frontiers | Frontiers in Education

TYPE Original Research
PUBLISHED 14 June 2023
DOI 10.3389/feduc.2023.1055453



OPEN ACCESS

EDITED BY
Ramona Simut,
University of Oradea, Romania

REVIEWED BY
Jolita Greblikaite,
Vytautas Magnus University, Lithuania
Qi Mingde,
Guangdong University of Technology, China

*CORRESPONDENCE
Lucía Rodríguez-Aceves
✉ lucia_rodriguez@tec.mx

RECEIVED 27 September 2022
ACCEPTED 22 May 2023
PUBLISHED 14 June 2023

CITATION
Silveyra-León G, Rodríguez-Aceves L and Baños-Monroy VI (2023) Do entrepreneurship challenges raise student's entrepreneurial competencies and intention?
*Front. Educ.* 8:1055453.
doi: 10.3389/feduc.2023.1055453



# Do entrepreneurship challenges raise student's entrepreneurial competencies and intention?

Geraldina Silveyra-León[1], Lucía Rodríguez-Aceves[2]* and Verónica I. Baños-Monroy[3]

[1]Entrepreneurship Institute (IEEGL), Tecnologico de Monterrey, Monterrey, Mexico, [2]Entrepreneurship Department, School of Business, Tecnologico de Monterrey, Monterrey, Mexico, [3]Management and leadership Department, School of Business, Tecnologico de Monterrey, Monterrey, Mexico

Motivated by the question on what content and which pedagogical methodologies are effective in teaching entrepreneurship, this research tested whether entrepreneurial intention and entrepreneurial competencies changed after undergraduates attended an entrepreneurship challenge (ECH) experience. This pedagogical experience was carefully designed as a 5-week in-class education and a 1-week boot camp-type intensive activity. The research design was an empirical, survey-based pre- and post-study on a sample of 525 freshmen. Results showed an increase in *entrepreneurial intention* and in the entrepreneurial competencies measured (*opportunity identification, evaluation and exploitation, and resources procurement*). This research contributes to entrepreneurship education through the design and measurement of an effective program based on a previous framework for entrepreneurship courses and aligned with the education-through-entrepreneurship approach.

KEYWORDS

**entrepreneurial intention, entrepreneurship education, entrepreneurship challenge, entrepreneurship competencies, entrepreneurship education program design, higher education, México**

## 1. Introduction

In past decades, entrepreneurship education (EE) has attracted the attention of governments, institutions, individual scholars, and universities worldwide because it provides students with the tools necessary to initiate a new business (Balan et al., 2018; Kozlinska et al., 2020). EE is highly relevant under two assumptions: First, entrepreneurs who create an enterprise within a university environment have a more significant impact on their ecosystem's economic development (von Graevenitz et al., 2010), and they perform much better than others (Godsey and Sebora, 2010) because such institutions provide entrepreneurs with skills, attitudes, and knowledge to raise their alertness and abilities towards business opportunities (Piperopoulos and Dimov, 2015). Indeed, research has established that EE plays a fundamental role in developing more and better entrepreneurs (Karimi et al., 2014). The second assumption affirms that entrepreneurs can be nurtured. As far as we know, however, no entrepreneurial gene exists—no one is simply born an entrepreneur (Neck and Greene, 2011).

Although scholars concur that entrepreneurship can be taught, questions remain about content and appropriate pedagogy (Ramsgaard and Christensen, 2016; Balan et al., 2018). According to Ahmad et al. (2018), educators in entrepreneurship are still struggling to find a fit between instructional objectives and suitable teaching techniques. Besides that, EE faces another challenge: measurement of its effect and impact. The impact is frequently measured by students'

increased motivation or entrepreneurial intention after an EE course since it represents one of EE's few measurable outcomes (Fitzsimmons and Douglas, 2011; Nabi et al., 2017). However, another line of thought establishes that EE's impact can also be measured through competency development (Sánchez, 2013).

Along the same line, previous research has provided evidence that through EE, entrepreneurship competencies can be developed (Pittaway and Cope, 2007; Ghina, 2015; Silveyra et al., 2021), and entrepreneurial activity can be enhanced (Rasmussen and Sørheim, 2006; Bagheri and Pihie, 2011). What is accomplished through EE should be aligned with course design, considering its objective, pedagogical approach, and content, among other factors (Fayolle and Gailly, 2008; Gedeon, 2014). Systematic reviews on EE courses worldwide have identified four approaches: about, for, in, and through entrepreneurship (Edwards-schachter et al., 2015). Each includes different pedagogical methodologies and approaches to reach EE objectives.

Although a wide variety of pedagogical methodologies have been used in the entrepreneurship domain (Solomon, 2007; Neck and Greene, 2011), one of the most frequently applied is experiential learning (Fayolle, 2013). However, in spite of its intuitive appropriateness and the encouragement among leading scholars to use it (Neck and Greene, 2011), there is a lack of evidence to support the belief that experiential teaching methods have a greater impact on students' learning than traditional lecture-based teaching methods (Kozlinska et al., 2020). Consequently, due to the fact that more and more entrepreneurship education courses and programs are moving towards experiential teaching methods, it is important to investigate whether this teaching style leads to better student competencies and entrepreneurship intention, which are the desired outcomes of educational practice (Silveyra et al., 2021).

Therefore, the aim of this paper is to examine the relationship between experiential pedagogy and undergraduate student's entrepreneurship intention and competencies (opportunity identification, evaluation, exploitation and resources procurement). On the one hand, entrepreneurial intention has been used to assess the effectiveness of entrepreneurship programs (Nabi et al., 2017; Kozlinska et al., 2020). On the other hand, the phenomenon of entrepreneurship necessarily involves the dynamic interplay of opportunities and resources (Clough et al., 2019).

The main contribution of this paper is the design of an Entrepreneurship Challenge (ECH) and the measurement of its effectiveness. The ECH's design includes pedagogies aligned to objectives for each of its phases. In general, the ECH takes the form of a five-week in-class educational format followed by a full-week immersion (boot camp-type training). Importantly, the ECH design is based on the framework proposed by Gedeon (2014) for modeling entrepreneurship programes and is aligned with the education-through-entrepreneurship approach (Edwards-schachter et al., 2015; Piperopoulos and Dimov, 2015).

The study follows a quantitative empirical research design, based on a two wave data collection (pre-ECH and post-ECH) using a paper based questionnaire. The analysis consisted of a paired sample t-test of the variables of interest (entrepreneurial intention and entrepreneurial competencies) to identify changes (if any). Findings showed positive and significant differences for all the variables, being entrepreneurial intention the highest increase and resources procurement the highest mean.

This paper is structured as follows: The first section contains a literature review along three lines of thought: (1) EE, (2) entrepreneurial intention, and (3) entrepreneurial competencies. The second section includes a detailed description of ECH's design. The third section describes the research method and its results. Finally, a discussion of results is presented, along with conclusions.

# 2. Background

## 2.1. Entrepreneurship education

Sufficient evidence exists that entrepreneurship can be taught, or at least encouraged, through education (Solomon, 2007). Therefore, EE can be considered a key instrument for fostering entrepreneurial attitudes, intentions, and competencies (Karimi et al., 2016). Even so, several researchers have established that EE remains in its early stages because no standard theoretical framework or best practice for educating or fostering entrepreneurs has gained consensus (Balan et al., 2018; Hatt, 2018). Previous literature reviews on EE programs and courses reveal various objectives, philosophies, content, pedagogies, and results sought (Gedeon, 2014). This has impacted scientific research on EE, given that lack of theoretical frameworks for a course and program design leads to ambiguity and imprecision (Fayolle and Gailly, 2008).

Therefore, scholarly discussion has shifted from whether entrepreneurship can be taught to what content EE should deliver, but most importantly, how content should be delivered to reach EE objectives (Ahmad et al., 2018). The educational focus is now on pedagogy—which methods are the most efficient for fostering an entrepreneurial mindset, developing entrepreneurial competencies, or increasing entrepreneurial action, among others. However, a valid pathway has been developed to design programs according to objectives, i.e., entrepreneurship about, for, in, and through (Smith et al., 2006). Table 1 summarises how EE pedagogies, audience, and content should be aligned with objectives. Although previous research reveals that EE has used a wide variety of pedagogical methodologies (Solomon, 2007; Neck and Greene, 2011), for the most part, entrepreneurial education has embraced the constructivist approach, manifested through experiential learning pedagogies (Corbett, 2005; Fayolle, 2013; Lackéus, 2014).

As mentioned previously, another challenge EE faces is the measurement of its impact or efficiency, but Jack and Anderson (1998) have established a framework to evaluate EE's impact. This framework (Table 2) highlights the importance of following up with participants after course completion (Henry et al., 2005). The theoretical framework also serves as justification for how, in this paper, measurements are made pre and post-entrepreneurship experience, both students' perceptions of their intentions and their entrepreneurship competencies. Notably, measurement does not suggest a causal effect of entrepreneurship competencies on entrepreneurial intention, only a comparison to identify differences (if any). The following section offers a discussion on entrepreneurial intention.

TABLE 1 Entrepreneurship and education pedagogies.

| EE objective | Learning process | Key dimensions of the teaching model | Concepts and relevant theories |
|---|---|---|---|
| Education about entrepreneurship | Learn to be an academic | -Academic conception of entrepreneurship | -Entrepreneurship as a research area |
| | | -Focus on the theoretical dimension | -Theories for teaching and doing research in the field |
| | | -Teaching educational model | |
| | | -Discussion in the classroom of research topics | |
| | | -Main audience: PhD students, professors, and researchers | |
| Education for entrepreneurship | Learn to be a business creator | -Entrepreneurship as a specific concept and professional situation (independent entrepreneur, creation of new ventures, corporate entrepreneurship, etc.) | -Theories of the entrepreneurial process |
| | | -Focus on the professional / practical dimension (knowing what, how and who) | -Learning by doing / creating |
| | | -Pedagogies of learning-by-doing | -Learning failure |
| | | -Acquisition of skills, practical knowledge, techniques to act and be successful as an entrepreneur | -Limited rationality |
| | | -Development of entrepreneurial skills is expected | -Effectuation |
| | | -Main audience: potential entrepreneurs who work or have a specific entrepreneurial project | -Entrepreneurial cognition (heuristics, risk perception, etc.) |
| | | | -Business management and growth |
| Education in entrepreneurship | Learn skills for growth of an existing business | -Management training for established entrepreneurs focused on ensuring growth and development of the business | -Skills for solving problems |
| | | -Development programs for management and training for growth, as well as specific courses on product development and marketing, among others | -Improvement and update of business management skills |
| | | -Courses aimed at helping individuals or groups of individuals adopt an entrepreneurial approach, regardless of the type of organisation for which they work | |
| Education through entrepreneurship | Learn to become an entrepreneurial person | -Entrepreneurship as a general and wide concept. | -Entrepreneurship intention |
| | | -Focus on the dimension of entrepreneurial spirit ('know why' and 'know when'). Changes are expected in attitudes, perceptions, and intentions towards entrepreneurship | -Entrepreneurial Event Model (Shapero and Sokol, 1982) |
| | | | -Theory of Planned Behavior (Ajzen, 1991) |
| | | -Great diversity of audiences: students in business and non-business areas | -Entrepreneurial self-efficacy |
| | | -High importance of consolidated entrepreneurs as role models in the classroom | -Entrepreneurial orientation (applied at the individual level) |

Own elaboration based on Henry et al. (2005), Fayolle and Gailly (2008), and Piperopoulos and Dimov (2015).

## 2.2. Entrepreneurial intention

As mentioned, intention models have been widely used in studying entrepreneurship phenomena, partly because they provide information on how individuals process information, make decisions, and subsequently perform (Liñán and Fayolle, 2015). Adequate evidence, both theoretical and empirical, shows that intentions best predict any planned behavior (Zampetakis and Moustakis, 2006; Liñán and Chen, 2009; Liñán et al., 2013; Liñán and Fayolle, 2015). Currently, entrepreneurial intention is a consolidated research area within the field of entrepreneurship (Fayolle and Liñán, 2014). Yet, it still offers opportunities for studying background motivation or specific variables' explanatory capacity when elucidating intention in specific scenarios (Liñán and Fayolle, 2015).

In the specific field of entrepreneurship, the Theory of Planned Behavior (TPB) has been a framework for exploring individuals'

attitudes toward entrepreneurship (Liñán and Chen, 2009) since it helps explain the complexity and underlying cognitive processes behind new venture creation (Liñán et al., 2013). TPB is a parsimonious, well-grounded theory that has verified robust behavior predictions (Krueger and Carsrud, 1993). In fact, several recent studies have demonstrated validity of this theory in different cultural settings (Nabi et al., 2017; Fragoso et al., 2020). According to the TPB, three independent factors determine the intention of a behavior: (a) attitude towards the behavior, (b) social norms, and (c) perceived behavioral control (Ajzen, 1991).

Due to assessing the effectiveness of entrepreneurship programs has primarily focused on measuring the intention to become an entrepreneur and the factors that influence it (Kozlinska et al., 2020), the following hypothesis is proposed:

> *H1*: The entrepreneurship challenge (ECH) increases student's entrepreneurial intention.

## 2.3. Entrepreneurial competencies

Over the past few years, the competency-based approach has become a standard framework for studying entrepreneurs' characteristics and actions (Man et al., 2002; Rasmussen and Sørheim, 2006). But because competencies prepare students for challenges in their professional lives (Bowden, 2004), one problem in acquiring entrepreneurship competencies is that, unlike other professions, entrepreneurs' responsibilities, activities, or duties have not been clearly defined (Baron, 2007). Therefore, formal education for developing entrepreneurship competencies might not be as clear in their pedagogic designs as in other professions. Thus, previous research efforts have resulted in a wide variety of proposed frameworks for entrepreneurship competencies (Onstenk, 2003; Wu, 2009; Mitchelmore and Rowley, 2010; Morris et al., 2013; Dimitratos et al., 2014; Tehseen and Ramayah, 2015). These could serve as starting points for definitions of competencies addressed through EE, given that the competencies entrepreneurs need to create successful businesses are many, but, at the same time, changing in importance and scope according to each stage of the entrepreneurial process (Baron, 2007).

According to some researchers, competencies developed through any entrepreneurship intervention should closely relate to its objectives (Fayolle and Gailly, 2008; Gedeon, 2014). Here, the ECH aims to develop entrepreneurial competencies while increasing students' entrepreneurship intention. The ECH draws from the assumption that an entrepreneurial individual is the one who identifies, evaluates and exploits opportunities (Lackéus, 2014) and can be fostered through the education (Lanero et al., 2011) of young students. This objective is closely related to what Shane and Venkataraman (2000) defined as the core of entrepreneurship: the identification, evaluation and exploitation of opportunities regardless of the resources an individual currently possesses.

Therefore, in this educational experience design, four competencies were measured: (1) opportunity identification, (2) opportunity evaluation, (3) opportunity exploitation and (4) resources procurement because they can be developed through an education program and they are relevant to the development of an entrepreneurial intention and action (Chandler and Jansen, 1992; Man et al., 2002; Man and Lau, 2005; Wu, 2009; Mitchelmore and Rowley, 2010, 2013; Rasmussen et al., 2011; Chell, 2013; Morris et al., 2013).

According to the literature, opportunity identification is the ability to look at the habitual and unusual, to observe the ordinary and the extraordinary (Volery et al., 2013). That is, opportunity identification concerns the perception of changing conditions or unknown possibilities in an environment that represents potential sources of profit (Morris et al., 2013). In other words, the ability to identify opportunities lies at the heart of entrepreneurship (Shane and Venkataraman, 2000; Davidsson, 2015; Karimi et al., 2016). The second competency, opportunity evaluation, refers to the ability to assess the structural content of opportunities to accurately determine their attractiveness (Morris et al., 2013). This is to estimate the potential viability of the opportunity. On the other hand, the third competency, exploitation of opportunities, unlike the previous two, refers to the search for feedback, continuously incorporating new information and adapting the initial idea, in such a way that the original idea becomes an opportunity (Volery et al., 2013). Exploitation of opportunities, implies the development of market opportunities through various means (Man et al., 2002), as well as the mobilisation and recombination of a variety of resources, such as financial capital, human capital and social capital. The phenomenon of entrepreneurship necessarily involves the dynamic interplay of opportunities and resources (Clough et al., 2019). Thus, the fourth competency is resources procurement, which relates to skills necessary to access resources not necessarily owned or controlled to accomplish the implementation of previously identified opportunities (Hayton and Kelley, 2006; Morris et al., 2013). This means acquiring and developing the resources necessary to start and operate a company (Mitchelmore and Rowley, 2010).

Previous research has found that competencies prepare individuals to act as starting a venture (Izquierdo et al., 2005). This is because the competencies acquired through education increase the perception of individuals of their ability to carry out a particular activity, such as creating a company (Sánchez, 2013), potentially increasing entrepreneurial activity (Izquierdo et al., 2005). Consequently, those individuals with a higher level of certain competencies feel better able to start a company, which indicates a connection between competencies and the perceived control of creating a new company (Murugesan and Dominic, 2014). Therefore, the following hypotheses is proposed:

> *H2*: The entrepreneurship challenge (ECH) increases student's entrepreneurial competencies related to (a) opportunity identification, (b) opportunity evaluation, (c) opportunity exploitation and (d) resources procurement.

# 3. Method

## 3.1. Entrepreneurship challenge (ECH) overview and purpose

The ECH's purpose was to provide all freshmen students with a first entrepreneurial experience through which they developed

TABLE 2 Theoretical framework to evaluate an entrepreneurship education course.

| Period after completed a course | Measurement of impact of entrepreneurship education |
|---|---|
| More than 10 years ago | Contribution to society and economy |
| | Performance of the venture created |
| | Professional satisfaction |
| | Self-actualisation and psychological success |
| 3 to 10 years after | Survival and reputation of the venture created |
| | Change in reputation and innovation level of the venture established |
| 0 to 5 years after | Number and type of venture created |
| | Mergers and acquisitions |
| | Entrepreneurial positions obtained |
| | Entrepreneurial positions searched |
| Measures pre and post the course | Intentions to undertake a behavior |
| | Knowledge acquired |
| | Perceptions of learning and competencies acquired |
| Current and on-going measures | Student enrolment |
| | Number and type of courses offered |
| | Interest in entrepreneurship |
| | Knowledge in the field |

Adapted from Henry et al. (2005).

entrepreneurial competencies by a) creating economic value with limited resources, b) within a limited period of time, c) through seed capital provided by the university.

Students experienced the ECH in teams of five members. Each team had a mentor who provided guidance and advice. At the beginning of the ECH, each team received approximately 120 USD of seed capital, which allowed them to begin operations and generate profits. When the ECH ended, teams returned the seed capital to the university and, through a crowdfunding platform, allocated their profits to a non-profit organisation whose social cause was attractive to the team members.

Using methodologies proposed by Fayolle and Gailly (2008) and Gedeon (2014), the ECH was designed to develop entrepreneurial competencies using an action-based educational approach, emphasising education through entrepreneurship. Such an approach allowed students to understand "what" and "who" is important when attempting to act entrepreneurially (Williams Middleton and Donnellon, 2014), which refers to 'know why' (Rae and Carswell, 2001). The ECH was divided into three phases: preparation, execution and reflection (see Table 3).

1,108 freshmen students participated in the ECH, which took place in 2017. 32 teachers were involved as mentors, each supporting between 20 to 50 students. Additionally, 12 staff members were responsible for support and logistics activities. The total amount of seed capital allocated to the ECH was 24,000 USD. Profits generated by the ECH participants totaled 30,000 USD.

In the following sections, each phase is more specifically described.

### 3.1.1. Preparation phase

During the preparation stage (Table 3), students received an introduction to the ECH, through which participants became acquainted with entrepreneurship competencies and received instructions about different activities to be performed. Before the execution stage, participants attended four sessions in a classroom with about 20 to 30 students. Because previous research has found that competencies are best acquired actively (Macosko et al., 2009), teacher-mentors used an active learning approach, becoming session facilitators, while students actively participated in their learning process.

### 3.1.2. Execution phase

The ECH execution phase consisted of a full immersion week which took place at the end of September. Because regular classes were suspended, students focused only on the activities of the challenge. During this phase, students experienced various stimuli to support their learning process. For instance, talks with role models, whom previous research has found to influence individuals' intention towards entrepreneurship (Kolvereid, 1996; Godsey and Sebora, 2010; Joensuu-Salo et al., 2015), workshops on resilience and failure that allowed students to experience and talk about these concepts (Pittaway and Cope, 2007; Fayolle and Gailly, 2008), visits to co-working spaces to interact with the local entrepreneurial ecosystem (Rae and Carswell, 2001), and, finally, a peer-to-peer evaluation that encouraged learning among students (Williams Middleton and Donnellon, 2014). Through this stage, students had mentors who, according to Ahmad et al. (2018), facilitated personal and professional growth by sharing insights and knowledge. See Table 4 for a detailed agenda.

### 3.1.3. Reflection stage

In the ECH's final stage, the different experiences, including successes and failures, capitalised on learning. According to previous research, through reflection, entrepreneurs learn to inquire into the meanings of their past experiences and social interactions (Holcomb et al., 2009). For this reason, students wrote a personal essay reflecting

on their individual ECH experiences from beginning to end. Importantly, reflection allowed entrepreneurs not only to assimilate, reframe and restructure their understanding and acquired knowledge from various events but also to apply learning outcomes to recognize required personal skills and actions to predict and/or prevent potential crises and challenges while creating a company (Cope and Watts, 2006; Holcomb et al., 2009).

## 3.2. Research design

To test the proposed hypotheses, the research employed a quantitative empirical approach and used a two-wave data collection method (pre-ECH and post-ECH) using a paper based questionnaire. The analysis consisted of a paired sample t-test of the variables of interest (entrepreneurial intention and entrepreneurial competencies) to determine any differences. Due to the research purpose, the study was not designed as an experiment. Thus, causality among the variables of study is not assumed.

### 3.2.1. Sample and data collection

ECH participants consisted of 1,108 freshmen students, enrolled in 35 academic programs at undergrad level. Data was collected at the beginning of the ECH (T0) and at the end of it 6 weeks later (T1). In both waves, a paper based questionnaire was applied within a classroom, simultaneously in all groups of students, and supervised by a professor. Students did not receive credit for participating in the study.

At T0, 800 complete responses were obtained (response rate of 69%) and at T2 717 (response rate of 62%). The two surveys (T0 and T1) had 525 matching and complete responses, representing 45% of the total ECH enrolment. In the final sample of 525 students, 285 were male (54.3%) and 240 female (45.7%), with ages from 16 to 23 years (mean of 18.3).

### 3.2.2. Measures

To operationalize the variables, previous scales with adequate construct validity and reliability were used. All items (aside from demographic characteristics) were measured using a 7-point Likert scale ranging from 1 representing 'strongly disagree' to 7 representing 'strongly agree.' These items and the sources from which they were adopted are summarised in Appendix 1.

Entrepreneurial intention was a pure intention measure, assessed using a scale adapted from Liñán and Chen (2009) and used previously by other scholars (Chen et al., 1998). Opportunity identification, opportunity evaluation and evaluation exploitation were measured using a scale adapted from Chandler and Jansen (1992), Anna et al. (2000), and Shane and Venkataraman (2000). These scales have been used in various previous studies (Baum et al., 2001; Man and Lau, 2005; Ahmad et al., 2010). Resources procurement was measured by a scale adapted from Winborg and Landstrom (2001). This scale was previously used by Politis et al. (2010) and Morris et al. (2013), who developed further insights into the most critical competencies for entrepreneurial success.

### 3.2.3. Measurement model

Data was analysed using partial least squares with the software SmartPLS 3.0 (Ringle et al., 2005). The measurement properties of the scales were tested to ensure one-dimensionality, discriminant and convergent validity (see Table 5). For reliability, all the constructs had the Cronbach's and composite reliability (CR) values well above 0.70, as recommended by Fornell and Larcker (1981) and Nunnally (1975). Moreover all the items met the 0.50 significance-loading threshold (Carmines and Zeller, 1979; Hair et al., 2019), and all the constructs had average variance extracted (AVE) above 0.50 (Hair et al., 2017). In sum, evidence suggests the presence of convergent validity.

To assess the distinctiveness of the constructs, the Fornell-Larcker criterion was used (Fornell and Larcker, 1981). Table 6 suggests that the values along the diagonal for each construct are greater than any

TABLE 3 Teaching model framework for ECH.

| Stages | Preparation | Execution | Reflection |
|---|---|---|---|
| Objective(s) | Introduce freshmen into the ECH and prepare them for the execution phase | Develop entrepreneurial competencies through the ECH | Raise awareness of the experience and the acquisition of entrepreneurial competencies |
| Duration | 4 weekly classroom sessions | 1 week of full immersion. Mixed sessions: auditorium setting and the real world | 1 session classroom |
| Group size | 39 groups | 3 auditorium | 39 groups |
| | 20–30 students per group | 350 students per auditorium | 20–30 students per group |
| Content | Session 1. Introduction and Team Building | Day 1. Conference: Role models | Resilience |
| | Session 2. Opportunity identification | Day 2. Workshop: Resilience | Feedback |
| | Session 3. Ideation and concept validation | Day 3. Hands on: Execution of the project and visit co-working spaces within the city | Personal essay |
| | Session 4. Working plan and pitch | Day 4. Plenary session: Failure as part of the entrepreneurial process | |
| | | Day 5. Peer evaluation: pitch results | |
| Pedagogy | Active learning | Direct experiential learning | Reflective learning |
| | | Challenge-based learning | |

Own elaboration based on Fayolle and Gailly (2008) and Gedeon (2014).

values to their left in the same row. In addition, the cross loadings analysis showed that the items had higher loadings with their associated constructs, demonstrating the existence of discriminant validity (Barclay et al., 1995; Martínez Ávila and Fierro Moreno, 2018).

To test for common method bias (CMB) the measured latent marker variable (MLMV) approach was used (Lindell and Whitney, 2001; Chin et al., 2013). In the survey used to collect data, other variables were included. In specific, risk perception, which has no nomological relationship with the rest of measures. Thus, it was used as the marker variable. Table 7 shows the path coefficients without the marker variable in the model, with the marker variable and the differences. Because the differences for both, T0 and T1 are significantly low, it is suggested the lack of CMB (Lindell and Whitney, 2001; Chin et al., 2013). It is noteworthy that in the research design no causality between the variables was assumed. However, the MLMV test in SmartPLS, requires the comparison of the paths.

### 3.2.4. Results

Table 8 shows the sample's descriptive statistics and the variables' correlations. Means ranged from 4.6 to 6.03. Correlations were all positive and significant A multicollinearity analysis was performed by using the variance inflation factor (VIF) (Diamantopoulos and Siguaw, 2006; Hair et al., 2019). As recommended (Hair et al., 2019), all values ranged from 1.2 to 4.5, which are less than the cutoff value of 5, suggesting the absence of collinearity issues.

The paired samples t-test results showed positive and significant differences for all of the constructs. Entrepreneurial intention increased 11.1%, opportunity identification 5.1%, opportunity evaluation 10.7%, opportunity exploitation 7.6% and resources procurement 7.1% (see Table 9). The highest mean in T0 (5.63) and T1 (6.03) corresponded to resources procurement (see Table 9).

## 4. Discussion and conclusion

This research explored pre-existing perceptions and attitudes towards entrepreneurial competencies and entrepreneurship intention (T0) and after participating in an entrepreneurship challenge (T1). Motivated by the question of what (contents) and how (pedagogy) entrepreneurship should be taught (Pittaway and Cope, 2007; Ramsgaard and Christensen, 2016; Balan et al., 2018), this research explored how a carefully designed entrepreneurial challenge was used to teach entrepreneurship and to influence the entrepreneurial intention and entrepreneurial competencies of 525 undergrad students.

Findings provide evidence that those 5 weeks of learning, while at the same time actively *doing* entrepreneurship, contributed to students considering starting their businesses at some point during their trajectory at the university, thus increasing their intention towards entrepreneurship. Consequently, hypothesis 1 is not rejected.

TABLE 4 ECH execution stage agenda.

| Schedule | Monday | Tuesday | Wednesday | Thursday | Friday | Schedule |
|---|---|---|---|---|---|---|
| 8:00–8:30 | Mentoring *(stages 1, 2, 3 and 4)* | Mentoring *(stages 1, 2, 3 and 4)* | Tour around co-working places (throughout the city) | Mentoring *(stage 1, 2, 3 and 4)* | Check-in (attendance) | 8:00–8:30 |
| 8:30–9:00 | Check-in (attendance) | | Execution outside Campus (material acquisition, production, sales) | | Team back (Deliveries preparation) | 8:30–9:00 |
| 9:00–9:30 | Welcoming *(stages 1, 2, 3 and 4)* | Check-in (attendance) | | Check-in (attendance) | Mentoring *(plenary stage)* | 9:00–9:30 |
| 9:30–10:00 | Social Projects Presentation *(stages 1, 2, 3 and 4)* | Resilience Activity *(stages 1, 2, 3 and 4)* | | Failure sharing activity *(stages 1, 2, 3 and 4)* | | 9:30–10:00 |
| 10:00–10:30 | | | | | | 10:00–10:30 |
| 10:30–11:00 | Role Model Conference | | | | Fast pitches (Peer evaluation activity) *(plenary stage)* | 10:30–11:00 |
| 11:00–11:30 | Check-out (attendance) *(stages 1, 2, 3 and 4)* | Execution outside Campus (material acquisition, production, sales) | | Execution outside Campus (material acquisition, production, sales) | | 11:00–11:30 |
| 11:30–12:00 | Execution outside Campus (material acquisition, production, sales) | | | | Exit survey | 11:30–12:00 |
| 12:00–12:30 | | | | | Final (Pitch competition) *(plenary stage)* | 12:00–12:30 |
| 12:30–13:00 | | | | | | 12:30–13:00 |
| 13:00–17:00 | | | | | Closure | 13:00–17:00 |
| 17:00–17:30 | Team back | Team back | Team back | Team back | | 17:00–17:30 |
| 17:30–18:00 | ECH Deliverables (via Black Board) | ECH Deliverables (via Black Board) | ECH Deliverables (via Black Board) | ECH Deliverables (via Black Board) | | 17:30–18:00 |
| 18:00–18:30 | | | | | | 18:00–18:30 |

Own elaboration.

10.3389/feduc.2023.1055453

TABLE 5 Means, standard deviations and correlations.

| | | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Entrepreneurial intention (t0) | 4.62 | 1.52 | 1 | | | | | | | | | |
| 2 | Opportunity identification (t0) | 5.36 | 1.10 | 0.480** | 1 | | | | | | | | |
| 3 | Opportunity evaluation (t0) | 5.07 | 1.21 | 0.477** | 0.746** | 1 | | | | | | | |
| 4 | Opportunity exploitation (t0) | 5.23 | 1.18 | 0.501** | 0.813** | 0.752** | 1 | | | | | | |
| 5 | Resources procurement (t0) | 5.63 | 0.91 | 0.337** | 0.560** | 0.516** | 0.539** | 1 | | | | | |
| 6 | Entrepreneurial intention (t1) | 5.13 | 1.59 | 0.577** | 0.342** | 0.384** | 0.371** | 0.275** | 1 | | | | |
| 7 | Opportunity identification (t1) | 5.63 | 1.08 | 0.445** | 0.546** | 0.456** | 0.509** | 0.405** | 0.596** | 1 | | | |
| 8 | Opportunity evaluation (t1) | 5.61 | 1.06 | 0.431** | 0.507** | 0.536** | 0.491** | 0.392** | 0.564** | 0.772** | 1 | | |
| 9 | Opportunity exploitation (t1) | 5.63 | 1.11 | 0.463** | 0.543** | 0.505** | 0.552** | 0.377** | 0.614** | 0.815** | 0.828** | 1 | |
| 10 | Resources procurement (t1) | 6.03 | 0.83 | 0.363** | 0.409** | 0.392** | 0.418** | 0.498** | 0.447** | 0.594** | 0.656** | 0.624** | 1 |

a. $N = 525$; b. $^{**}p < 0.01$, c. $^{*}p < 0.05$.

TABLE 6 Indicators loadings, convergent validity, and reliability test.

| Latent variable | Items | Standardized loading | | Cronbach α | | Composite reliability | | Average variance extracted | |
|---|---|---|---|---|---|---|---|---|---|
| | | T0 | T1 | T0 | T1 | T0 | T1 | T0 | T1 |
| Entrepreneurial intention | IE01 | 0.851 | 0.894 | 0.832 | 0.892 | 0.889 | 0.926 | 0.669 | 0.759 |
| | IE02 | 0.719 | 0.786 | | | | | | |
| | IE03 | 0.895 | 0.929 | | | | | | |
| | IE04 | 0.795 | 0.869 | | | | | | |
| Opportunity identification | OPID01 | 0.838 | 0.866 | 0.883 | 0.913 | 0.918 | 0.939 | 0.738 | 0.794 |
| | OPID02 | 0.847 | 0.909 | | | | | | |
| | OPID03 | 0.887 | 0.923 | | | | | | |
| | OPID04 | 0.863 | 0.865 | | | | | | |
| Opportunity evaluation | OPEV01 | 0.885 | 0.871 | 0.9 | 0.894 | 0.93 | 0.926 | 0.77 | 0.759 |
| | OPEV02 | 0.864 | 0.873 | | | | | | |
| | OPEV03 | 0.887 | 0.876 | | | | | | |
| | OPEV04 | 0.873 | 0.865 | | | | | | |
| Opportunity exploitation | OPEX01 | 0.848 | 0.865 | 0.89 | 0.907 | 0.924 | 0.935 | 0.751 | 0.781 |
| | OPEX02 | 0.875 | 0.894 | | | | | | |
| | OPEX03 | 0.873 | 0.888 | | | | | | |
| | OPEX04 | 0.872 | 0.889 | | | | | | |
| Resources procurement | RL1 | 0.722 | 0.795 | 0.74 | 0.803 | 0.834 | 0.87 | 0.56 | 0.627 |
| | RL2 | 0.639 | 0.72 | | | | | | |
| | RL3 | 0.813 | 0.836 | | | | | | |
| | RL4 | 0.805 | 0.81 | | | | | | |

Cronbach's α; CR = Composite reliability; for all measurement items, five-point Likert scales were used (i.e., 1 strongly disagree, 5 strongly agree).

TABLE 7 Discriminant validity using Fornell-Larcker Criterion.

| T0 | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Entrepreneurial intention (t0) | **0.818** | | | | |
| 2 | Opportunity identification (t0) | 0.478 | **0.877** | | | |
| 3 | Opportunity evaluation (t0) | 0.501 | 0.756 | **0.867** | | |
| 4 | Opportunity exploitation (t0) | 0.489 | 0.764 | 0.816 | **0.859** | |
| 5 | Resources procurement (t0) | 0.348 | 0.53 | 0.553 | 0.577 | **0.748** |
| **T1** | | **1** | **2** | **3** | **4** | **5** |
| 1 | Entrepreneurial intention (t1) | **0.871** | | | | |
| 2 | Opportunity identification (t1) | 0.567 | **0.871** | | | |
| 3 | Opportunity evaluation (t1) | 0.614 | 0.832 | **0.884** | | |
| 4 | Opportunity exploitation (t1) | 0.599 | 0.78 | 0.818 | **0.891** | |
| 5 | Resources procurement (t1) | 0.461 | 0.672 | 0.64 | 0.613 | **0.792** |

The values along the diagonal for each construct are greater than any values to their left in the same row.

TABLE 8 Common method bias test, Lindell and Whitney (2001) marker variable approach.

| Relationship | T0 | | | T1 | | |
|---|---|---|---|---|---|---|
| | Without marker | With marker | Difference | Without marker | With marker | Difference |
| Opportunity identification – Entrepreneurial Intention | 0.148 | 0.147 | −0.001 | 0.254 | 0.246 | −0.008 |
| Opportunity evaluation – Entrepreneurial intention | 0.168 | 0.174 | 0.006 | 0.075 | 0.038 | −0.037 |
| Opportunity exploitation – Entrepreneurial intention | 0.227 | 0.235 | 0.008 | 0.306 | 0.269 | −0.037 |
| Resources procurement – Entrepreneurial intention | 0.048 | 0.046 | −0.002 | 0.059 | 0.051 | −0.008 |
| R Square | 0.832 | 0.832 | 0.000 | 0.892 | 0.892 | 0.000 |

Own elaboration.

TABLE 9 Results for Pretest and Post-test differences.

| | T0 mean | T1 mean | Difference | Percentage | T-statistics | Significance |
|---|---|---|---|---|---|---|
| Entrepreneurial intention | 4.62 | 5.13 | 0.51 | 11.1% | −8.22 | 0.000 |
| Opportunity identification | 5.36 | 5.63 | 0.28 | 5.1% | −6.06 | 0.000 |
| Opportunity evaluation | 5.07 | 5.61 | 0.54 | 10.7% | −11.31 | 0.000 |
| Opportunity exploitation | 5.23 | 5.63 | 0.40 | 7.6% | −8.42 | 0.000 |
| Resources procurement | 5.63 | 6.03 | 0.40 | 7.1% | −10.45 | 0.000 |

Regarding the second hypothesis related to the development of entrepreneurial competencies as a measure of EE experience, previous research establishes that entrepreneurship can be taught (Kuratko, 2005; Hindle, 2007; Solomon, 2007; Neck and Greene, 2011; Sánchez, 2011, 2013), and one outcome of the program could be the development of specific competencies (Martin et al., 2013). Results obtained through this research design showed an increase in the entrepreneurial competencies (opportunity identification, evaluation, exploitation and resources procurement) after the ECH experience. Neither, therefore, is the second hypothesis rejected. Entrepreneurship competencies include a person's underlying characteristics (personality traits, attitudes, social roles, self-image) and attributes acquired through education (skills, knowledge, experiences) (Man and Lau, 2005). Previous research provides evidence that the latter can be modified in the short term through interventions (Bird, 1995; Man et al., 2002; Ghina, 2015) such as the ECH.

This research contributes to EE through the design and measurement of an entrepreneurship challenge based on a previously proposed framework for entrepreneurship courses (Fayolle et al., 2006; Gedeon, 2014) and aligned with education through the entrepreneurship approach (Edwards-schachter et al., 2015; Piperopoulos and Dimov, 2015). By using various pedagogical methodologies, the ECH's experiential learning allowed students to generate new meaning to entrepreneurship, which could lead them to

a change in thinking and behavior (Fayolle and Gailly, 2008). Therefore, this research provides evidence that the ECH fulfilled its objective of increasing students' perceptions and attitudes towards entrepreneurial competencies (opportunity identification, evaluation, exploitation and resources procurement) and entrepreneurial intention. In addition, this study supports the assumption that experiential learning is one of the best ways to teach entrepreneurship (Neck and Greene, 2011; Kozlinska et al., 2020).

Our study concludes that education practitioners should be encouraged to measure their programs' impact on student populations to advance the field and better understand EE's effects. This could allow space to focus on attributes of programs more useful for increasing entrepreneurial activity and mindset. Therefore, if universities, governments, business incubators, and other stakeholders from the entrepreneurial ecosystem want to encourage entrepreneurial activity, they should consider previously proven frameworks when designing interventions. Consequently, we contribute to the existing literature by highlighting with evidence the importance of aligning the intervention's objectives with the pedagogy applied and its measurement.

This research has some limitations. First, the sample, context, and results are based on a private university with an excellent reputation for developing entrepreneurial activity and spirit. In this scenario, many students might be biased not about the ECH but about the university, meaning their entrepreneurial intention or entrepreneurial competencies could easily be triggered. Another limitation is a possible source of bias related to the students' teams and mentors that can be present in the sample and results; therefore, it would be desirable to control for such variables in future studies.

Future research can implement the ECH design in other academic institutions in Mexico or overseas. The richness of possible comparisons among databases could allow improvement of the ECH pedagogical approach and design, thereby increasing the impact on student's entrepreneurial intention and competencies. Further research should be conducted regarding competencies suitable for each stage of the entrepreneurship process. Another possible line of future research is analysing age and gender and their relationship with competencies and entrepreneurial intention development using our sample. Studies have been conducted about this relationship in other countries like Germany (Oehler et al., 2015) and revealed that women students were less prone to start a business at the end of their universities than men. In this vein, significant differences in students' interest in business founding were found regarding age, gender, and field of study in an Austrian sample (Schwarz et al., 2009).

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Acknowledgments

We acknowledge the support of Vice-presidency of Tecnologico de Monterrey, for covering the APC of this paper.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

## References

Ahmad, N. H., Ramayah, T., Wilson, C., and Kummerow, L. (2010). Is entrepreneurial competency and business success relationship contingent upon business environment? *Int. J. Entrep. Behav. Res.* 16, 182–203. doi: 10.1108/13552551011042780

Ahmad, N. H., Suseno, Y., Seet, P., and Susomrith, P. (2018). "Entrepreneurial competencies and firm performance in emerging economies: A study of women entrepreneurs in Malaysia entrepreneurial competencies and firm performance in emerging economies: A Study of Women Entrepreneurs in Malaysia" in *Knowledge, Learning and Innovation. Contributions to Management Science*. eds. V. Ratten, V. Braga and C. Marques (Cham: Springer), 4–26.

Ajzen, I. (1991). The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211. doi: 10.1016/0749-5978(91)90020-T

Anna, A. L., Chandler, G. N., Jansen, E., and Mero, N. P. (2000). Women business owners in traditional and non-traditional industries. *Journal of Business venturing* 15, 279–303. doi: 10.1016/S0883-9026(98)00012-3

Bagheri, A., and Pihie, Z. A. L. (2011). Competencies enabling university students to successfully lead entrepreneurial projects and activities. International Conference on Social Science and Humanity, 5, 454–458. Available at: http://www.ipedr.com/vol5/no1/97-H10008.pdf

Balan, P., Maritz, A., and Mckinlay, M. (2018). A structured method for innovating in entrepreneurship pedagogies. *Educ. Train.* 60, 819–840. doi: 10.1108/ET-05-2017-0064

Barclay, D., Higgins, C., and Thomson, R. (1995). The partial least squares (PLS) approach to causal modelling: personal computer adoption and use as an illustration. *Stud. Technol.* 2, 285–309.

Baron, R. A. (2007). Behavioural and cognitive factors in entrepreneurship: entrepreneurs as the active element in new venture creation. *Strateg. Entrep. J.* 1, 167–182. doi: 10.1002/sej

Baum, J. R., Locke, E. A., and Smith, K. E. N. G. (2001). A multidimensional model of venture growth. *Acad. Manag. J.* 44, 292–303. doi: 10.2307/3069456

Bird, B. (1995). "Toward a theory of entrepreneurial competency" in *Seminal Ideas for the Next Twenty-Five Years of Advances (Advances in Entrepreneurship, Firm Emergence and Growth, Vol. 21)*. eds. J. A. Katz and A. C. Corbet (Bingley: Emerald Publishing Limited), 51–72.

Bowden, J. A. (2004). *Competency-based learning. In Connotative learning: The Trainer's guide to learning theories and their practical application to training design*. Kendall Hunt Publishing; Dubuque, Iowa

Carmines, E. G., and Zeller, R. A. (1979). *Reliability and validity assessment*. Sage publications. Thousand Oaks, CA

Chandler, G. N., and Jansen, E. (1992). The founder's self-assessed competence and venture performance. *J. Bus. Ventur.* 7, 223–236. doi: 10.1016/0883-9026(92)90028-P

Chell, E. (2013). Review of skill and the entrepreneurial process. *Int. J. Entrepreneurial Behav. Res.* 19, 6–31. doi: 10.1108/13552551311299233

Chen, C. C., Greene, P. G., and Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *J. Bus. Ventur.* 13, 295–316. doi: 10.1016/S0883-9026(97)00029-3

Chin, W. W., Thatcher, J. B., Wright, R. T., and Steel, D. (2013). "Controlling for common method variance in PLS analysis: the measured latent marker variable approach" in *New perspectives in partial least squares and related methods* (New York: Springer), 231–239.

Clough, D. R., Fang, T. P., Vissa, B., and Wu, A. (2019). Turning lead into gold: how do entrepreneurs mobilize resources to exploit opportunities? *Acad. Manag. Ann.* 13, 240–271. doi: 10.5465/annals.2016.0132

Cope, J., and Watts, G. (2006). *Learning by doing. Nursing Standard: Official Newspaper of the Royal College of Nursing, 20*, 61. RCN Publishing: Lancashire, England

Corbett, A. C. (2005). Experiential learning within the process of opportunity identification and exploitation. *Entrep. Theory Pract.* 29, 473–491. doi: 10.1111/j.1540-6520.2005.00094.x

Davidsson, P. (2015). Entrepreneurial opportunities and the entrepreneurship nexus: A re-conceptualization. *J. Bus. Ventur.* 30, 674–695. doi: 10.1016/j.jbusvent.2015.01.002

Diamantopoulos, A., and Siguaw, J. A. (2006). Formative versus reflective indicators in organisational measure development: A comparison and empirical illustration. *Br. J. Manag.* 17, 263–282. doi: 10.1111/j.1467-8551.2006.00500.x

Dimitratos, P., Liouka, I., and Young, S. (2014). A missing operationalization: entrepreneurial competencies in multinational enterprise subsidiaries. *Long Range Plan.* 47, 64–75. doi: 10.1016/j.lrp.2013.10.004

Edwards-schachter, M., García-granero, A., Sánchez-barrioluengo, M., Quesada-pineda, H., and Amara, N. (2015). Disentangling competences: interrelationships on creativity, innovation and entrepreneurship. *Think. Skills Creat.* 16, 27–39. doi: 10.1016/j.tsc.2014.11.006

Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship Reg. Dev.* 25, 692–701. doi: 10.1080/08985626.2013.821318

Fayolle, A., and Gailly, B. (2008). From craft to science teaching models and learning processes in entrepreneurship education. *J. Eur. Ind. Train.* 32, 569–593. doi: 10.1108/03090590810899838

Fayolle, A., Gailly, B., and Lassas-Clerc, N. (2006). Assessing the impact of entrepreneurship education programmes: a new methodology. *J. Eur. Ind. Train.* 30, 701–720. doi: 10.1108/03090590610715022

Fayolle, A., and Liñán, F. (2014). The future of research on entrepreneurial intentions. *J. Bus. Res.* 67, 663–666. doi: 10.1016/j.jbusres.2013.11.024

Fitzsimmons, J. R., and Douglas, E. J. (2011). Interaction between feasibility and desirability in the formation of entrepreneurial intentions. *J. Bus. Ventur.* 26, 431–440. doi: 10.1016/j.jbusvent.2010.01.001

Fornell, C., and Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: algebra and statistics. *J. Mark. Res.* 18, 382–388. doi: 10.1177/002224378101800313

Fragoso, R., Rocha-Junior, W., and Xavier, A. (2020). Determinant factors of entrepreneurial intention among university students in Brazil and Portugal. *Journal of Small Business and Entrepreneurship*, 32, 33–57. doi: 10.1080/08276331.2018.1551459

Gedeon, S. (2014). Application of best practices in university entrepreneurship education. *Eur. J. Train. Dev.* 38, 231–253. doi: 10.1108/EJTD-05-2013-0058

Ghina, A. (2015). Building a systematic framework for entrepreneurship education. *J. Entrep. Educ.* 18, 73–99.

Godsey, M. L., and Sebora, T. C. (2010). Entrepreneur role models and high school entrepreneurship career choice: results of a field experiment. *Small Bus. Inst. J.* 5, 83–125.

Hair, J. F. Jr., Matthews, L. M., Matthews, R. L., and Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *Int. J. Multivariate Data Analysis* 1, 107–123. doi: 10.1504/IJMDA.2017.087624

Hair, J. F., Risher, J. J., Sarstedt, M., and Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* 31, 2–24. doi: 10.1108/EBR-11-2018-0203

Hatt, L. (2018). Threshold concepts in entrepreneurship – the entrepreneurs' perspective. *Education + Training* 60, 155–167. doi: 10.1108/ET-08-2017-0119

Hayton, J. C., and Kelley, D. J. (2006). A competency-based framework for promoting corporate entrepreneurship. *Hum. Resour. Manag.* 45, 407–427. doi: 10.1002/hrm.20118

Henry, C., Hill, F., and Leitch, C. (2005). Entrepreneurship education and training: can entrepreneurship be taught? Part II. *Education + Training* 47, 158–169. doi: 10.1108/00400910510592211

Hindle, K. (2007). "Teaching entrepreneurship at university: from the wrong building to the right philosophy" in *Handbook of Research in Entrepreneurship Education: A General Perspective*. ed. A. Fayolle (Cheltenham: Edward Elgar Publishing), 104–126.

Holcomb, T. R., Ireland, R. D., Holmes, R. M., and Hitt, M. A. (2009). Architecture of entrepreneurial learning: exploring the link among heuristics, knowledge, and action. *Entrep. Theory Pract.* 33, 167–192. doi: 10.1111/j.1540-6520.2008.00285.x

Izquierdo, E., Deschoolmeester, D., and Salazar, D. (2005). The importance of competencies for entrepreneurship: A view from entrepreneurs and scholars' perspective. Present at IntEnt Conference in Reino Unido, 1–13. Available at: http://www.espae.espol.edu.ec/images/documentos/publicaciones/documentos_trabajo/entrepreneurship/Importance.pdf

Jack, S. L., and Anderson, A. R. (1998). Entrepreneurship education within the condition of entreprenology. Proceedings of the Conference on Enterprise and Learning, 13–28.

Joensuu-Salo, S., Varamäki, E., and Viljamaa, A. (2015). What makes a student start a firm? Beyond intentions – what makes a student start a firm? *Education + Training* 57, 853–873. doi: 10.1108/ET-11-2014-0142

Karimi, S., Biemans, H. J. A., Lans, T., Chizari, M., and Mulder, M. (2014). Effects of role models and gender on students' entrepreneurial intentions Saeid. *Eur. J. Train. Dev.* 38, 694–727. doi: 10.1108/EJTD-03-2013-0036

Karimi, S., Biemans, H. J. A., Lans, T., Chizari, M., and Mulder, M. (2016). The impact of entrepreneurship education: A study of Iranian students' entrepreneurial intentions and opportunity identification. *J. Small Bus. Manag.* 54, 187–209. doi: 10.1111/jsbm.12137

Kolvereid, L. (1996). Prediction of employment status choice intentions. *Enterp. Theory Pract.* 21, 47–58. doi: 10.1177/104225879602100104

Kozlinska, I., Rebmann, A., and Mets, T. (2020). Entrepreneurial competencies and employment status of business graduates: the role of experiential entrepreneurship pedagogy. *J. Small Bus. Entrepreneurship*, 32, 1–38. doi: 10.1080/08276331.2020.1821159

Krueger, N. F., and Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship Reg. Dev.* 5, 315–330. doi: 10.1080/08985629300000020

Kuratko, D. F. (2005). The emergence of entrepreneurship education: development, trends, and challenges. *Entrep. Theory Pract.* 29, 577–597. doi: 10.1111/j.1540-6520.2005.00099.x

Lackéus, M. (2014). An emotion based approach to assessing entrepreneurial education. *Int. J. Manag. Educ.* 12, 374–396. doi: 10.1016/j.ijme.2014.06.005

Lanero, A., Vázquez, J. L., Gutiérrez, P., and García, M. P. (2011). The impact of entrepreneurship education in European universities: an intention-based approach analyzed in the Spanish area. *Int. Rev. Public Nonprofit Mark.* 8, 111–130. doi: 10.1007/s12208-011-0067-8

Liñán, F., and Chen, Y.-W. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrep. Theory Pract.* 33, 593–617. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6520.2009.00318.x/full

Liñán, F., and Fayolle, A. (2015). A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda. *Int. Entrep. Manag. J.* 11, 907–933. doi: 10.1007/s11365-015-0356-5

Liñán, F., Nabi, G., and Krueger, N. (2013). British and Spanish entrepreneurial intentions: A comparative study. *Revista de Economía Mundial* 33, 73–103. doi: 10.1227/01.NEU.0000297044.82035.57

Lindell, M. K., and Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *J. Appl. Psychol.* 86, 114–121. doi: 10.1037/0021-9010.86.1.114

Macosko, J. C., Johnson, A. D., and Yocum, S. M. (2009). Teaching entrepreneurship through science-oriented teams and projects: three case studies. Available at: https://econpapers.repec.org/RePEc:elg:eechap:12826_9

Man, T. W. Y., and Lau, T. (2005). The context of entrepreneurship in Hong Kong. *J. Small Bus. Enterp. Dev.* 12, 464–481. doi: 10.1108/14626000510628162

Man, T. W. Y., Lau, T., and Chan, K. F. (2002). The competitiveness of small and medium enterprises A conceptualization with focus on entrepreneurial competencies. *J. Bus. Ventur.* 17, 123–142. doi: 10.1016/S0883-9026(00)00058-6

Martin, B. C., McNally, J. J., and Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *J. Bus. Ventur.* 28, 211–224. doi: 10.1016/j.jbusvent.2012.03.002

Martínez Ávila, M., and Fierro Moreno, E. (2018). Aplicación de la técnica PLS-SEM en la gestión del conocimiento: un enfoque técnico práctico. *RIDE. Rev. Iberoam. Investig. Desarro.* 8, 130–164. doi: 10.23913/ride.v8i16.336

Mitchelmore, S., and Rowley, J. (2010). Entrepreneurial competencies: a literature review and development agenda. *Int. J. Entrepreneurial Behav. Res.* 16, 92–111. doi: 10.1108/13552551011026995

Mitchelmore, S., and Rowley, J. (2013). Entrepreneurial competencies of women entrepreneurs pursuing business growth. *J. Small Bus. Enterp. Dev.* 20, 125–142. doi: 10.1108/14626001311298448

Morris, M. H., Webb, J. W., Fu, J., and Singhal, S. (2013). A competency-based perspective on entrepreneurship education: conceptual and empirical insights. *J. Small Bus. Manag.* 51, 352–369. doi: 10.1111/jsbm.12023

Murugesan, R., and Dominic, P. D. D. (2014). Socio, economic and psychological determinants of entrepreneurial intentions: A structural equation model. *Glob. Bus. Econ. Rev.* 16, 396–415. doi: 10.1504/GBER.2014.065363

Nabi, G., Liñan, F., Krueger, N., Fayolle, A., and Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Acad. Manag. Learn. Edu.* 16, 277–299. doi: 10.5465/amle.2015.0026

Neck, H. M., and Greene, P. G. (2011). Entrepreneurship education: known worlds and new Frontiers. *J. Small Bus. Manag.* 49, 55–70. doi: 10.1111/j.1540-627X.2010.00314.x

Nunnally, J. C. (1975). Psychometric theory—25 years ago and now. *Educ. Res.* 4, 7–21. doi: 10.3102/0013189X004010007

Oehler, A., Höffer, A., and Schalkowski, H. (2015). Entrepreneurial education and knowledge: empirical evidence on a sample of German undergraduate students. *J. Technol. Transfer.* 40, 536–557. doi: 10.1007/s10961-014-9350-2

Onstenk, J. (2003). Entrepreneurship and vocational education. *Eur. Educ. Res. J.* 2, 74–89. doi: 10.2304/eerj.2003.2.1.12

Piperopoulos, P., and Dimov, D. (2015). Burst bubbles or build steam? Entrepreneurship education, entrepreneurial self-efficacy, and entrepreneurial intentions. *J. Small Bus. Manag.* 53, 970–985. doi: 10.1111/jsbm.12116

Pittaway, L., and Cope, J. (2007). Entrepreneurship education: a systematic review of the evidence. *Int. Small Bus. J.* 25, 479–510. doi: 10.1177/0266242607080656

Politis, D., Winborg, J., and Dahlstrand, A. L. (2010). Exploring the resource logic of student entrepreneurs. *Int. Small Bus. J.* 30, 659–683. doi: 10.1177/0266242610383445

Rae, D., and Carswell, M. (2001). Towards a conceptual understanding of entrepreneurial learning. *J. Small Bus. Enterp. Dev.* 8, 150–158. doi: 10.1108/EUM0000000006816

Ramsgaard, M. B., and Christensen, M. E. (2016). Interplay of entrepreneurial learning forms: a case study of experiential interplay of entrepreneurial learning forms: a case study of experiential learning settings. *Innov. Educ. Teach. Int.* 55, 55–64. doi: 10.1080/14703297.2016.1228468

Rasmussen, E., Mosey, S., and Wright, M. (2011). The evolution of entrepreneurial competencies: A longitudinal study of university spin-off venture emergence. *J. Manag. Stud.* 48, 1314–1345. doi: 10.1111/j.1467-6486.2010.00995.x

Rasmussen, E., and Sørheim, R. (2006). Action-based entrepreneurship education. *Technovation* 26, 185–194. doi: 10.1016/j.technovation.2005.06.012

Ringle, C. M., Wende, S., and Will, A. (2005). SmartPLS 2.0 (beta). Germany: University of Hamburg

Sánchez, J. C. (2011). University training for entrepreneurial competencies: its impact on intention of venture creation. *Int. Entrep. Manag. J.* 7, 239–254. doi: 10.1007/s11365-010-0156-x

Sánchez, J. C. (2013). The impact of an entrepreneurship education program on entrepreneurial competencies and intention. *J. Small Bus. Manag.* 51, 447–465. doi: 10.1111/jsbm.12025

Schwarz, E. J., Wdowiak, M. A., Almer-Jarz, D. A., and Breitenecker, R. J. (2009). The effects of attitudes and perceived environment conditions on students' entrepreneurial intent: an Austrian perspective. *Education + Training* 51, 272–291. doi: 10.1108/00400910910964566

Shane, S., and Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Acad. Manag. Rev.* 25, 217–226. doi: 10.5465/amr.2000.2791611

Shapero, A., and Sokol, L. (1982). "The social dimensions of entrepreneurship" in *Encyclopedia of entrepreneurship*, 72–90. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1497759

Silveyra, G., Herrero, Á., and Pérez, A. (2021). Model of teachable entrepreneurship competencies (M-TEC): scale development. *Int. J. Manag. Educ.* 19:100392. doi: 10.1016/j.ijme.2020.100392

Smith, A. J., Collins, L. A., and Hannon, P. D. (2006). Embedding new entrepreneurship programmes in UK higher education institutions: challenges and considerations. *Education + Training* 48, 555–567. doi: 10.1108/00400910610710001

Solomon, G. (2007). An examination of entrepreneurship education in the United States. *J. Small Bus. Enterp. Dev.* 14, 168–182. doi: 10.1108/14626000710746637

Tehseen, S., and Ramayah, T. (2015). Entrepreneurial competencies and SMEs business success: the contingent role of external integration. *Mediterr. J. Soc. Sci.* 6, 50–61. doi: 10.5901/mjss.2015.v6n1p50

Volery, T., Müller, S., Oser, F., Naepflin, C., and del Rey, N. (2013). The impact of entrepreneurship education on human Capital at Upper-Secondary Level. *J. Small Bus. Manag.* 51, 429–446. doi: 10.1111/jsbm.12020

von Graevenitz, G., Harhoff, D., and Weber, R. (2010). The effects of entrepreneurship education. *J. Econ. Behav. Organ.* 76, 90–112. doi: 10.1016/j.jebo.2010.02.015

Williams Middleton, K., and Donnellon, A. (2014). Personalizing entrepreneurial learning: A pedagogy for facilitating the know why. *Entrep. Res. J.* 4, 167–204. doi: 10.1515/erj-2013-0040

Winborg, J., and Landström, H. (2001). Financial bootstrapping in small businesses: Examining small business managers' resource acquisition behaviors. *Journal of business venturing* 16, 235–254. doi: 10.1016/S0883-9026(99)00055-5

Wu, W. W. (2009). A competency-based model for the success of an entrepreneurial start-up. *WSEAS Trans. Bus. Econ.* 6, 279–291.

Zampetakis, L. A., and Moustakis, V. (2006). Linking creativity with entrepreneurial intentions: A structural approach. *Int. Entrep. Manag. J.* 2, 413–428. doi: 10.1007/s11365-006-0006-z

# Appendix 1

Items included in the questionnaire.

| | |
|---|---|
| *Entrepreneurial Intention* | |
| I. Please indicate your agreement with the following phrases: | |
| | *1 = Completely disagree 7 = Completely agree* |
| IE01 | I plan to start a new business within 5 years of completing my studies |
| IE02 | I have already made taken some steps towards starting my own business (e.g., seeking information, discussing the idea with friends, writing a business plan) |
| IE03 | I am sure I will start my own business within 5 years of completing my studies |
| IE04 | It is one of my career goals to become an entrepreneur |
| *Opportunity identification, evaluation, and exploitation* | |
| II. Please indicate your agreement with the following phrases: | |
| | *1 = Completely disagree 7 = Completely agree* |
| Opportunity identification | |
| OPID01 | I consider myself able to identify consumer needs that have not yet been met |
| OPID02 | I consider myself able to imagine products and / or services that generate benefits for people |
| OPID03 | I consider myself able to identify products and / or services that people want |
| OPID04 | I consider myself able to take advantage of high-value business opportunities |
| Opportunity evaluation | |
| OPEV01 | I have a gut feeling for potential opportunities |
| OPEV02 | I can distinguish between profitable opportunities and not so profitable opportunities |
| OPEV03 | I have a knack for telling high-value opportunities apart from low-value opportunities |
| OPEV04 | When facing multiple opportunities, I am able to select the good ones |
| Opportunity exploitation | |
| OPEX01 | I consider myself capable of generating creative business ideas |
| OPEX02 | I consider myself capable of generating innovative products and / or services |
| OPEX03 | I consider myself able to visualise the steps to follow to implement a business idea |
| OPEX04 | I consider myself able to formulate and implement strategies to realise a business idea |
| *Resources procurement* | |
| IV. Please indicate your agreement with the following phrases: | |
| | *1 = Completely disagree 7 = Completely agree* |
| RL01 | Mobilizing resources in unusual ways |
| RL02 | Reducing your resource requirements (economize) |
| RL03 | Finding ways to actually create new resources, competences, technologies |
| RL04 | Responding to challenges and tasks by redeploying resources in different ways |

Own elaboration adapted from Liñán and Chen (2009), Chandler and Jansen (1992), Anna et al. (2000), and Morris et al. (2013).