource and people mobilisation, and financial and economic literacy; and 3) *actions*, which contains the dimensions of initiative and leadership, planning and management, facing uncertainty, ambiguity, and risk (intuition for problem solving), working with other people, and learning through experience.

Of the abovementioned dimensions, the *PElEO* program is designed to develop Creativity (ideas and opportunities), Personal Control and Goal Orientation (resources), Leadership and Intuition for Problem Solving (actions). These dimensions were selected to be considered individual attributes, linked to entrepreneurship, and basic dimensions within the entrepreneurial competence promoted by the Spanish education system, that can be learnt and developed through experience and measured through the *Attitude Toward Enterprise Test* (ATE), which evaluates EP in young people based on attitude theory (Athayde, 2009, 2012). ATE has been validated in several countries including the United Kingdom, Italy, South Africa, and Spain (Bernal et al., 2021).

The PEIEO structure comprises the dimensions or attitudinal indicators of EP: Creativity, Leadership, Personal Control, and Goal Orientation. In turn, each of these is made up of ten activities, for a total of forty activities. The Problem Solving dimension is worked on in a cross-cutting manner in the activities proposed for the previous dimensions of EP. The general objectives of the program are related to training to generate ideas that facilitate the innovation process (Creativity), motivate and positively influence people to carry out a series of actions and objectives (Leadership), manage and self-regulate their own behaviour (Personal Control), and acquire a proactive attitude to achieve goals (Goal Orientation). To get these purpose, more than 130 specific objectives have been proposed. The timing is characterised by its flexibility, being able to adopt a quarterly, half-yearly, or complementary course development, depending on the degree of intensity and the time available in the educational centres. Internally, each activity has a minimum duration of 30 min, although it could be expanded or contracted in time depending on the contextual variables within the classroom. The evaluation of the program is divided into a continuous evaluation by means of rubrics in each activity, and a summative evaluation through the application of standardised tests that measure attitudes, knowledge, and entrepreneurial skills.

The attitudinal dimensions, which are crucial components of EP, were the cornerstones of our evaluation. These dimensions, including Creativity, Leadership, Personal Control, and Goal Orientation, are not just theoretical concepts, but also practical tools that can be cultivated to foster entrepreneurial success (Cárdenas-Gutiérrez, Martín-Gutiérrez, & Montoto-Fernández, 2023).

- Creativity: a key attitudinal dimension, is closely linked to openness to experience. It is an intellectual disposition that enables individuals to explore, learn, and understand their environment. A creative person is adept at identifying opportunities that others might overlook, finding unique solutions to problems, and generating benefits for themselves and their community (Jesson, 2012; Quattrini, 2023; Wagner, 2014).
- Leadership: Different meanings encompass several possibilities. The first relates to an individual's ability to obtain certain people to voluntarily follow them in performing specific tasks (Etzioni, 1961). The second refers to the capacity to share specific values and build a common goal (Hellriegel & Slocum, 2012). The third is the ability to influence others, gain commitment, and foster achievement of common goals (Enderica et al., 2018). Leadership is not just about achieving objectives but also about building human teams and developing or guiding them. It stimulates and spreads enthusiasm among its collaborators, promotes a favourable climate, has excellent communication and dialogue skills, is aware of its strengths and weaknesses, knows how to adapt its management style according to the situation and person, listens to others' opinions and suggestions, is reflective, assumes responsibilities, provides continuous feedback, and conveys respect and trust (Mayorga et al., 2019; Tolentino, 2020).
- Personal Control: Refers to the locus of control, that is, the extent to which people perceive themselves as capable of influencing the actions and outcomes of events in their lives (Rotter, 1966). Depending on a person's perception of the source of control, two types are distinguished: internal locus of control (success of actions depends on the individual's actions; they control them), and external locus of control (uncontrollable actions dependent on chance) (Toti et al., 2021). Entrepreneurial education strengthens the internal locus of control.

- Goal Orientation is the ability to consider what success is and carry out tasks to achieve it. Suppose success is interpreted from an internal perspective, where the acquisition of knowledge, skills, and attitudes is necessary for the person, involvement, and perseverance to increase. In contrast, if it is understood as something external to the individual, involvement and perseverance decline to avoid the possibility of failure (Anderman, 2020; Werner et al., 2019).

To conclude this section, Fig. 1 graphically illustrates the interconnection between the different concepts analysed.

This figure indicates that EP represents an individual's willingness to undertake entrepreneurial initiatives in certain contexts and constitutes the combination of personal and socio-productive capacities that a person develops through interaction with the environment, working with other people (external transaction), and constructing personal narratives based on their own experience (internal transaction). EP thus understood promotes the intention to generate entrepreneurial initiatives. Without entrepreneurial intention, entrepreneurial competence may remain latent or underutilised. Therefore, intention acts as a catalyst that transforms EP into action. Education is a fundamental way for this process to succeed, mainly through educational programs such as the *PEIEO*, which favours the development of those dimensions of entrepreneurial competence that are considered basic in the Spanish education system.

## 3. Methodology

### 3.1. Research and study design

This study was carried out with a pre-test and post-test design in a sample divided into a control group and an experimental group of students registered in the educational stages of Secondary Education, Vocational Training, and Baccalaureate (the latter only participated in the control group), in order to test the hypotheses related to participation in the *PElEO* program (educational program for the development of EP in adolescents) and its effectiveness in formative dimensions considered within EP.

The general aim of the investigation was to determine the effectiveness of the entrepreneurial education program *PElEO* in developing the entrepreneurial dimensions of EP in adolescents (women and men). It should be remembered that the Spanish education system develops both entrepreneurial competences of a business nature and transversal entrepreneurial competences in its subjects on entrepreneurship.

This quantitative, explanatory, cross-sectional study with latent variables (Cuevas-Vargas et al., 2019) was conducted using SPSS v.25.

First, the EP variable was designed as a second-order construct, and we evaluated the impact of the *PElEO* program on each of the dimensions of EP and on the higher variable. We also explored the existence of significant differences between the mean values of each dimension and the higher variables before and after the program's implementation. This allowed us to evaluate the effectiveness of *PElEO*. Second, we analysed the possible changes in the weight of each of the dimensions that made up the variable after the implementation of the educational program in men and women. Third, we assessed the differences between men and women in the dimensions that comprise EP before and after applying the program.

### 3.2. Hypotheses

Therefore, the following hypotheses are proposed:

- $H1_0$. There are no differences in the mean values of the post-test for the control (students participating in the traditional program) and experimental groups (students participating in the *PElEO* program).
- $H1_1$. There are differences in the mean values of the post-test for the control (students participating in the traditional program) and experimental groups (students participating in the *PElEO* program).
- $H2_0$. There are no statistically significant differences in the mean values of EP and each of its dimensions before and after the application of the *PElEO* program in men and women.
  $H_{21}$. There are statistically significant differences in the mean values of EP and each of its dimensions before and after the application of the *PElEO* program in men and women.

### 3.3. Population and sample

The sample was recruited using stratified probabilistic sampling. The following selection criteria were applied: a) territorial statistics by Autonomous Community (NUTS): Andalucía (ES61), Madrid (ES30), Castilla y León (ES41), Valencia (ES52), Castilla-La Mancha (ES42), La Rioja (ES23), País Vasco (ES21), and Navarra (ES22); b) the number of students registered in Secondary Education and Vocational Training; c)

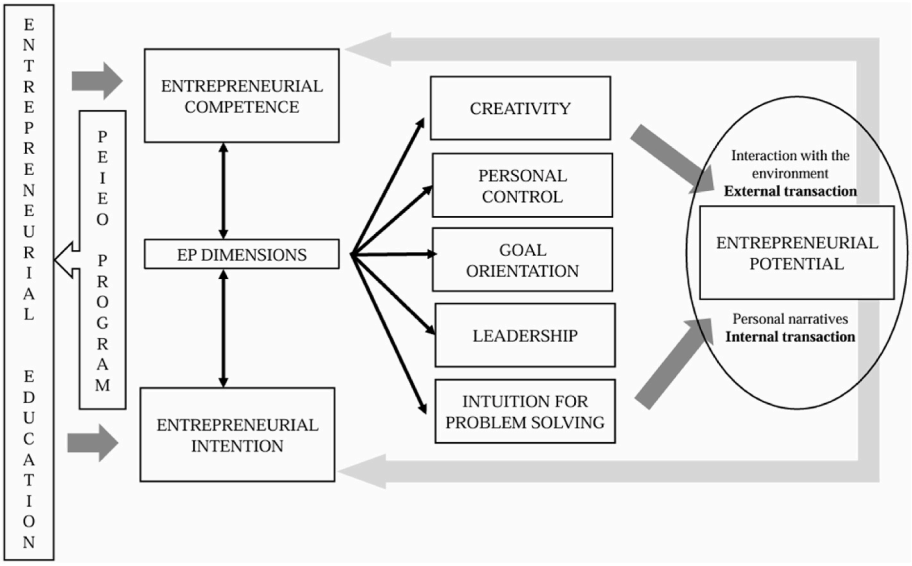


**Fig. 1.** Conceptual map of EP
Source: Own elaboration based on Bernal, 2022, p. 47.

the nature of the educational centre (public and private); and d) gender.

The number of centres that participated in the study were: Andalucía (15), Madrid (4), Castilla y León (5), Valencia (5), Castilla-La Mancha (1), La Rioja (5), País Vasco (5), and Navarra (1). It is worth mentioning that at least one experimental group and a control group were selected in each centre.

The sample comprised of 1036 individuals. Specifically, 440 respondents participated in the control group (223 women and 217 men), that is, students who did not receive the program, and 596 respondents belonged to the experimental group (299 women and 297 men).

Initially we assume that the population follows a normal distribution. According to Hair et al. (1999), if we assume that the variables follow a Normal distribution and given that the population size is unknown, the minimum sample size required would be determined by the following equation:

$$n = \frac{z_{\alpha/2}(p.q)}{e^2},$$

where:

n = sample size,
$z_{\alpha/2}$ = percentile of the distribution
p = estimated variability in the population
q = (1-p)
e = sampling error

For a confidence level of 95%, taking p = q = 0.5 and a maximum error of 5%, the minimum sample size we would need for our study would be:

$$n = \frac{1,96(0,5*0,5)}{0,05^2} = 384 \text{ individuals.}$$

After performing the test to check the normality of the data, the result shows that the distribution of the variables is not normal. This does not prevent us from performing ANOVA analyses since this type of analysis is robust (valid) when the sample size is large as in our case. This statement is supported by research by Blanca-Mena et al. (2017).

The profiles of the surveyed students are listed in Table 1.

### 3.4. Instruments

The variables were measured using a scale previously defined and verified in the scientific literature on this topic. Specifically, the business attitudes were measured using the *Attitude Toward Enterprise Test* (ATE), proposed by Athayde (2009, 2012) and adapted to the Spanish context (ATE-S) by Bernal et al. (2021).

ATE is structured into four subscales related to the dimensions of EP: 1) Leadership to build work teams, make decisions, negotiate, and plan. 2) Creativity to generate ideas that facilitate the innovation process; 3) Goal Orientation with perseverance, proactivity, and goal achievement; and 4) Personal Control to manage and self-regulate one's behaviours. This is set in 30 items based on a Likert scale, with responses ranging from 0 (totally disagree) to 7 (totally agree). The validity and reliability of the ATE have been previously demonstrated in its original version, with a Cronbach's alpha of 0.809, 0.752, 0.750, 0.725, and 0.829 for Leadership, Creativity, Goal Orientation, Personal Control, and general test, respectively (Athayde, 2009).

The Spanish version of the ATE-S allows the application of this EP measurement instrument to adolescents. The ATE-S test (Bernal et al., 2021) consists of five dimensions that integrate and measure EP: Leadership, Creativity, Goal Orientation, Personal Control, and Intuition for Problem Solving (four initial dimensions of the original version of ATE plus the dimension Intuition for Problem Solving). The latter refers to uncertain and intense circumstances. These dimensions were measured using a five-point Likert scale ranging from totally disagree (0) to totally agree (5). The same instrument was distributed to the control and experimental groups in the pre-test and post-test.

### 3.5. Procedure

Firstly, we contacted the head offices of the educational centres that taught Secondary Education and Vocational Training, as well as the teaching staff involved in the subjects "Introduction to Entrepreneurial and Business Activity" (subject of Year 11, which, with the current change in legislation, is now called "Economy and Entrepreneurship")

**Table 1**
Characteristics of the sample of students in the control and experimental groups.

| Demographic factors | | Control group | | Experimental group | | Total | |
|---|---|---|---|---|---|---|---|
| | | Nº | (%) | Nº | (%) | Nº | (%) |
| Sex | Man | 223 | 50.68 | 299 | 50.17 | 522 | 50.39 |
| | Woman | 217 | 49.32 | 297 | 49.83 | 514 | 49.61 |
| | Total | 440 | 100.00 | 596 | 100.00 | 1036 | 100.00 |
| Age (years) | 12–16 | 173 | 39.32 | 282 | 47.32 | 455 | 43.92 |
| | 17–20 | 169 | 38.41 | 212 | 35.57 | 381 | 36.78 |
| | 21–25 | 69 | 15.68 | 62 | 10.40 | 131 | 12.64 |
| | Over 25 | 29 | 6.59 | 40 | 6.71 | 69 | 6.66 |
| | Total | 440 | 100.00 | 596 | 100.00 | 1036 | 100.00 |
| Educational stage | Secondary Education | 175 | 39.77 | 253 | 42.45 | 428 | 41.31 |
| | Baccalaureate | 6 | 1.36 | 25 | 4.19 | 31 | 2.99 |
| | Vocational training (Post-Secondary) | 102 | 23.18 | 128 | 21.48 | 230 | 22.20 |
| | Vocational training (Advanced) | 157 | 35.68 | 190 | 31.88 | 347 | 33.49 |
| | Total | 440 | 100.00 | 596 | 100.00 | 1036 | 100.00 |
| Nature of the educational centre | Public | 344 | 78.18 | 427 | 71.64 | 771 | 74.42 |
| | Charter | 91 | 20.68 | 112 | 18.79 | 203 | 19.59 |
| | Private | 5 | 1.14 | 57 | 9.56 | 62 | 5.98 |
| | Total | 440 | 100.00 | 596 | 100.00 | 1036 | 100.00 |
| Autonomous Community | Andalucía | 187 | 42.50 | 311 | 52.18 | 498 | 48.07 |
| | Madrid | 68 | 15.45 | 105 | 17.62 | 173 | 16.70 |
| | Castilla y León | 37 | 8.41 | 50 | 8.39 | 87 | 8.40 |
| | Valencia | 35 | 7.95 | 35 | 5.87 | 70 | 6.76 |
| | Castilla La Mancha | 0 | 0.00 | 21 | 3.52 | 21 | 2.03 |
| | La Rioja | 16 | 3.64 | 63 | 10.57 | 79 | 7.63 |
| | País Vasco | 97 | 22.05 | 11 | 1.85 | 108 | 10.42 |
| | Total | 440 | 100.00 | 596 | 100.00 | 1036 | 100.00 |

Source: Own elaboration.

and "Business and Entrepreneurial Initiative" (subject of Vocational Training, with the current change in legislation, is now called Personal Itinerary for Employability II). After agreeing to participate in the study, an informative session was held on the application of the ATE-S test and implementation of the program. The research team advised the teachers to apply for the *PElEO* program in educational centres.

Prior to data collection, the student groups (of each teacher involved) were randomised to one condition or another (experimental or control). The control and experimental groups were selected from educational centres. Participants in the control group had their EP measured in the pre-test and post-test at time points similar to those of the experimental group. The pre-test was conducted during the last week of January 2022, and the post-test was performed in the second week of June 2022. The pre-test and post-test were completed using Google Forms. The students agreed to participate voluntarily in the study and were not informed about which group they belonged to (control or experimental) to prevent any form of psychological reactivity (Hawthorne effect) that could affect their spontaneous behaviour (McCarney et al., 2007).

Between the pre-test and post-test, the experimental groups implemented the *PElEO* project, whereas the control groups conducted their classes following a traditional methodology. The educational program for the development of EP in adolescents (*PElEO*) was designed for the research team "XXXX, within the project entitled "XXXXX" XXXXX (Code. XXXX). This program was developed in the experimental groups of this study, between the pre-test and post-test measures and during school hours.

*PEIEO* is organised following the sequential structure of a training program in formal education. It begins with a theoretical foundation, opting for a pedagogy of entrepreneurial education as a holistic concept, favouring the conciliation between 'entrepreneurship education' and 'entrepreneurial education', which are considered conceptual and interpretative frameworks that guide the meaning of 'entrepreneurial education'. This conceptual adoption leads to an understanding of entrepreneurship that goes beyond the creation, management, and development of business projects, extending towards the configuration of significant personal projects in different environments of human action. Next, the curricular integration of entrepreneurial competence is described as an educational subject that cuts across different areas of knowledge and as specific content in certain subjects and modules.

The application of the *PElEO* program required prior training of the participating teachers in charge of implementing the program in the experimental groups. The intervention was integrated into the didactic schedule of the previously mentioned subjects and adapted to the characteristics of the class group. The duration of the intervention was four and a half months, and the session comprised activities of 30–60 min. EP was addressed through program activities related to the entrepreneurial dimensions. Specifically, ten activities were carried out for each of the dimensions, stressing activities linked to personal, social, and labour scopes. The set of activities that make up the PEIEO program can be found in Cárdenas-Gutiérrez et al. (2023).

### 3.6. Data analysis

After gathering the data, they were registered, tabulated, and prepared for treatment using SPSS statistical package v.25. The information was analysed using descriptive and parametric inferential statistics after meeting the necessary conditions (Siegel, 1991). Because the sample size was sufficiently large and the distribution of the data was normal, it was possible to apply parametric techniques to test the hypotheses.

First, each dimension was modelled as a second-order construct. This modelling allowed for the aggregated values of each of the dimensions and higher variables. To this end, SmartPls v.3.4 software was used for this purpose.

Second, with the aim of evaluating the impact of the educational program on the dimensions considered, we analysed the existence of significant differences between the mean values of the scale (ATE-S) and each of its dimensions, considering the subsamples taken before and after the application of the educational program, and comparing the values of the control and experimental groups. This did not allow us to verify that all the students (control and experimental groups) started from the same initial level, although it allowed us to study the effectiveness of the educational program in improving the level of the students in each dimension.

Third, we analysed whether the effect of the educational program on EP differed between male and female students. To achieve this, we explored the existence of statistically significant differences in the mean values of each dimension, comparing the groups of men and women before and after the application of the *PElEO* program.

Student's t-test was performed (independent and paired samples). In all cases, the statistical significance was set at $\alpha = 0.05$.

## 4. Findings

### 4.1. Effectiveness of the PElEO educational program

Table 2 presents the mean values for each dimension before and after implementing the *PElEO* program for both the control and experimental groups. As can be observed, both the traditional methodology and the *PElEO* program developed EP and all its dimensions, with Creativity (control = 2.89; experimental = 3.24) and Intuition for Problem Solving (control = 2.22; experimental = 2.87) being the most enhanced traits in both cases. However, there was greater variation in the obtained results (pre-/post-test) when the educational program was applied at the general level and by dimension. For instance, the EP in the experimental groups increased by almost two points more than that in the control groups. This was also observed in the rest of the dimensions, with the difference being greater in some of them (0.65 in Intuition for Problem Solving) than in others (0.13 in Goal Orientation).

With respect to the results obtained in the experimental groups (Table 2), the analysis performed for the entire sample reveals that, after the application of the *PElEO* program, the general mean value reached in EP (ATE) increased by 9.82 points (mean = 95.49) over the initial mean recorded (mean = 85.67), obtaining a significance of p = 0.000.

The mean EP value is higher in the post-test scores than in the pre-test scores prior to the development of the *PElEO* program. In addition, it is found that there are statistically significant differences between the mean level of the initial EP (ATE) score and the value reached after the application of the *PElEO* program, where the mean obtained is positively skewed, as the p-value is less than 0.05.

This situation is repeated in the specific dimensions that make up the

**Table 2**
Proportion of the ATE variable and each dimension of the ATE-S scale (Creativity, Personal Control, Goal Orientation, Leadership, and Intuition for Problem Solving) in the control and experimental groups.

| Dimensions | Group | Pre-test Mean | Post-test Mean | Pre-test Standard Deviation | Post-test Standard Deviation |
|---|---|---|---|---|---|
| ATE | Control | 85.03 | 92.93 | 10.233 | 7.631 |
| | Experimental | 85.67 | 95.49 | 8.701 | 7.376 |
| Creativity | Control | 15.69 | 18.58 | 2.746 | 1.245 |
| | Experimental | 15.90 | 19.14 | 2.475 | 1.233 |
| Personal Control | Control | 18.79 | 19.23 | 2.367 | 1.316 |
| | Experimental | 18.97 | 19.79 | 2.152 | 1.390 |
| Goal Orientation | Control | 20.42 | 21.79 | 3.130 | 2.180 |
| | Experimental | 20.67 | 22.17 | 2.899 | 2.363 |
| Leadership | Control | 14.02 | 14.98 | 3.056 | 2.516 |
| | Experimental | 14.09 | 15.48 | 2.901 | 2.771 |
| Intuition for Problem Solving | Control | 16.12 | 18.34 | 2.467 | 1.686 |
| | Experimental | 16.04 | 18.91 | 2.274 | 1.535 |

Source: Own elaboration.

ATE (EP). Table 3 shows how these dimensions show a statistically significant increase (p = 0.000). The most developed dimensions after the application of *PElEO* are CRE and INT (3.24 and 2.87 points respectively above the initial level) and the least enhanced with the program is CON (0.82 points above the initial level) which, in turn, was the dimension with the highest mean in the pretest (mean = 18.97).

Table 3 shows that there were no statistically significant differences in the pre-test scores between the control and experimental groups. In other words, the individuals in both the control and experimental groups started from the same initial situation. However, the results obtained in the post-test showed statistically significant differences (p-value below 0.05) in ATE and in all its dimensions, with all the mean values being greater in the experimental group than in the control group. There are differences in the mean values of the post-test for the control (students participating in the traditional program) and experimental groups (students participating in the *PElEO* program). This indicates rejection of $H1_0$ and acceptance of $H1_1$. The *PElEO* program was effective and achieved its objectives with respect to generic entrepreneurship programs (traditional methodology).

### 4.2. Differences in the EP of men and women after the application of the PElEO program

As is shown in Table 4, in general, for both men and women in the experimental group, it can be observed that the program had a positive and significant effect on the EP of the students and all its dimensions since the p-value was lower than 0.005 in all cases.

The analyses confirmed significant differences in the mean values of EP and each of its dimensions before and after the implementation of the *PElEO* program. However, there were no differences between men and women. Therefore, $H2_0$ is accepted, and the alternative ($H2_1$) is rejected.

As can be observed in Table 4, on the one hand, in the pre-test (before applying for the program), statistically significant differences were observed as a function of gender in EP (ATE, sig. = 0.003) as the p-value was lower than 0.05. Specifically, significant differences were observed between men and women at the beginning of the program in Creativity (sig. = 0.002) and Goal Orientation (sig. = 0.000). In the remaining cases, no differences were detected between the men and women.

The results of the post-test (Table 4) showed no significant differences between men and women (p-value below 0.05) neither in general (EP) nor by dimension (Creativity, Personal Control, Goal Orientation, Leadership, Intuition for Problem Solving). Therefore, although the starting point of men and women was not the same before initiating the *PElEO* program, since the women obtained a higher score than the men in some dimensions, the development of entrepreneurial dimensions was equalized after completing the program. This indicates that the *PElEO* program had a greater impact on men than on women.

## 5. Discussion

This study, which was focused on determining the effectiveness of the *PElEO* program in the development of EP in the adolescent population in Spain and in the possible underlying differences between men and women, sheds light on several fundamental aspects. It can be concluded that the program was effective and promoted the development of EP and its five dimensions in the group of individuals who participated in the program. The results highlight that a student-centred and systematic methodology can enhance the skills necessary for entrepreneurship. These findings support previous studies emphasizing the need for cross-curricular, contextualised education to foster entrepreneurial skills (Bacigalupo et al., 2016), establishing a solid foundation for embedding programs like *PElEO* in educational curricula.

Despite its effectiveness, the program had not a different impact on men and women. We observed in this regard that there are certain dimensions (Creativity and Goal Orientation) in which women have better scores than men before applying to the program. We also discovered that men scored slightly higher in Personal Control and Intuition for Problem Solving, and that the dimensions of Creativity and Intuition for Solving Problems achieved the best results in the post-test for both men and women. The gender gap in the Leadership dimension decreased too. However, different studies have shown gender differences in entrepreneurial intention (cognition that guides the action of the entrepreneurial person, which is a fundamental component of EP), concluding that it is greater in men than in women in a wide variety of cultures and geographic scopes (Minniti & Nardone, 2007; Zellweger et al., 2011). Moreover, it has been demonstrated that women have a lower level of

**Table 3**
T-test for the equality of means of the control and experimental groups (pre-test and post-test differences) for the ATE variable and each of the dimensions of the ATE-S scale (Creativity, Personal Control, Goal Orientation, Leadership, and Intuition for Problem Solving).

| | | Levene's test for equality of variances | | T-test for equality of means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | T | Sig. (bilateral) | Difference of means (Control group- Experimental group) | Standard error difference |
| ATE | Pre-test | 7.873 | 0.005 | −1.054[a] | 0.292 | −0.637 | 0.604 |
| | Post-test | 2.687 | 0.102 | −5.444[a] | **0.000** | −2.562 | 0.470 |
| Creativity | Pre-test | 2.344 | 0.126 | −1.323[a] | 0.186 | −0.216 | 0.163 |
| | Post-test | 2.703 | 0.100 | −7.091[a] | **0.000** | −0.552 | 0.078 |
| Personal Control | Pre-test | 3.612 | 0.058 | −1.287[a] | 0.198 | −0.182 | 0.141 |
| | Post-test | 7.423 | 0.007 | −6.711[b] | **0.000** | −0.569 | 0.085 |
| Goal Orientation | Pre-test | 1.296 | 0.255 | −1.336[a] | 0.182 | −0.252 | 0.189 |
| | Post-test | 15.979 | 0.000 | −2.638[b] | **0.008** | −0.375 | 0.142 |
| Leadership | Pre-test | 1.186 | 0.276 | −0.349[a] | 0.727 | −0.065 | 0.187 |
| | Post-test | 17.865 | 0.000 | −3.020[b] | **0.003** | −0.499 | 0.165 |
| Intuition for Problem Solving | Pre-test | 4.313 | 0.038 | 0.519[a] | 0.604 | 0.078 | 0.150 |
| | Post-test | 1.916 | 0.167 | −5.644[a] | **0.000** | −0.568 | 0.101 |

Note.
[a] Equal variances are assumed.
[b] No equal variances are assumed.

**Table 4**
T-test for the equality of means of men and women (pre-test and post-test differences) for the ATE variable and each of the dimensions of the ATE-S scale (Creativity, Personal Control, Goal Orientation, Leadership, and Intuition for Problem Solving) in the experimental groups.

| | | Levene's test for equality of variances | | T-test for equality of means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | T | Sig. (bilateral) | Difference of means (men -women) | Standard error difference |
| ATE | Pre-test | 0.258 | 0.611 | −2.939[a] | 0.003 | −2.082 | 0.708 |
| | Post-test | 0.017 | 0.898 | 0.405[a] | 0.685 | 0.245 | 0.605 |
| Creativity | Pre-test | 0.654 | 0.419 | −3.115[a] | **0.002** | −0.627 | 0.201 |
| | Post-test | 0.821 | 0.365 | 1.755[a] | 0.080 | 0.177 | 0.101 |
| Personal Control | Pre-test | 0.093 | 0.760 | 0.401[a] | 0.689 | 0.071 | 0.176 |
| | Post-test | 5.119 | 0.024 | −0.430[b] | 0.668 | −0.049 | 0.114 |
| Goal Orientation | Pre-test | 0.125 | 0.724 | −5.580[a] | **0.000** | −1.293 | 0.232 |
| | Post-test | 0.435 | 0.510 | 1.243[a] | 0.214 | 0.240 | 0.194 |
| Leadership | Pre-test | 0.179 | 0.673 | −0.440[a] | 0.660 | −0.105 | 0.238 |
| | Post-test | 0.494 | 0.483 | 0.326[a] | 0.745 | 0.074 | 0.227 |
| Intuition for Problem Solving | Pre-test | 0.075 | 0.784 | −0.686[a] | 0.493 | −0.128 | 0.186 |
| | Post-test | 9.343 | 0.002 | −1.571[b] | 0.117 | −0.197 | 0.126 |

Note.
[a] Equal variances are assumed.
[b] No equal variances are assumed.

confidence in their entrepreneurial skills than men (Wilson et al., 2007) due to their self-perception of being less capable of carrying out a business behaviour, along with the experience of receiving less support from both the closest environment and the social environment (Santos et al., 2010). Studies such as those by Fonseca et al. (2015) report the existence of significant differences between men and women regarding entrepreneurial intention, concluding that men's entrepreneurial intention is associated with self-efficacy to a greater extent than women's entrepreneurial intention, indicating that women present a lack of knowledge, fear of failure, and doubts in their skills to carry out tasks related to entrepreneurship. Therefore, scientific evidence shows that the difference between entrepreneurial intention and gender is due to psychological factors rather than social norms (Jofré, 2017) and that there is an underlying divide in entrepreneurial intention that marks the personality setting (Obschonka et al., 2014).

On the contrary, other authors point out that the starting points are the same for both men and women in entrepreneurial intention and at the skill level, and that the divide starts to broaden during tertiary education and expands in the job market (Krieger et al., 2022).

In this respect, one possible explanation for women scoring higher in the pre-test on the dimensions of Creativity and Goal Orientation may lie in social and cultural factors that require them to excel in their fields of interest to be recognised. However, as they begin to enter contexts that are, in a certain way, masculinised (or understood as spaces of male power or domination), they may become immersed in the dynamics that limit them.

These results are in line with those of Fonseca et al. (2015), who stated that, although women present a greater variety of skills in adolescence, they do not develop entrepreneurial business capacity to a significant extent. For this reason, programs such as *PElEO* do not promote meaningful growth in these skills, although they do demonstrate that women have previously developed, such as Creativity or Goal Orientation. Fonseca et al. (2015) assert that women are afraid of failure and do not trust their skills to perform tasks related to entrepreneurship. This could be related to the stereotypical idea that entrepreneurial (and probably successful) processes are related to masculine skills and values (Laguía et al., 2019) because, as was also suggested by Gupta et al. (2008), the existence of masculine stereotype activation, both implicit and explicit, influences people's EP, even if these are not deliberately mentioned.

Thus, the *PElEO* program helped demonstrate which dimensions of EP are already developed by women (Creativity, Personal Control, Goal Orientation, Leadership and Intuition for Problem Solving), requiring further studies to analyze other dimensions of EP that ad hoc programs could enhance. Some of these dimensions are gathered in the European model Entrecomp (including in the areas of ideas and opportunities, resources and actions), which must be used as a reference for the design of entrepreneurship education programs from a gender perspective that promotes greater involvement of women in studies related to the scientific and technological scope and facilitates entrepreneurship by opportunity rather than necessity.

Therefore, it is necessary to expand the dimensions studied in future research if we want the gender gap to decrease, perhaps by analysing the differences in the entrepreneurial intention of men and women, considering this intention as the cognition that guides the action of the entrepreneur towards the creation of a company (Moriano et al., 2007), and, according to Martín et al. (2013), provides students with attitudes and skills, which refer to the personal dimension, along with business knowledge that incorporates the economic dimension. This approach opens the possibility of new studies on entrepreneurial education and gender (Núñez-Canal et al., 2023).

From this perspective, and based on this multifactor compilation underlying the socio-educational dynamics that impact the entrepreneurial dimensions of EP, we propose that future entrepreneurial programs aimed at Secondary Education and Vocational Training should include new dimensions of the EP and consider the following elements to improve the dimensions analysed in this workfor both men and women:

A) Creativity:
- **Active Learning Methodologies:** Using methods such as project-based learning and design thinking can enhance students' creativity. According to Neck and Greene (2011), these methodologies allow students to develop ideas experimentally, addressing real-world problems and exploring innovative solutions.
- **Spaces for Free Expression and Experimentation:** Creating learning environments that value divergent thinking, such as innovation labs or makerspaces, fosters creativity (Fillis & Rentschler, 2010). These spaces allow students to explore ideas and concepts without fear of making mistakes, a crucial element in creative thinking.

B) Leadership:
- **Collaborative Activities and Rotating Leadership Roles:** Encouraging teamwork with gender balance and allowing students to rotate leadership roles helps them develop skills to guide others and make decisions (Baggen et al., 2016). These practical leadership experiences improve students' competencies in team management and effective communication.
- **Mentorship from Experienced Leaders:** Establishing mentorship programs where students can interact with

successful entrepreneurs (men and female) or community leaders contributes to developing their leadership style and receiving constructive feedback (St-Jean & Audet, 2012).

C) Personal Control:
- **Training in Self-Regulation Skills:** Self-reflection and goal-setting activities help students improve self-control and resilience. Boyatzis (2008) suggests that self-management competencies can be developed through practices that enhance self-awareness and stress management.
- **Gradual Challenges and Tasks:** Designing activities that increase in difficulty and require overcoming obstacles teaches students to manage frustration and persevere in their goals (Gibb, 2002).

D) Goal Orientation:
- **Goal-Setting and Progress Evaluation:** Achievement orientation is strengthened by practicing setting clear, measurable goals. By defining and reviewing milestones, students learn to value effort and maintain motivation over time (McClelland, 1988).
- **Recognition and Rewards for Achievements:** Introducing recognition systems, such as awards or certifications, helps motivate students and builds an achievement-oriented mindset (Hannon, 2005).

E) Intuition for Problem Solving:
- **Simulations and Case Studies:** Including cases of entrepreneurship led by women and engaging students in activities where they make decisions in simulated scenarios quickly and effectively enhances their intuition and problem-solving skills (Sadler-Smith, 2015). Business simulations, in particular, are practical tools for presenting students with complex, multidimensional problems.
- **Developing Analytical Capacity in Ambiguous Contexts:** Providing students with opportunities to analyze complex problems with limited information strengthens their entrepreneurial intuition. Working on projects without clear answers fosters intuitive decision-making (Kirkley, 2017).

## 6. Conclusions

We can conclude, in this sense, that entrepreneurial education is essential to developing EP in Secondary Education and Vocational Training students, especially in developing projects that combine personal and socio-productive aspects to build a strong entrepreneurial identity.

This research presents the strengths of the methods used in the study, highlighting the type of design in which the EP of the student was measured before and after the application of an entrepreneurial educational program and using control and experimental groups. In this regard, the *PElEO* program is a practical and concrete contribution to increasing certain dimensions of the EP, which goes beyond other Spanish and European educational proposals indicated in this paper and confirms that formal education contributes to the formation of specific entrepreneurial human capital (Martin et al., 2013). These findings reinforce the importance of including entrepreneurship materials in educational programs to achieve learning goals (Núñez-Canal et al., 2023). Therefore, it is imperative to further investigate this avenue of research to determine the most appropriate curriculum for each stage of development.

Moreover, the strengthening EP through specific entrepreneurship program (*PElEO*), can transform not only the educational field but society in general by improving employability, promoting equal opportunities, and fostering a more active, creative, and resilient citizenry. To maximise these benefits, educational policies and research must continue to evolve and adapt to future challenges and opportunities. Some of these benefits are noted below:

- Implications for citizenship: a) Individual and collective empowerment to make informed decisions, undertake projects that benefit them personally and their community, and engage actively in socio-economic development (Kyambade et al., 2024; Legatzke et al., 2024); b) Increase in employment and innovation (Amado et al., 2024); c) The promotion of a culture of resilience and adaptability can better adapt to economic, technological, and social transformations (Kumasey et al., 2024; Sahu & Panda, 2024).
- Implications for national and international educational policies: a) Integration of entrepreneurial education into educational policies as a critical component of students' personal and professional development (Iizuka et al., 2024); b) Promotion of equal opportunities through programs should be inclusive and accessible, allowing people all to develop their EP (Aman et al., 2024; Baalbaki & El Khoury, 2024); and c) International cooperation and sharing of best practices, experiences, and educational resources that enhance entrepreneurship (Yetkin & Tunçalp, 2024).
- Implications for education: a) Curriculum review at all levels (primary, secondary, and higher education) to include entrepreneurial education, creativity, and problem-solving skills more explicitly; b) Development of innovative pedagogical methods (project-based learning, service-learning, and experiential education); c) Teacher training in entrepreneurial pedagogy and updates on entrepreneurship trends.
- Implications for research: a) Exploration of new dimensions of entrepreneurship, such as differences in entrepreneurial leadership styles, social innovation, and the integration of soft skills in education (Patel et al., 2024; Wang & Thai, 2024); b) Continuous evaluation and improvement of entrepreneurial education programs to identify which practices are most effective and how they can be improved or adapted to different contexts; c) Interdisciplinary research, as well as entrepreneurship, is not only an economic phenomenon but also a social, psychological, and cultural one that influences the development of EP.

A limitation of this study is that the dimensions of EP considered are not the only ones linked to entrepreneurial attitudes. This limitation is due to the test used (ATE-S) which has conditioned the dimensions considered. Future research could use other complementary instruments to provide a broader view of pupils' entrepreneurial attitudes. For example, the Basic Scale of Entrepreneurial Skills (Bernal-Guerrero et al., 2021), the scale for measuring personal initiative in education (EMIPAE) (Gorostiaga et al., 2018), the General Self-Efficacy Scale (Baessler & Schwarzer, 1996), and the questionnaire for validating the status of the identity of the self (EOMEIS) (Schwartz, 2004).

To date, the ATE test has been validated and adapted for use in the UK, Italy, South Africa, and Spain (Bernal et al., 2021). In addition, recent studies have employed this in their research (Al-Qadasi et al., 2024; Amofah & Saladrigues, 2022; Elitas et al., 2023; Silva et al., 2021). However, this contribution goes a step further by linking the development of EP to a specific entrepreneurship education program (*PElEO*) in the curriculum of the educational system. This could be replicated in other countries and/or contexts to test the effectiveness of entrepreneurial programs and actions promoted by the educational system.

## CRediT authorship contribution statement

**Ángela Martín-Gutiérrez:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Carolina Fernández-Salinero Miguel:** Writing – review & editing, Writing – original draft, Supervision, Resources, Conceptualization. **María Elena García-Mora:** Writing – review & editing, Writing – original draft, Conceptualization. **Ana María Montero-Pedrera:** Writing – review & editing, Writing – original draft.

## Data availability

The following website provides access to data related to the project: https://institucional.us.es/peleo2020. However, the authors of this publication may be asked for any information that they deemed necessary.

## Ethics approval and consent to participate

The Biomedical Research Ethics Committee of Andalusia, Spain approved this research with the following code: (C.P.ABG21-C.I.0851-N-21). Date of approval 16 January 2021.

## Consent for publication

The authors declare that they have no conflicts of interest. All authors have read and agreed to the published version of the manuscript.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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