The International Journal of Management Education 21 (2023) 100798

Contents lists available at ScienceDirect

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

# How does university-based entrepreneurship education facilitate the development of entrepreneurial Intention ? Integrating passion- and competency-based perspectives

Fei Hou [a], Ming-De Qi [b,*], Yu Su [a], Yenchun Jim Wu [c,d], Jia-Yun Tang [a]

[a] Institute of Advanced Studies in Humanities and Social Sciences, Beijing Normal University, Zhuhai, China
[b] School of Management, Guangdong University of Technology, Guangzhou, China
[c] MBA Program in Southeast Asia, National Taipei University of Education, 106, Taipei, Taiwan
[d] Graduate Institute of Global Business and Strategy, National Taiwan Normal University, 106, Taipei, Taiwan

ARTICLE INFO

*Keywords:*
University-based entrepreneurship education
Entrepreneurial passion
Entrepreneurial competencies
Entrepreneurial intention
Multilevel mediation model

ABSTRACT

The identification of the effects of university-based entrepreneurship education has attracted increasing interest in both academic and practical communities. On the basis of integrating passion- and competency-based perspectives, this study attempted to offer a sound understanding of how university-based entrepreneurship education influences the entrepreneurial intention of university students. Based on a dataset of 1050 university students from 50 universities in the Guangdong-Hong Kong-Macao Greater Bay Area in China, a hierarchical linear modeling analysis was performed, and the results support our hypotheses. Our research provides the first empirical evidence illustrating how, in the organizational context, university-based entrepreneurship education facilitates the shaping of future entrepreneurs from dual perspectives. The implications of our findings were discussed.

## 1. Introduction

As the economy moves from a focus on management to a focus on entrepreneurship (Thurik & Wennekers, 2004), both business management and entrepreneurship development become equally important. In particular, entrepreneurship has been considered to serve as a major vehicle in promoting competitiveness and innovation (Alrawadieh et al., 2019; Booth et al., 2020; Horng et al., 2020). In this respect, entrepreneurship education (EE) has been substantially invested in worldwide, with the aim of promoting entrepreneurial intention (EI) and entrepreneurial activities. Furthermore, EE has been considered to be at the essential part of education policy in any nations, through a series of influential reports, such as European Commission (2006). Thus, in recent decades, tremendous progress has been made in terms of entrepreneurship and EE (Sánchez, 2013).

In addition, considered critical institutions, universities offer various inspirational training and learning resources to facilitate entrepreneurship (Souitaris et al., 2007; Walter et al., 2013). As entrepreneurship training courses and programs have grown drastically in recent years, scholarly interest has increased regarding the outcomes of EE (Dickson et al., 2008; Walter & Block, 2016).

According to the psychology literature, due to the fact that behavior is difficult to observe or relates to unexpected time lags, the

* Corresponding author. School of Management, Guangdong University of Technology, Guangzhou, 510520, China.
*E-mail addresses:* houfei@bnuz.edu.cn (F. Hou), qmingde@163.com (M.-D. Qi), suyu@bnuz.edu.cn (Y. Su), wuyenchun@gmail.com (Y.J. Wu), tangjiayun6868@126.com (J.-Y. Tang).

https://doi.org/10.1016/j.ijme.2023.100798
Received 11 November 2021; Received in revised form 12 February 2022; Accepted 7 March 2023
Available online 20 March 2023

best precedent of planned behavior is intention. As such, entrepreneurial behavior is a typical planned behavior (Krueger & Brazeal, 1994); consequently, scholars have developed considerable interest in the research subject of EI (Alrawadieh et al., 2019; Kolvereid, 1996; Pham et al., 2021; Souitaris et al., 2007; Walter et al., 2013). Along this reasoning, EI seems to play dominant part in the set of variables that are employed to evaluate the effectiveness of EE programs (Martínez-Gregorio et al., 2021).

Although the benefits of EE have been established, researches on the implications of EE remain divided (Bae et al., 2014; Longva & Foss, 2018; Martínez-Gregorio et al., 2021). Most researches have revealed that the EE-EI linkage is positive (i.e., Kautonen et al., 2015; Rauch & Hulsink, 2015; Sánchez, 2013; Souitaris et al., 2007; Walter et al., 2013; Westhead & Solesvik, 2016). In contrast, other studies have suggested that there is also evidence of a negative one (i.e., Oosterbeek et al., 2010; von Graevenitz et al., 2010), or non-significant (i.e., Huber et al., 2014; Varamäki et al., 2015). Accordingly, the extant EE literature shows that research regarding how to design and improve effective EE programs is still scarce (Edelman et al., 2008; Gielnik et al., 2017). These mixed findings indicate that the effectiveness of EE should be further explored from different perspectives.

In explaining how EE influences subsequent EI, most prior empirical studies have been limited to students' perceived EE at the individual level. Conversely, other streams of research have examined the factors impacting EI and entrepreneurial interest at the organizational level, including organizational norms (Louis et al., 1989), university quality (Di Gregorio & Shane, 2003), and EE (Souitaris et al., 2007; Walter et al., 2013).

As behavior researchers have indicated, attitudes and intentions are ultimately determined by both intrinsic-individual and extrinsic-contextual variables (Ajzen, 1991; Bonesso et al., 2018; Schlaegel & Koenig, 2014). However, the extant research, considering university-based EE as a situational variable in explaining the entrepreneurship development of students and graduates, is still limited. Thus, this study attempts to position EE as an exogenous influencing factor and empirically test its impacts on EI.

In addition, novel ways for assessing the effects of university-based EE are limited. EE literature shows that EE's effects through emotion- or transition-based indicators have been largely ignored. In particular, scholars have found that passion can fuel entrepreneurs in persistently working hard and in a dedicated manner to realize business ideas (Cardon et al., 2009). Accordingly, entrepreneurial passion (EP) has been regarded in the literature as an essential motivational driver toward entrepreneurship (Cardon et al., 2009; Gielnik et al., 2017). However, EE's effects on the development of EP are strikingly absent in existing studies (Nabi et al., 2017). Although the significance of passion as a benefit of EE programs, it remains an underexplored domain and, thus, warrants further research attention. Furthermore, the consideration of the role played by EP as a mediator in the EE-EI link is also absent from the extant research examining the effects of EE. Hence, this study further explores the emotion-based mechanism through which EE programs facilitate the development of EI in university students.

Despite the widespread use of EE in higher education (Weaver et al., 2010), little scholarly attention has been paid to the effect of EE programs on entrepreneurial competencies (EC) (Sánchez, 2013). In particular, the impact of EE on the development of EC not only concerning with creating businesses but also enhance recognition of business opportunities in increasingly changing globalized context has been a substantial academic issue (Martins et al., 2022; Nabi et al., 2018; Sherkat & Chenari, 2022; Souitaris et al., 2007; Zhang et al., 2014). Nevertheless, considering the significance of EC, research in this domain is still in the initial phase (Brinckmann, 2008), partly since scholars have defined EC from different perspectives and, consequently, have obtained mixed results. Thus, studies on the relationship between EE and EC are lacking in terms of high-quality quantitative research. Additionally, recent research has indicated that the links among EE, EC, and EI also need to be investigated in depth (Sánchez, 2013). This study fills this gap by considering and examining competency-based mechanisms to identify the EC's mediating role in the EE-EI linkage.

To fill the abovementioned research gap, drawing from the theory of human capital, entrepreneurial emotion, and organizational norms, this study attempts to theoretically and empirically explore the cross-level EE-EI link based on a survey dataset of 1050 students from 50 universities, by applying a hierarchical linear modeling (HLM) approach. In the analysis, a multilevel mediation model is employed to draw stronger conclusions with regard to the cross-level impacts of EE programs. The study design aids in uncovering both the passion- and competency-based mechanisms through which EE programs boost the development of EI.

This study makes contribution to the EE literature as followings. First, given that prior EE research has mainly based on the

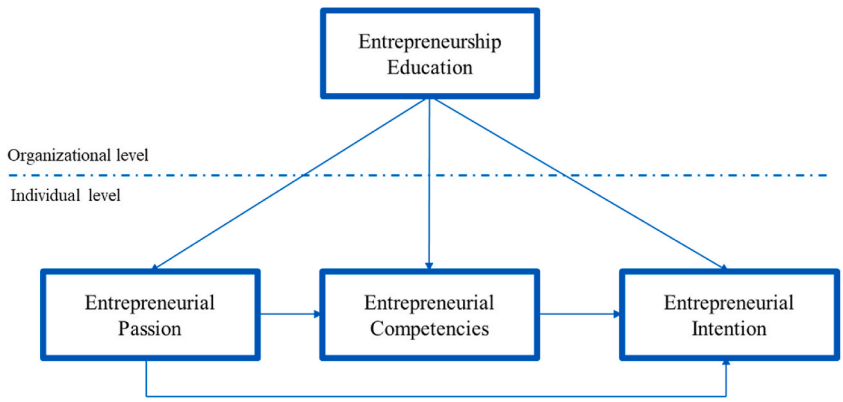


**Fig. 1.** A multilevel research framework.

individual-level, this study expands this perspective by considering EE as an organizational-level factor and explores its cross-level effects on individual-level EE program-derived benefits. As such, this approach can help in explaining the controversial results of prior research (Walter et al., 2013). Second, this study attempts to provide novel ways of assessing the effects of university-based EE and to identify the underlying mechanisms to uncover how EE fosters the development of future entrepreneurs. Prior studies have failed to consider the perspectives of EP or EC in terms of the processes through which EE programs generate outcomes. Therefore, linking the passion- and competency-based perspectives is important for examining the mechanisms through which EE programs exert an influence on EI. Accordingly, the current study responds to the calls of Souitaris et al. (2007) and Nabi et al. (2017) by providing the first empirical evidence to warrant this hypothesis from dual perspectives, thus adding to this stream of research. Third, our findings can also help policy makers and EE university educators benchmark educational outcomes and design effective stimulating initiatives to improve EE programs. The proposed theoretical multilevel model is presented in Fig. 1.

## 2. Theoretical background and hypotheses

There are two categories of arguments to explain why individuals identify, assess, and exploit entrepreneurship-related opportunities. Compared with individual-level arguments (i.e., achievement-oriented, risk-tolerant, and independence-seeking arguments), organizational-level arguments have noted that the characteristics of a university (i.e., university policies, university culture) are related to entrepreneur behavior (Shane, 2004). In particular, entrepreneurship researchers have noted that university EE programs has exerted a positive effect on students' EI (Souitaris et al., 2007).

The controversy concerning the inconsistent results of previous individual-level studies can be explained and solved in part through a cross-level approach (Walter et al., 2013). According to Hoegl et al. (2003), key team-level properties can have more effects on intrateam members than on extrateam members. In this sense, regardless of individual preferences, the contextual effect is present when team-level properties make team members become more assimilated in socialized ways. Following this contextual effect approach, universities with pro-entrepreneurship characteristics create norms in terms of entrepreneurship value and are more likely conducive to student entrepreneurship (Walter et al., 2013). In this vein, this study argues that EE, as an organization-level factor, can create a contextual situation that affects individual-level EE program-derived benefits.

Compared with prior research on student entrepreneurship that used pretest-posttest designs, the scope of our research can complement and expand this valuable research domain, as this study adopts a cross-level approach to accurately assess the impact of EE, as an organizational aspect, on individual-level EE program-derived benefits. Based on these reasonings, this study explores how EE, as an organizational characteristic, accounts for the between-group variance in the EE program-derived benefits of participants and how these benefits increase EI.

### *2.1. Entrepreneurship education and entrepreneurial intention*

EE refers to the scope of special courses that are mainly aimed at qualifying students for entrepreneurship-related activities. Although recent studies have shown that EE can yield a variety of entrepreneurial results (Mojab et al., 2011; Sánchez, 2013), whether entrepreneurship can be taught or trained is still an inconsistent dispute (Aronsson, 2004; Walter et al., 2013).

Henry et al. (2005) noted that education and training can develop or enhance some elements associated with entrepreneurship, which can transfer entrepreneurship-related human capital and thus enhance business opportunity identification (Ucbasaran et al., 2008). Entrepreneurship courses and training offer methods and techniques, including business planning and market analysis, that can help identify valuable and profitable business ideas. Moreover, EE can also transfer entrepreneurship-specific human capital, which enhances the potential outcomes by exploiting opportunities. Participants in entrepreneurship courses can learn about the transition from business ideas to market, such as courses including strategies for market penetration, resource acquisition, and the organization and management of ventures. In this respect, researchers have denoted that entrepreneurship-specific human capital has a positive effect on entrepreneurial self-efficacy (Zhao et al., 2005) and business performance (Bosma et al., 2004).

In particular, the conception of EE program is broader than a course, meaning that it is a portfolio of entrepreneurship-related courses and activities (Souitaris et al., 2007). Following Souitaris et al.'s (2007) study, a 'good practice' balanced EE program consists of four components: (1) a 'taught' component, including entrepreneurial courses and lectures; (2) a 'business-planning' component, including development of business idea and competition of business plan; (3) an 'interaction with practice' component, including interacting with real entrepreneurs and networking events; and (4) a 'organization support' component, including market research supporting, a pool of technology supporting, as well as seed funding for student teams.

In this sense, from the perspective of organizational norms, an EE program can construct entrepreneurship-specific organizational norms that indicate that entrepreneurship is socially desirable. Consequently, these pro-entrepreneurship norms can enhance organizational members' perception of entrepreneurship as a legitimate alternative career choice and amplify occupational preferences to run business. Indeed, prior researches have indicated that perceived social desirability is positively associated with EI (Kolvereid, 1996; Peterman & Kennedy, 2003).

Accordingly, this study predicts:

**Hypothesis 1**. University-based entrepreneurship education is positively associated with entrepreneurial intention.

### 2.2. Entrepreneurship education and entrepreneurial passion

Meta-analytic studies have indicated that EE programs can enhance cognitive and motivational outcomes, leading to more startups (Martin et al., 2013). Scholars recognize that the aim of EE is to encourage, stimulate and arouse the emotions of university students toward entrepreneurship (Zhang et al., 2020). In reviewing literature on the domain of entrepreneurship, EP has been considered a key motivational factor driving entrepreneurship (Cardon et al., 2009; Gielnik et al., 2017).

In light of Cardon et al. (2009), entrepreneurs could be persistently fueled by passion to work hard with dedication to realize business ideas. Accordingly, in this study, EP is employed as an indicator to reflect students' motivation toward entrepreneurship. In this sense, to evaluate the effectiveness of EE programs, we must know not only how much students learn about entrepreneurship or to what the extant they are satisfied with the programs or training but also whether they are affected in terms of EP toward entrepreneurship due to these programs.

This argument is supported by a recent empirical evidence. Wang et al. (2019) noted that EE courses have higher effectiveness in the attitude or emotion domain than in the skills or knowledge domain. This result was not beyond expectations since EE courses were initially designed to promote the accumulation of professional knowledge and skills associated with the process of entrepreneurship. During this unique learning process of EE courses, students have more opportunities for face-to-face interactions with invited lecturers and entrepreneurs to share their knowledge and experiences of real entrepreneurial dynamics and exchange ideas; thus, students are continuously motivated and encouraged to enter the entrepreneurial process. In this sense, EE courses convey more effects on the entrepreneurship-related attitude domain than on the knowledge or skills domain.

The expertise literature has shown that extended and intensive training with deliberate practice can constantly be associated with high-level performance in a variety of fields (Ericsson et al., 1993). For the field of entrepreneurship, specific training with deliberate practice can lead to mastery and performance (Baron & Henry, 2010; Keith et al., 2016). Training and deliberate practice involve engagement in activities, and as a result, performance is improved and the development of EP can be facilitated (Mageau et al., 2009). Positive feelings about EP can be generated through engaging in entrepreneurship-related activities (Gielnik, Spitzmuller, et al., 2015). In addition, following control and self-regulation theories, the positive emotions that are characteristic of EP can be experienced through progress and goal accomplishment (Locke & Latham, 2002). Mageau et al. (2009) argued that individuals can likely experience some kind of achievement through spending time and effort on activities, which leads to higher EP. In the training modules of EE programs, participants can have opportunities to experience the entrepreneurial process and engage in entrepreneurship, which can aid them in developing passion toward entrepreneurship.

In particular, from the perspective of organizational norms, entrepreneurship-specific organizational norms generated by EE programs can make EP socially desirable. The effects of organizational norms occur because organizational members are inclined to communicate and interact with each other and be infected by EP properties at the organizational-level. Via the intra-organization interaction, prescinding from individual preferences, organizational members might be influenced by the "emotional contagion" (Cherulnik et al., 2001). Extending this logic, EE programs produce pro-entrepreneurship norms, which can increase organizational members' EP.

Accordingly, this study predicts:

**Hypothesis 2**. University-based entrepreneurship education is positively associated with entrepreneurial passion.

### 2.3. Entrepreneurship education and entrepreneurial competencies

#### 2.3.1. Entrepreneurial competencies defined from the opportunity perspective

Despite their supposed importance, EC have been defined from various perspectives, which has produced different outcomes. In the existing research on EC, scholars have mainly defined entrepreneurship-related competencies from four perspectives, including entrepreneur characteristics, management, relationship, and opportunity. Specifically, in view of trait theorists, the EC of entrepreneurs have been regarded as personal characteristics (Thompson, 2004). From the management perspective, the literature has defined EC as the capabilities of business operation and management, including commitment capability, strategic capability and organizational capability (Man et al., 2002). From the perspective of relationships, scholars consider EC important capabilities that closely link the internal and external factors of enterprises (Rasmussen & Nielsen, 2004). Based on the opportunity perspective, EC can be defined as the abilities of entrepreneurs to discover, identify and utilize opportunities (Muzychenko, 2008; Rasmussen et al., 2011; Shane & Venkataraman, 2000; Zahra et al., 2011).

In reviewing the four perspectives of EC, this study has taken the opportunity perspective to explore the EE-EC link. The reason for this approach is as follows: EE emphasizes business entry (Kuratko, 2005), whereas business management education focuses on the operation of ongoing business (Gartner & Vesper, 1994). In the case of business management education programs, students are trained to obtain professional knowledge and skills that will form their competencies related to business operations, but they may fail to learn to the steps involved in starting a venture, such as opportunity identification and exploitation, which will help develop their intention to run their own business.

Additionally, Chandler and Jansen (1992) suggested that the capability to recognize entrepreneurial opportunities is at the core of EC, which are essential for successful entrepreneurial action. In the entrepreneurship process, entrepreneurs should play two roles: first, they should perceive changes in the environment and identify opportunities with potential value; second, they should effectively manage and allocate the internal and external resources of the enterprise to make use of opportunities (Chandler & Hanks, 1994; Shane et al., 2010). In this sense, this study defines EC in two dimensions: opportunity identification and opportunity exploitation.

Furthermore, after reviewing the recent literature, we have found limited empirical research concerning the assessment of EE effects in terms of competency-based indicators. For example, Sánchez (2013) examined the EE-EC linkage and defined EC based on specific personal traits (i.e., self-efficacy, proactivity, and risk taking). Lackéus (2015) and Wang et al. (2019) investigated the influence of EE on EC and defined EC as the knowledge, skills, and attitudes held by organizational members. Sánchez (2013) noted that in most competency models, these trait-based competencies are not exclusive. Other competency models, such as those related to knowledge, skills, and abilities, might also be important (Oosterbeek et al., 2010). Specifically, knowledge competencies involve having accessibility to special information and experience; skill competencies may entail technical skills; and ability competencies are associated with the cognitive capacity to identify opportunities.

As such, despite EC being important benefits of EE programs, the EE-EC linkage remains an underexplored phenomenon and, thus, warrants further research attention. Therefore, this study focuses on specific EC from an opportunity perspective and explores their relation with EE.

#### *2.3.2. The effect of entrepreneurship education on entrepreneurial competencies*

Defined in terms of a cluster of related knowledge, skills, traits, and attitudes, competencies are correlated to job performance and could be enhanced through training (Parry, 1998). EC are not innate personality characteristics and can be taught and improved upon through EE programs (Sánchez, 2013). Bird (1995) claimed that individuals' characteristics are fixed and defined them as inaccessible, while claiming that entrepreneurship-related competencies are learnable. Specifically, education, work experience, and entrepreneurial experience are factors that can improve EC (Bird, 1995). Specialized courses or training in EE programs can furnish individuals with the knowledge and skills about how to startup a venture and thus can increase their confidence, which is necessary when creating a venture and improving the perceived feasibility of entrepreneurship. In addition, EE programs not only demonstrate the socially acceptable and rewarding perceptions of entrepreneurial activity but also improve the perceived desirability of entrepreneurship.

As previously mentioned, from the perspective of organizational norms, the entrepreneurship-specific organizational norms generated through EE programs can make entrepreneurship-related competencies socially desirable. Through intraorganizational interactions, organizational members are more likely to be influenced by organizational norms to learn from one another and enhance their competencies. Following this logic, EE programs produce pro-entrepreneurship norms, which can raise members' entrepreneurship-related competencies.

Accordingly, this study predicts:

**Hypothesis 3**. University-based entrepreneurship education is positively associated with entrepreneurial competencies.

### *2.4. The mediation effect of entrepreneurial passion on the cross-level relationship between entrepreneurship education and entrepreneurial intention*

Following Vallerand et al.'s (2003) theory, passion is a source of energy that could trigger individuals to devote themselves to an activity and attain improved performance. Indeed, scholars have demonstrated that passion leads individuals to extended participation in activities and is conducive to goal achievement and performance (Mageau et al., 2009).

On the one hand, scholars have argued that passion can lead to experience flow and positive affect pre- and post-task engagement (Mageau et al., 2009; Vallerand et al., 2003). Thus, the experiencing of positive affect can facilitate active efforts in activities as well as higher goal setting and goal commitment (Seo et al., 2004). Thus, the predictive validity of passion lies in the fact that valued activities and the attached positive affect will be internalized inch by inch and gradually construct part of individual identity. Consequently, individuals form a center feature of identity by developing a certain passion, which is essential in that the more central an activity is to an individual's identity, the stronger his/her emotional experience evoked by a given activity engagement. Thus, passion has more impact on individual attitudes about particular activities. In the case of this study, engagement in entrepreneurship-simulated tasks in EE programs and training can allow participants to experience positive affect and thus drive them to devote themselves to entrepreneurship-related tasks, which will benefit their perception of entrepreneurship.

On the other hand, Baron (2008) noted that passion is positively associated with entrepreneurial processes. For instance, passion can enhance individuals' creativity by enabling them to conflate and integrate divergent concepts and implement experiments with original ideas (Liu et al., 2011), while the new business creation process involves various creative tasks (Gielnik et al., 2017). Indeed, some empirical evidences show that passion can drive success in entrepreneurship (Cardon & Kirk, 2015).

Consequently, higher EP can facilitate the likelihood of an individual having the intention to create new ventures. Taking together, this study predicts:

**Hypothesis 4**. Entrepreneurial passion mediates the cross-level relationship between entrepreneurship education and entrepreneurial intention.

### *2.5. The mediation effect of entrepreneurial competencies on the cross-level relationship between entrepreneurship education and entrepreneurial intention*

The theory of planned behavior (TPB) (Ajzen, 1991) and the theory of social learning and self-efficacy (Bandura, 1997) are the most influential principal theoretical foundations in guiding the research on EI. Further, many other variables are hypothesized to be predictors of EI. Most scholars have argued that EI is determined by both individual factors (e.g., psychological constructs) and situational factors (e.g., political and economic factors) (Lee & Wong, 2004).

Within the psychological constructs, personality traits have been most frequently explored in relation to EI. Compared to broad personality traits, specific traits can be more closely associated with the activities and entrepreneurship-related tasks. These specific traits can be labeled competencies, which can be conceptualized as personal characteristics encompassing traits, skills, and knowledge (Sánchez, 2013). Other studies have focused on behavior reflecting EC from the perspective of processes (e.g., Mitton, 1989). EC have been explored from viewpoint of the supposed relationship between competencies and the creation and development of a venture.

However, exploration in the field of EC is in its early phase (Brinckmann, 2008) because EC have been defined in terms of various views and, accordingly, have led to different outcomes. As previously mentioned, among the various research perspectives of EC, the present study adopts the opportunity approach. This approach focuses on competencies to recognize and exploit the business opportunities included in the EE and training program for potential entrepreneurs.

Scholars have argued that EC can be considered predictors of business success, which affect the inclination and ability of organizational members to perform entrepreneurship-related tasks (Sánchez, 2013). According to human capital theory (Mincer, 1958), education and training have exerted a significant impact on human capital assets. Therefore, individuals will achieve better results when they have access to higher levels of knowledge, skills, and other competencies.

Through EE programs, students could acquire entrepreneurial knowledge associated with business skills, social networks and product availability. The acquisition and transformation of this knowledge can help them better identify business opportunities (Politis, 2005). At the same time, Rae and Carswell (2001) found that by observing and rethinking the success and failure behaviors of other entrepreneurs, potential entrepreneurs can improve their capability to make use of opportunities and solve the problems they may encounter in the operation and management of new ventures.

Thus, it has been shown that EE programs can enhance students' perceived feasibility of entrepreneurship by amplifying their entrepreneurship-related knowledge and improving their EC. As a result, students can become more confident and successful in tasks about opportunity identification compared with those not taking EE or training programs, which leads to improve the EI in the former.

Taking together, this study argues that EE can enhance or amplify these entrepreneurship-related competencies, which, in turn, leads individuals to enhance EI. In this regard, EC thus work as enrichment mechanisms through which EE increases EI. Accordingly, this study predicts:

**Hypothesis 5**. Entrepreneurial competencies mediate the cross-level relationship between entrepreneurship education and entrepreneurial intention.

Furthermore, Souitaris et al. (2007) noted that the emotional preference of people toward entrepreneurship and the particular opportunities that may have an effect on their decisions of whether to exploit opportunities for entrepreneurship should be considered in the context of bolstering with special EE programs. According to Vallerand et al. (2003) and Cardon et al. (2009), EP with a motivational function has positive impacts on performance. Cardon et al. (2009) demonstrated that entrepreneurs experience EP through various entrepreneurial activities; as a result, this EP is the source of energy leading to success in opportunity identification and business creation.

In addition, passion is more likely associated with acting on opportunities (Klaukien et al., 2013). The tasks performed during EE programs and training (i.e., simulation tasks to set up a new business) can generate EP. Training participants perform tasks resembling real entrepreneurial conditions, which facilitates their experiencing of positive affect. Thus, experiencing emotions can lead to active efforts in entrepreneurship-related activities, such as setting and achieving goals and identifying opportunities. In this vein, the experiencing of flow and positive affect can positively affect EC.

Accordingly, this study predicts:

**Hypothesis 6**. Entrepreneurial competencies mediate the cross-level relationship between entrepreneurial passion and entrepreneurial intention.

**Hypothesis 7**. Entrepreneurial passion and entrepreneurial competencies sequentially mediate the cross-level relationship between entrepreneurship education and entrepreneurial intention.

## 3. Methods

### *3.1. Research context*

Currently, Chinese universities are attempting to furnish student communities with favorable university policies and an adequate entrepreneurial climate to explore, assess and exploit the knowledge and opportunities that can facilitate the transformation process of new businesses. Aligning with reason, we must examine how university-based EE affects students' intention to engage in entrepreneurship in a specific university context.

This study tries to obtain empirical evidence regarding the influence of EE on EI through the use of a quantitative approach. The research data were obtained by questionnaires, which were distributed to university students in the Guangdong-Hong Kong-Macao GBA in China. Student participants who had taken some kind of entrepreneurship course were invited to complete the survey.

Regarding the privacy of research participants, the surveys of this study were anonymous. Further, the voluntary and confidentiality of the data collection implementation were assured by participants in advance. Per applicable institutional and national guidelines, no additional consent approval was required.

### 3.2. Sample selection

Universities in the Guangdong-Hong Kong-Macao GBA in China provide the setting for our study. The GBA is composed of Hong Kong and Macao Special Administrative Regions and 9 Pearl River Delta cities in Guangdong Province, including Guangzhou, Shenzhen, Zhuhai, etc. This region is one with the highest degree of openness and the strongest economic vitality in China and plays an important role in the overall strategic position in terms of national development. Recently, there has been an influx of entrepreneurs, who have been attracted by the GBA. As such, these entrepreneurs and their entrepreneurial activities have effectively facilitated the rapid economic and social development of the GBA.

As such, the GBA has a stronger entrepreneurial climate and a variety of entrepreneurial practices than do other areas in China, resulting in stronger impacts on university students in this region. In particular, university-based EE has been paid more attention in this region. Abundant entrepreneurship-related education courses and practical programs have been designed and offered by universities. A variety of entrepreneurship-related activities consist of the raising of perception for entrepreneurship as an alternative to traditional careers and the supporting of startup venture projects. In addition, considering lots of universities and EE programs in the region, a sophisticated quantitative survey was conducted.

Therefore, the GBA is an ideal survey area for examining how university-based EE affects university students. This survey was implemented in universities in the GBA in China through both offline- and online-based questionnaires.

### 3.3. Procedures

Based on nested data (e.g., students nested within universities), this study attempted to explore the impact of organizational-level EE on individual-level EI via a multilevel approach. Hierarchical linear modeling (HLM) has been employed to deal with nested data and to conduct cross-level analysis (Raudenbush & Bryk, 2002). A random sample of 50 universities was drawn from a survey population of universities in the GBA in China to ensure sufficient research representativeness of and variability in survey data, sample universities including Sun Yat-sen University; Shenzhen University; Beijing Normal University, zhuhai; University of Hong Kong; City University of Hong Kong; University of Macau; etc. In terms of HLM approach, each sample university has about 15–25 participants. Additionally, this study focused on students majored in the business management, and science and technology, because these fields have relatively high startup potential (i.e., Autio et al., 1997; Boubker et al., 2021; Walter et al., 2013).

Trained interviewers conducted the surveys to obtain individual-level data from students who generally had experience with some kinds of lectures or programs related to entrepreneurship. A total of 1050 valid questionnaires from 1870 respondents were collected, giving a response rate of 56.15%. Our final sample included 682 male and 368 female students. Respondents consisted of all types of university students; undergraduate students accounted for 86%, postgraduate students accounted for 14%, business management students accounted for 40%, science and technology students accounted for 24%, literature and law students accounted for 30%, and pharmaceutical students accounted for 6% of the total sample. Among the subjects, 80% had no prior related entrepreneurial experience, and 20% had some experience with entrepreneurship. Due to there being approximately one year on average until the next career decision for responding students, a high validity of self-assessment EI was assumed to be a precedent of actual behavior (Ajzen, 1991).

### 3.4. Measures

The constructs of the proposed model were measured on a 5-point Likert scale, with 1 representing strongly disagree to 5 representing strongly agree, the extent to which participants agreed with each item based on their experiences during the survey.

#### 3.4.1. Entrepreneurship education

To assess EE, the 10-item self-assessment scale adopted by Franke and Lüthje (2004) was applied to analyze students' perceived EE environment. The measure was designed to assess the atmosphere of EE, psychological quality of education and curriculum and activity development. A sample item was as follows: "My university has a strong cultural atmosphere of innovation and entrepreneurship."

The results from a multilevel random-intercept model indicated that the mean $R_{wg(j)}$ of EE was 0.908 (SD = 0.166), suggesting sufficient within-group agreement to warrant group-level aggregation (LeBreton & Senter, 2008). Thus, individual perceived EE ratings could be aggregated to the high level to formulate EE, modeled as a organizational-level variable.

In addition, according to Geldhof et al. (2014), Cronbach's alpha at both within- and between-organizational levels for EE was assessed by applying multilevel confirmatory factor analysis (MCFA). Based on the MCFA approach, the parameters of measurement model at the within- and between- organizational levels were specifically decomposed to impede conflation in the estimates of reliability at both levels. The MCFA results showed that Cronbach's alpha at the between- organizational level was 0.965, suggesting that EE was reliable at the organizational level; Cronbach's alpha at the within- organizational level was 0.888, indicating that EE was reliable at the individual level.

#### 3.4.2. Entrepreneurial passion

An 8-item self-assessment scale was used to measure students' perceived EP, which was originally developed by Cardon et al. (2012). A sample item was as follows: "It's exciting to find solutions to unmet market demands and commercialize them." Moreover, based on MCFA (Geldhof et al., 2014), Cronbach's alpha at the between-organizational level was 0.943 and Cronbach's alpha at the

within- organizational level was 0.889, indicating that the measure was reliable at both levels.

### 3.4.3. Entrepreneurial competencies

The 7-item self-assessment scale adopted by Chandler and Hanks (1994) was applied to assess EC. The scale composes two dimensions: opportunity identification and opportunity exploitation. A sample item was as follows: "My qualification has provided me with sufficient confidence to accurately perceive unmet customer needs." Moreover, Cronbach's alpha at the between-organizational level was 0.985 and Cronbach's alpha at the within- organizational level was 0.925, indicating that the measure was reliable at both levels.

### 3.4.4. Entrepreneurial intention

This study concentrated on EI because intention is more measurable without unpredictable time lag and potential survival bias, an ex post rationalization of respondents. Thus, EI can directly assess the impacts of EE when considered an organizational-level factor (Walter et al., 2013). To assess EI, a 4-item self-assessment scale adopted from Kuckertz and Wagner (2010) was applied to assess the degree to which respondents are inclined to create a venture in the near future. A sample item was as follows: "I am determined to create a firm in the future." Moreover, Cronbach's alpha at the between-organizational level was 0.920 and Cronbach's alpha at the within- organizational level was 0.887, indicating that the measure was reliable at both levels.

### 3.4.5. Control variables

Following recent EI studies, control variables were included in the regressions to isolate the impact of the independent variables. According to recent studies at the intersection of gender and entrepreneurship, entrepreneurship is considered a masculine field (Wu et al., 2019). The payoffs from entrepreneurship can be enhanced by investments in human capital (Unger et al., 2011). Thus, respondents' education levels (grades) and majors were controlled in the study. In addition, respondents with more entrepreneurship-related experience or work experience might engage in entrepreneurship-related activities (Kautonen et al., 2015). Following the suggestion by Walter et al. (2013), individual-level influences, such as the need for achievement and entrepreneurial role models, can affect EI.

Therefore, gender, education level, major, entrepreneurial experience, need for achievement, and entrepreneurial role models were adopted as controlling variables.

## 3.5. Analytical strategy

This study attempts to explore the effect of between-level variables on within-level outcomes by employing nested data (students

**Table 1**
Overall reliability of the constructs and factor loadings of the indicators.

| Construct (source) | Items | Factor loading | SMCs | Cronbach' alpha | CR | AVE |
|---|---|---|---|---|---|---|
| **Entrepreneurship Education** | EE1 | 0.875 | 0.766 | 0.950 | 0.957 | 0.690 |
| Franke& Liitlije (2004). | EE2 | 0.848 | 0.719 | | | |
| | EE3 | 0.840 | 0.706 | | | |
| | EE4 | 0.838 | 0.702 | | | |
| | EE5 | 0.836 | 0.699 | | | |
| | EE6 | 0.826 | 0.682 | | | |
| | EE7 | 0.825 | 0.681 | | | |
| | EE8 | 0.822 | 0.676 | | | |
| | EE9 | 0.800 | 0.640 | | | |
| | EE10 | 0.796 | 0.634 | | | |
| **Entrepreneurial Passion** | EP1 | 0.864 | 0.746 | 0.936 | 0.947 | 0.691 |
| Cardon et al. (2013) | EP2 | 0.855 | 0.731 | | | |
| | EP3 | 0.851 | 0.724 | | | |
| | EP4 | 0.831 | 0.691 | | | |
| | EP5 | 0.827 | 0.684 | | | |
| | EP6 | 0.822 | 0.676 | | | |
| | EP7 | 0.810 | 0.656 | | | |
| | EP8 | 0.786 | 0.618 | | | |
| **Entrepreneurial Competencies** | EC1 | 0.870 | 0.757 | 0.934 | 0.945 | 0.708 |
| Chandler and Hanks (1994) | EC2 | 0.864 | 0.746 | | | |
| | EC3 | 0.855 | 0.731 | | | |
| | EC4 | 0.853 | 0.728 | | | |
| | EC5 | 0.845 | 0.714 | | | |
| | EC6 | 0.820 | 0.672 | | | |
| | EC7 | 0.780 | 0.608 | | | |
| **Entrepreneurial Intention** | EI1 | 0.908 | 0.824 | 0.889 | 0.924 | 0.752 |
| Kuckertz and Wagner (2010) | EI2 | 0.881 | 0.776 | | | |
| | EI3 | 0.874 | 0.764 | | | |
| | EI4 | 0.803 | 0.645 | | | |

Notes: SMCs = Square multiple correlations, CR = Composite reliability, AVE = Average variance extracted.

**Table 2**
Correlation matrix of the main variables and discriminant validity by the Fornell–Larcker criterion.

| Construct | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Gender | 1.36 | 0.48 | 1 | | | | | | | | | |
| 2. Education | 2.39 | 1.29 | −0.010 | 1 | | | | | | | | |
| 3. Major | 2.57 | 1.15 | 0.319** | 0.020 | 1 | | | | | | | |
| 4. EN-Experience | 1.20 | 0.40 | 0.164** | 0.077 | 0.017 | 1 | | | | | | |
| 5. NA | 3.29 | 0.76 | 0.062 | −0.020 | −0.020 | 0.185** | 1 | | | | | |
| 6. RMP | 2.52 | 0.77 | 0.085 | −0.032 | 0.039 | 0.197** | 0.103* | 1 | | | | |
| 7. EE | 3.48 | 0.78 | −0.018 | −0.072 | 0.089 | 0.161** | 0.006 | 0.039 | **0.871** | | | |
| 8. EP | 3.56 | 0.79 | 0.140* | 0.084 | 0.085 | 0.184** | 0.176*** | 0.125** | 0.523** | **0.870** | | |
| 9. EC | 3.42 | 0.69 | 0.147** | −0.029 | 0.037 | 0.221** | 0.106*** | 0.093* | 0.594** | 0.609** | **0.909** | |
| 10. EI | 3.24 | 0.89 | 0.174** | 0.020 | 0.076 | 0.200** | 0.128*** | 0.088* | 0.383** | 0.666** | 0.586** | **0.867** |

Notes.
*p < 0.05; **p < 0.01; ***p < 0.001.
The square roots of AVE (the bold numbers) for discriminant validity are in parentheses along the diagonal.
Gender: 1 = female (35%), 2 = male (65%).
Education: 1 = grade 1 (4%), 2 = grade 2 (13%), 3 = grade 3 (44%), 4 = grade 4 (25%), 5 = post graduate (14%).
Major: 1 = literature & law (30%), 2 = pharmaceutics (6%), 3 = business management (40%), 4 = science & technology (24%).
Entrepreneurial experience (EN-Experience): 1 = none (80%), 2 = have (20%).
NA = need for achievement; RMP = role model performance.
EE = entrepreneurship education; EP = entrepreneurial passion; EC = entrepreneurial competencies; EI = entrepreneurial intention.

nested within universities). The statistical bugs of the traditional apporachs dealing with nested data have been overcome by HLM (Raudenbush & Bryk, 2002). HLM with restricted maximum likelihood estimates was used to analyze cross-level data. Due to our hypotheses involved in evaluating the main-effect of variables at the organizational level on outcomes at the individual level, intercept-as-outcome models were applied to test the hypotheses.

Additionally, our multilevel approach complements prior quasi-experimental methods in this domain. According to Souitaris et al. (2007), prior studies compared university students' EI before and after completing entrepreneurial programs or courses, and the inter-temporal changes were interpreted as treatment effects. In contrast, the multilevel method applied in this study links between-level influences to between-level variance in entrepreneurial intention. Therefore, the significant path relationships could be ascribed to an organizational level factor (e.g., EE). Therefore, this cross-level research design could complement prior work mostly in the form of pre- and post-intervention waves of surveying by drawing upon a multi-organizational sample and controlling for individual-level influences, thereby aiding to increase the external validity of prior findings.

To assess the direct and indirect effects of cross-level predictor variables, it was suggested that grand mean centering be applied to analyze hierarchical data (Enders & Tofighi, 2007). To test the mediation hypotheses, it was recommended by Preacher et al. (2010) that estimation methods be utilized simultaneously. Bias-corrected Monte Carlo parametric bootstrapping with 20,000 resamples was used to build a confidence interval (CI) of 95% around each simulated indirect effect, and thus statistical significance was assessed. The estimates for the parameters and standard errors stemmed from the analysis were used to build a distribution of sampling for the indirect effects (e.g., Lanaj et al., 2014; Lennard et al., 2019).

## 4. Results

### 4.1. Convergent and discriminant validity

In terms of Cronbach's alphas and composite reliability (CR) coefficients, the proposed model variables were all acceptable (>0.7), demonstrating high internal consistency (Fornell & Larcker, 1981). All the factor loadings of the research variables were beyond the recommended criteria (>0.7). The square multiple correlation (SMC) values of all the research variables were beyond threshold value (>0.5), indicating that the research variables had acceptable item reliability. Furthermore, all average variance extracted (AVE) of the model variables were over the threshold value of 0.5, indicating that the convergent validity of the model constructs was confirmed. The overall reliability of the variables and factor loadings of the indicators are presented in Table 1.

In light of Fornell and Larcker's (1981) study, it is recommended that the square roots of the AVE with interconstruct correlations be compared to evaluate model constructs' discriminant validity. All cases of interconstruct correlation coefficients are below the square root of the AVE of each construct (as shown in Table 2). Thus, it is implied that in the survey, the model constructs are presumed to have acceptable discriminant validity.

The means, standard deviations and correlation coefficients of the constructs are shown in Table 2. EE was positively related to EP ($r = 0.523$, $p < 0.01$), EC ($r = 0.594$, $p < 0.01$), and EI ($r = 0.383$, $p < 0.01$). Both EP and EC were positively related to EI ($r = 0.666$, $p < 0.01$; $r = 0.586$, $p < 0.01$, respectively), and EP was positively related to EC ($r = 0.609$, $p < 0.01$).

Before checking research hypotheses, Confirmatory Factor Analysis (CFA) was performed to evaluate the fit of the four-factor model, which included EE, EP, EC and EI. The proposed model demonstrated acceptable fit (c2 (98) = 194.11, GFI = 0.967, TLI = 0.960, RMSEA = 0.055, SRMR = 0.037), showing convergent validity. Following similar research (i.e., He et al., 2020), discriminant validity was examined by comparing the four-factor model with other alternative models. The CFA results showed that alternative

**Table 3**
Results of the confirmatory factor analysis.

| CFA Model | $\chi^2$ | df | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| **One factor model** | 1383.85 | 104 | 0.687 | 0.693 | 0.193 | 0.109 |
| **Two factor model** *EP + EC + EI* | 870.36 | 103 | 0.812 | 0.781 | 0.150 | 0.072 |
| **Two factor model** *EE + EP + EC* | 1043.75 | 103 | 0.770 | 0.732 | 0.166 | 0.098 |
| **Three factor model** *EP + EC* | 542.59 | 101 | 0.892 | 0.872 | 0.115 | 0.058 |
| **Three factor model** *EP + EI* | 505.35 | 101 | 0.901 | 0.882 | 0.110 | 0.054 |
| **Three factor model** *EC + EI* | 735.29 | 101 | 0.845 | 0.816 | 0.138 | 0.074 |
| **Three factor model** *EE + EP* | 786.26 | 101 | 0.832 | 0.801 | 0.143 | 0.088 |
| **Four factor model** | 194.11 | 98 | 0.967 | 0.960 | 0.055 | 0.037 |
| **Four factor model +Method factor** | 206.14 | 86 | 0.971 | 0.979 | 0.065 | 0.032 |

Notes.
$\chi^2$, chi-square value; df, degree of freedom; CFI, confirmatory fit indices; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.
EE = entrepreneurship education; EP = entrepreneurial passion; EC = entrepreneurial competencies; EI = entrepreneurial intention.

models have a poorer model fit than does the proposed four-factor model (see Table 3).

In addition, in light of Podsakoff et al. (2003), the controlling for the effects of a single unmeasured latent method factor was performed to check for common method bias, which is a latent variable approach involving adding a first-order factor, with all of the constructs' measures as indicators, to the proposed theoretical model and has been applied in a few researches (e.g., Carlson & Kacmar, 2000; Conger et al., 2000). As shown in Table 3, a method factor was added to the proposed model (four-factor model), and then, the fit indices of the model were estimated. The results showed that the model adding the method factor failed to show a stronger fit than that of the proposed four-factor model, indicating that common method bias was not an issue.

### 4.2. Hypothesis testing

Due to the analysis of cross-level data, HLM analysis was employed to examine the research hypotheses. First, to check and test for

**Table 4**
Results of the hierarchical linear modeling.

| Variable | β | SE | t | Within group $R^2$ | Between group $R^2$ |
|---|---|---|---|---|---|
| **Model 1: DV = Entrepreneurial passion (intercept = 0.006)** | | | | | |
| *Level-1 variables (n = 1050)* | | | | 0.054 | |
| Gender | 0.206 | 0.120 | 1.714 | | |
| Education | 0.055 | 0.042 | 1.323 | | |
| Major | 0.042 | 0.049 | 0.855 | | |
| Entrepreneurial experience | 0.402 | 0.137 | 2.930** | | |
| Need for achievement | 0.152 | 0.055 | 2.763** | | |
| Role model performance | 0.118 | 0.052 | 2.269** | | |
| *Level-2 variables(n = 50)* | | | | | 0.756 |
| Entrepreneurship education | 0.457 | 0.102 | 4.481*** | | |
| **Model 2: DV = Entrepreneurial competencies (intercept = 0.001)** | | | | | |
| *Level-1 variables (n = 1050)* | | | | 0.063 | |
| Gender | 0.253 | 0.120 | 1.963* | | |
| Education | −0.034 | 0.042 | −0.816 | | |
| Major | −0.001 | 0.049 | −0.029 | | |
| Entrepreneurial experience | 0.513 | 0.136 | 3.758*** | | |
| Need for achievement | 0.102 | 0.045 | 2.267** | | |
| Role model performance | 0.082 | 0.039 | 2.102* | | |
| *Level-2 variables(n = 50)* | | | | | 0.750 |
| Entrepreneurship education | 0.589 | 0.090 | 6.575*** | | |
| **Model 3: DV = Entrepreneurial intention (intercept = -1.600**)** | | | | | |
| *Level-1 variables (n = 1050)* | | | | 0.061 | |
| Gender | 0.283 | 0.120 | 2.362* | | |
| Education | 0.006 | 0.042 | 0.137 | | |
| Major | 0.026 | 0.049 | 0.519 | | |
| Entrepreneurial experience | 0.440 | 0.137 | 3.224** | | |
| Need for achievement | 0.112 | 0.053 | 2.113* | | |
| Role model performance | 0.071 | 0.065 | 1.092 | | |
| *Level-2 variable (n = 50)* | | | | | 0.747 |
| Entrepreneurship education | 0.519 | 0.144 | 3.605*** | | |
| **Model 4: DV = Entrepreneurial competencies (intercept = 0.001)** | | | | | |
| *Level-1 variables (n = 1050)* | | | | 0.501 | |
| Gender | 0.091 | 0.086 | 1.059 | | |
| Education | −0.073 | 0.030 | −2.450* | | |
| Major | −0.031 | 0.035 | −0.886 | | |
| Entrepreneurial experience | 0.231 | 0.098 | 2.353* | | |
| Need for achievement | 0.085 | 0.043 | 1.977* | | |
| Role model performance | 0.076 | 0.044 | 1.727 | | |
| Entrepreneurial passion | 0.692 | 0.052 | 13.360*** | | |
| *Level-2 variables (n = 50)* | | | | | **0.787** |
| Entrepreneurship education | 0.272 | 0.072 | 3.801*** | | |
| **Model 5: DV = Entrepreneurial intention (intercept = 0.001)** | | | | | |
| *Level-1 variables (n = 1050)* | | | | 0.521 | |
| Gender | 0.127 | 0.086 | 1.480 | | |
| Education | −0.023 | 0.030 | −0.754 | | |
| Major | 0.001 | 0.035 | 0.014 | | |
| Entrepreneurial experience | 0.128 | 0.099 | 1.293 | | |
| Need for achievement | 0.108 | 0.073 | 1.479 | | |
| Role model performance | −0.055 | 0.058 | −0.939 | | |
| Entrepreneurial passion | 0.601 | 0.059 | 10.168*** | | |
| Entrepreneurial competencies | 0.139 | 0.055 | 2.513* | | |
| *Level-2 variable (n = 50)* | | | | | 0.233 |
| Entrepreneurship education | 0.161 | 0.104 | 1.547 | | |

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

the presence of systematic between-organizational variance in the dependent variables and the significance of between-organizational residual variance, a null model with no predictors was constructed for analysis.

Intraclass correlation coefficient (1) ($ICC_1$) provided by the null models indicated that organizational-level predictors can potentially explain the maximum amount of variance in the individual-level variables to confirm the results of further cross-level analysis. The results of the null model showed that the $ICC_1$ of EP, EC, and EI were 0.38, 0.24, and 0.36, respectively, which were beyond the recommended threshold of 0.12, indicating that the model met the condition of cross-level analysis (James et al., 1992). The reliability of the group-level constructs was reflected by intraclass correlation coefficient (2) ($ICC_2$). The $ICC_2$ of EP, EC, and EI were 0.79, 0.64, and 0.77, respectively, meeting the threshold value of 0.60 (James et al., 1992).

#### 4.2.1. Direct effects

First, the study assessed for the direct effects of EE on EP, EC and EI and ran separate intercept-as-outcome models with EE as an organizational-level predictor and EP, EC and EI as individual-level outcomes. Table 4 shows that EE was significantly and positively associated with EP ($\beta = 0.457$, SE = 0.102, $p < 0.001$, Model 1), EC ($\beta = 0.589$, SE = 0.090, $p < 0.001$, Model 2), and EI ($\beta = 0.519$, SE = 0.144, $p < 0.001$, Model 3), supporting Hypotheses 1, 2, and 3, respectively.

Second, after controlling for EE in the regression equation, EP ($\beta = 0.692$, SE = 0.052, $p < 0.001$, Model 4) was significantly and positively associated with EC, which indicated that individuals who experienced more EP experienced greater increases in EC.

In addition, after controlling for EE and EP in the regression equation, EC ($\beta = 0.139$, SE = 0.055, $p < 0.05$, Model 5) were significantly and positively associated with EI, indicating that individuals with higher EC levels demonstrated greater increases in EI.

#### 4.2.2. Indirect effects

This study tested for whether EE had a indirect effect on EC via EP, as proposed in Hypotheses 4, 5, 6 and 7. Bias-corrected parametric bootstrapping (Monte Carlo) with 20,000 resamples was used to build a CI of 95% around each simulated indirect effect, and its statistical significance was assessed. Table 5 presents the estimates and CIs of all hypothesized indirect effects.

Based on 20,000 parametric bootstrap replications, the indirect effect of EE on EC via EP was 0.316 (95% CI = [0.175, 0.467]), the indirect effect of EE on EI via EP was 0.274 (95% CI = [0.149, 0.413]), and the indirect effect of EE on EI via EC was 0.037 (95% CI = [0.007, 0.079]). Additionally, at the within-level, the indirect effect of EP on EI via EC was 0.096 (95% CI = [0.021, 0.173]). Thus, Hypotheses 4, 5 and 6 were supported.

Then, this study tested for the sequential mediation effects proposed in Hypothesis 7. Based on 20,000 parametric bootstrap replications, the sequential indirect effect of EE→EP→EC→EI was .0043 (95% CI = [0.009, 0.089]). Thus, Hypothesis 7 was supported.

Therefore, EP and EC played both proximal and distal mediating roles in the EE-EI link. Interest is raised to examine whether there were significant differences among the three indirect effects. Through implementing a pairwise contrast of these three indirect effects based on bootstrapping analysis, the results indicate that the 95% CIs for the contrast of DIFF1 ($IND_{ep}$-$IND_{ec}$) and DIFF2 = $IND_{ep}$-$IND_{d}$ did not include zero (see Table 5, 95% CI = [0.109, 0.357], [0.123, 0.355]), demonstrating that a magnitude of indirect effects can be distinguished to compare with the two other counterparts; however, the 95% CI for the contrast of DIFF3 = $IND_{ec}$-$IND_{d}$ overlapped zero (see Table 5, 95% CI = [−0.040, 0.023]), showing that a magnitude of difference of indirect effects failed to be distinguished.

## 5. Discussion

Although EE programs and training have been increasingly considered effective approaches for facilitating entrepreneurship (Kuratko, 2005; Martin et al., 2013; Rauch & Hulsink, 2015), some previous studies do not support this linkage (i.e., Oosterbeek et al., 2010; von Graevenitz et al., 2010). Based on the premise that EE, as an organizational-level factor, can foster individual-level EE program-derived benefits, our study constructs a multilevel model to provide a theoretical understanding of how EE exerts cross-level positive effects on EI. In particular, the understanding of the processes required via emotion and competencies to facilitate EI is scarce. This study attempts to make contribution to the EE literature by integrating passion-based (e.g., Gielnik et al., 2017; Nabi et al., 2017;

**Table 5**
Significant indirect effects using Monte Carlo confidence intervals.

| Indirect Effect | Unstnd. Estimate(*b*) | SE | 95% CI for Mean Estimate[a] |
|---|---|---|---|
| **Hypothesized Indirect Effect** | | | |
| $IND_{ep}$: EE→EP→EI | 0.274 | 0.067 | [0.149, 0.413[b]] |
| $IND_{ec}$: EE→EC→EI | 0.037 | 0.018 | [0.007, 0.079[b]] |
| $IND_{w}$: EP→EC→EI | 0.096 | 0.039 | [0.021, 0.173[b]] |
| $IND_{d}$: EE→EP→EC→EI | 0.043 | 0.021 | [0.009, 0.089[b]] |
| **Contrasts** (indirect effect comparison) | | | |
| DIFF1 = $IND_{ep}$-$IND_{ec}$ | 0.237 | 0.068 | [0.109, 0.357[b]] |
| DIFF2 = $IND_{ep}$-$IND_{d}$ | 0.231 | 0.059 | [0.123, 0.355[b]] |
| DIFF3 = $IND_{ec}$-$IND_{d}$ | −0.006 | 0.015 | [-0.040, 0.023] |

Note: Unstnd. = Unstandardized. EE = entrepreneurship education; EP = entrepreneurial passion; EC = entrepreneurial competencies; EI = entrepreneurial intention.

[a] There values are based on the unstandardized path coefficients.

[b] 95% confidence intervals exclude zero.

Souitaris et al., 2007) and competency-based (e.g., Sánchez, 2013) perspectives to conduct multilevel research examining how EE programs influence EI. The findings show that EE is positively associated with improving not only students' EP but also their EC, thus supporting both the passion- and competency-based perspectives. EP and EC are, in turn, positively related to improving students' EI, supporting the proximal mediating role played by EP and EC in the EE-EI link. Finally, EP is positively related to improving students' EC, thus supporting the distal mediating role played by EC in the EE-EI linkage. Taken together, the current results indicate that on the one hand, EE programs can fuel students' EI by improving their EP, and on the other hand, EE programs can facilitate students' EI by enhancing their EC.

### 5.1. Theoretical implications

Supplemented with prior studies mostly based on case evidence or pretest-posttest design, our study provides significant evidence for the cross-level empirical support of EE program-derived benefits by surveying a representative, multiuniversity, and nested sample. Our study offers empirical evidence for the sustaining controversy regarding entrepreneurship teachability (Aronsson, 2004; Gendron, 2004; Henry et al., 2005) and thus can help enrich the EE literature and generalize the findings.

Moreover, our study expands the EE literature by uncovering the effectiveness of the novel specific EE programs benefits. Although considering the dominance of EI as an impact indicator for EE in the extant literature, it is necessary to obtain knowledge about other alternative EE-derived benefits. Although there is growing consensus on the essentiality of exploring entrepreneurship-related emotions, particularly during the process of new business creation (Cardon et al., 2012; Gielnik, Frese, et al., 2015), a scarce body of research has investigated emotion-based EE impact measures (Nabi et al., 2017). In the reviewed literature, it was found that only one empirical study considered emotional inspiration as an important EE program-driven benefit and examined the relationship between inspiration and EI (Souitaris et al., 2007). Thus, this study identifies EP as an important EE program-derived benefit (i.e., if EE enhances EP) and as a predictor of other EE program-impacted measures to further explore the relationship between EE program-derived entrepreneurial emotion and EI.

Furthermore, the study also contributes to the EE literature by offering empirical evidence of the impact of EE programs on EC and the mediating role played in the EE-EI link. Entrepreneurship has been considered a job (Shane et al., 2010), and as such, similar to other jobs, entrepreneurship can be taught (Martin et al., 2013). In this sense, it is essentiality to understand the process or mechanism underlying the transfer of entrepreneurship-related knowledge and skills to the entrepreneurial job context. However, although the importance of EE in terms of EC persceptive has been emphasized, most of the existing studies remain in the conceptual stage, and the mechanism of how EE programs influence EC lacks corresponding empirical tests. To narrow these gaps in the EE literature, our study provides a rigorous quantitative assessment to reveal the influence of EE on EC and EI. Specifically, from an opportunity perspective, this study defines EC as capabilities of opportunity identification and opportunity exploitation and explores their relationship with EE and their mediating role in the EE-EI link. Our findings indicate that the stronger the competencies are, the more the possibility that students will have access to some advantage compared to those lacking such competencies; thus, these students will have a higher level of intention toward entrepreneurship.

In general, the prior research concerning the impact of EE omitted either the passion-based or competency-based perspective to understand the benefits generated by EE programs. Few studies have integrated both perspectives to offer a deep exploration of the underlying mechanisms through which EE impacts EI, further limiting theoretical advancement. Therefore, by drawing upon the literature concerning the theory of human capital, entrepreneurial emotion, and organizational norms and integrating passion-based (e.g., Gielnik et al., 2017; Nabi et al., 2017) and competency-based (e.g., Sánchez, 2013; Souitaris et al., 2007) perspectives, our research findings offer a more comprehensive understanding of how EE programs influence students' EI both via EP and EC. As such, our study responds to the calls of Souitaris et al. (2007) and Nabi et al. (2017) and reveals the underlying mechanisms of how EE program-derived impact indicators (i.e., EP and EC) predict other impact measures (i.e., EI). Thus, it is important to contribute to the EE literature to comprehensively examine how EE program-derived benefits facilitate students' EI, underlining the proximal mediating process of passion-based psychological conditions and the distal mediating process of competency-based human capital assets.

Align with these reasoning, our results make essential theoretical contributions to the EE literature. First, given prior studies limited to individual-level EE, drawing from the organizational norms literature, our study extends this perspective by considering EE as an organization-level factor and explores the cross-level effects of EE on individual-level EE program-derived benefits. Second, with the aim of providing novel ways for assessing the effects of university-based EE and identifying the underlying mechanisms to uncover how EE fosters future entrepreneurs, the current study responds to the calls by Souitaris et al. (2007) and Nabi et al. (2017) by providing some of the first empirical evidence supporting this overarching hypothesis from integrated passion- and competency-based perspectives, thus adding to this stream of research. In addition, the theoretical framework of the Theory of Planned Behavior (TPB) (Ajzen, 1991) lays the foundation for a majority body of the research regarding the impact of EE on EI (Liñán & Fayolle, 2015; Martínez-Gregorio et al., 2021). In light of this theory, intentions toward implementing behaviors could predict planned behaviors (e.g., entrepreneurial behavior). Aligning with related researches that have revealed the precedents of EI of students (Barba-Sánchez & Atienza-Sahuquillo, 2018; Boubker et al., 2021; Souitaris et al., 2007; Walter et al., 2013), this study contributes to expand the TPB by considering and exploring the effects of other exogenous influence variables (e.g., EE, EP, and EC) on EI to confirm the EE-EI link and the mediating role played by EP and EC in this link. Finally, our findings can also aid policy makers and university educators in making decisions regarding the allocation of scarce EE resources and designing effective EE programs.

### 5.2. Practical implications

Our findings have several practical implications. First, our findings show that EE programs have significant positive effects on EC and EI, which is good news for governments and universities that have heavily invested in EE programs. Thus, EE is vital in the development of EC (Rae, 2010). According to Bakotic and Kruzic (2010), the development and enhancement of the EE-related competencies and skills needed later in the market should be on the focus of EE training programs. In a review of the EE literature, Jusoh et al. (2011) found that current EE programs pay little attention to the development of entrepreneurial skills and idea generation. Therefore, it is indicated that makers of public policy and education decision could confidently make future decisions in EE's investing and funding. According to the results of our study, the major pragmatic implication for the design and implementation of EE programs is that, unlike traditional considerations, which focus on training with regard to the knowledge and skills prerequisite for startup businesses, it is important to improve competencies in terms of opportunity identification and opportunity exploitation, which will be more beneficial to increasing students' intention to undertake business ventures.

Second, the emotional preference of individuals toward entrepreneurship should be considered because the emotional chemistry between individuals can affect their decision to recognize business opportunities (Souitaris et al., 2007). Our results show that bolstered with specific entrepreneurial training programs, EP can be enhanced, thus improving individuals' EC; therefore, the decision to startup a venture will be strengthened. Thus, the findings indicate that in the context of EE, it is not enough to just teach and train competencies, but rather, students' entrepreneurial emotion in the form of EP should be developed and fostered.

Third, our findings show that the indirect effect of EE programs on students' EI through EP is stronger than that through EC (estimate = .237, see Table 5). In other words, on the whole, EE programs are more likely to facilitate students' EI by inspiring their EP rather than transferring only entrepreneurship-related knowledge and skills. It is implied that the design of EE programs should pay attention to not only how much university students learn about entrepreneurship but also the degree to which they are inspired by and passionate about the program. Thus, the effectiveness of EE should consider the passion-based psychological condition as the most important EE program-derived benefit, which is more significantly related to EI.

Notably, our study offers the mentioned practical implications of competency-based EE program design, which is recommended to be implemented with caution. Although the estimated indirect effect is statistically significant, supporting the research hypothesis, the CI with lower or upper limits is very close to zero (see Table 5), likely showing small effect sizes for this indirect effect. Thus, this finding should be applied with some caution.

Therefore, it is recommended that EE programs focus more on passion-based courses or practices. According to theories about the passion development (Mageau et al., 2009; Vallerand et al., 2003), individuals are more likely to be passionate when participating in an activity. Thus, our results show that EE programs should concern with the action-oriented methodology of the training, which offers programs and trainings for engaging in entrepreneurship-related activities, such as real entrepreneurs' face-to-face interaction, business and action planning, and micro business simulation projects under real business conditions. This focus is important for boosting and developing passion. This design for EE programs can be beneficial for universities wishing to create highly passionate students and thus students with high intentions to engage in entrepreneurship.

### 5.3. Limitations and directions for future research

However, our study is not without limitations. First, limitations of survey data may miss the effect of diffusion of EE programs within organizations. Our study takes the premise that the offerings of EE programs (e.g., courses, lectures, and practices) can interpret a significant part of the between-university variance in student-level program-derived benefits (e.g., EP, EC, and EI). Thus, the current study focuses on actual taking part in one or multiple types of EE programs. However, program participants will likely share their insights and emotions with other students, consequently leading to the proliferation of entrepreneurship-related knowledge, perception and motivation within organizations. It is necessary to examine how EE programs stimulate and facilitate the diffusion of EC and EP within organizations. Future research in this regard is recommended to further corroborate our findings by expanding the surveyed sample. Second, the availability of economic resources for university students may be a key boundary condition for the effectiveness of EE programs. However, our study did not collect data in this regard, which should be considered to construct a more comprehensive EI-based theoretical model.

Several expanded avenues could be recommended for future researchers. First, the literature review indicated that little scholarly attention has been paid to empirically explore the translation of EI into startup activities, and thus, future research should focus on exploring how university-based EE bridges the transition from EI to entrepreneurial behavior, which is an important research domain because little is known about this transition (Nabi et al., 2017). Future research can be encouraged to concentrate on the mechanism through which intention follows through to activity or on what condition the following action will be stronger. The research questions are just like, for instance, why do participants with high EI after EE programs engage their entrepreneurial behavior while other participants do not? What' role is played by EE in this process? What factors can facilitate this process?

Second, it is suggested that the dynamic development of EE program-derived benefits be examined, such as learning and inspiration, intentions, personal initiative, knowledge, skills and passion, specifically, in the short run, how participants in EE programs maintain a high level of these outcomes, and furthermore, in the long run, how these benefits have an effect on entrepreneurial behavior and business performance. In addition, such longitudinal studies can investigate whether EE programs are conducive to a faster or higher level of program benefits rather than them being derived at the outset. Therefore, investigating the dynamic nature of these benefits will shed new light on the emergence of entrepreneurs' motivation and thus contribute to developing the theory of EE in terms of fully considering long-term transfer and effects.

## 6. Conclusions

The vast body of research on the effects of EE programs have omitted the consideration of EE, in an organizational context, exerting an effect on outcomes. The current research extends prior research by taking EE as an organizational factor to examine its impacts on individual-level EE program-derived benefits in adopting multilevel model analysis. In addition, to better understand how EE programs exert effects, it is essential to take account of the underlying processes leading to EI. However, previous literature has overlooked the transitional role of emotion or competencies in the EE-EI link. This research meets these gaps in the EE literature by placing EP and EC center stage to investigate their effects of EE on EI. Thus, our study provides first empirical evidence to investigate how university-based EE, in the organizational context, facilitates the shaping of future entrepreneurs from dual perspectives. Our findings show that ad hoc entrepreneurship-related education can boost EP and enhance EC in turn, which eventually translates into EI. Thus, participants in EE programs experience a boost in EI through the proximal and distal mediating effects of EP and EC. By integrating both passion- and competency-based perspectives, our findings underline the need to consider the joint interplay in the process of development of EI.

## Declarations of competing interest

None.

## Acknowledgements

The authors thank the editors and the anonymous reviewers for offering constructive and helpful guidance and comments on earlier versions of this article throughout the review process. The authors also thank the institutional contacts and the students who participated in the survey. Research Funders: Guangdong Province Department of Education Grant numbers: 2021GXJK256, 2020SFKC026.

## References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Alrawadieh, Z., Karayilan, E., & Cetin, G. (2019). Understanding the challenges of refugee entrepreneurship in tourism and hospitality. *Service Industries Journal, 39*(9–10), 717–740. https://doi.org/10.1080/02642069.2018.1440550

Aronsson, M. (2004). Education matters—but does entrepreneurship education? An interview with David Birch. *The Academy of Management Learning and Education, 3*(3), 289–292. https://doi.org/10.5465/amle.2004.14242224

Autio, E., Keeley, R. H., Klofsten, M., & Ulfstedt, T. (1997). Entrepreneurial intent among Students: Testing an intent model in asia, scandinavia and USA. In P. D. Reynolds (Ed.), *Frontiers of entrepreneurship research, 1997: Proceedings of the seventeenth annual entrepreneurship research conference* (pp. 133–147) (Babson College).

Bae, T. J., Qian, S., Miao, C., & Fiet, J. O. (2014). The relationship between entrepreneurship education and entrepreneurial intentions: A meta–analytic review. *Entrepreneurship: Theory and Practice, 38*(2), 217–254. https://doi.org/10.1111/etap.12095

Bakotic, D., & Kruzic, D. (2010). Students' perceptions and intentions towards entrepreneurship: The empirical findings from Croatia. *The Business Review, 14*(2), 209–215.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Barba-Sánchez, V., & Atienza-Sahuquillo, C. (2018). Entrepreneurial intention among engineering students: The role of entrepreneurship education. *European Research on Management and Business Economics, 24*(1), 53–61. https://doi.org/10.1016/j.iedeen.2017.04.001

Baron, R. A. (2008). The role of affect in the entrepreneurial process. *Academy of Management Review, 33*(2), 328–340. https://doi.org/10.5465/amr.2008.31193166

Baron, R. A., & Henry, R. A. (2010). How entrepreneurs acquire the capacity to excel: Insights from research on expert performance. *Strategic Entrepreneurship Journal, 4*(1), 49–65. https://doi.org/10.1002/sej.82

Bird, B. (1995). Toward a theory of entrepreneurial competency. In J. A. Katz, & R. H. Brockhaus (Eds.), *Advances in entrepreneurship, firm emergence, and growth* (Vol. 2, pp. 51–72). JAI Press Inc.

Bonesso, S., Gerli, F., Pizzi, C., & Cortellazzo, L. (2018). Students' entrepreneurial intentions: The role of prior learning experiences and emotional, social, and cognitive competencies. *Journal of Small Business Management, 56*, 215–242. https://doi.org/10.1111/jsbm.12399

Booth, P., Chaperon, S. A., Kennell, J. S., & Morrison, A. M. (2020). Entrepreneurship in island contexts: A systematic review of the tourism and hospitality literature. *International Journal of Hospitality Management, 85*, Article 102438. https://doi.org/10.1016/j.ijhm.2019.102438

Bosma, N., van Praag, M., Thurik, R., & de Wit, G. (2004). The value of human and social capital investments for the business performance of startups. *Small Business Economics, 23*(3), 227–236. https://doi.org/10.1023/b:sbej.0000032032.21192.72

Boubker, O., Arroud, M., & Ouajdouni, A. (2021). Entrepreneurship education versus management students' entrepreneurial intentions. A PLS-SEM approach. *International Journal of Management in Education, 19*(1), Article 100450. https://doi.org/10.1016/j.ijme.2020.100450

Brinckmann, J. (2008). *Competence of top management teams and the success of new tecnology based firms. A theoretical and empirical analysis concerning competencies of entrepreneneurial teams and the development of their ventures*. Gabler Publishing.

Cardon, M. S., Foo, M. D., Shepherd, D., & Wiklund, J. (2012). Exploring the heart: Entrepreneurial emotion is a hot topic. *Entrepreneurship: Theory and Practice, 36*(1), 1–10. https://doi.org/10.1111/j.1540-6520.2011.00501.x

Cardon, M. S., Gregoire, D. A., Stevens, C. E., & Patel, P. C. (2013). Measuring entrepreneurial passion: Conceptual foundations and scale validation. *Journal of Business Venturing, 28*, 373–396.

Cardon, M. S., & Kirk, C. P. (2015). Entrepreneurial passion as mediator of the self-efficacy to persistence relationship. *Entrepreneurship: Theory and Practice, 39*(5), 1027–1050. https://doi.org/10.1111/etap.12089

Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review, 34*(3), 511–532. https://doi.org/10.5465/amr.2009.40633190

Carlson, D. S., & Kacmar, K. M. (2000). Work–family conflict in the organization: Do life role values make a difference? *Journal of Management, 26*(5), 1031–1054. https://doi.org/10.1016/s0149-2063(00)00067-2

Chandler, G. N., & Hanks, S. H. (1994). Founder competence, the environment, and venture performance. *Entrepreneurship: Theory and Practice, 18*(3), 77–89. https://doi.org/10.1177/104225879401800306

Chandler, G. N., & Jansen, E. (1992). The founder's self-assessed competence and venture performance. *Journal of Business Venturing, 7*(3), 223–236. https://doi.org/10.1016/0883-9026(92)90028-

Cherulnik, P. D., Donley, K. A., Wiewel, T. S. R., & Miller, S. R. (2001). Charisma is contagious: The effect of leaders' charisma on observers' affect1. *Journal of Applied Social Psychology, 31*(10), 2149–2159. https://doi.org/10.1111/j.1559-1816.2001.tb00167.x

Conger, J. A., Kanungo, R. N., & Menon, S. T. (2000). Charismatic leadership and follower effects. *Journal of Organizational Behavior, 21*(7), 747–767. https://doi.org/10.1002/1099-1379(200011)21:7<747::aid-job46>3.0.co;2-j

Di Gregorio, D., & Shane, S. (2003). Why do some universities generate more start-ups than others? *Research Policy, 32*(2), 209–227. https://doi.org/10.1016/s0048-7333(02)00097-5

Dickson, P. H., Solomon, G. T., & Weaver, K. M. (2008). Entrepreneurial selection and success: Does education matter? *Journal of Small Business and Enterprise Development, 15*(2), 239–258. https://doi.org/10.1108/14626000810871655

Edelman, L. F., Manolova, T. S., & Brush, C. G. (2008). Entrepreneurship education: Correspondence between practices of nascent entrepreneurs and textbook prescriptions for success. *The Academy of Management Learning and Education, 7*(1), 56–70. https://doi.org/10.5465/amle.2008.31413862

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 12*(2), 121–138. https://doi.org/10.1037/1082-989x.12.2.121

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363–406. https://doi.org/10.1037/0033-295x.100.3.363

European Commission. (2006). Entrepreneurship education in europe: Fostering entrepreneurial mindsets through education and learning. In *Final proceedings of the conference on entrepreneurship education in Oslo* (pp. 1–92). European Commission.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Franke, N., & Lüthje, C. (2004). Entrepreneurial intentions of business students — a benchmarking study. *International Journal of Innovation and Technology Management*, 269–288. https://doi.org/10.1142/s0219877004000209, 01(03.

Gartner, W. B., & Vesper, K. H. (1994). Experiments in entrepreneurship education: Successes and failures. *Journal of Business Venturing, 9*(3), 179–187. https://doi.org/10.1016/0883-9026(94)90028-0

Geldhof, G. J., Preacher, K. J., & Zyphur, M. J. (2014). Reliability estimation in a multilevel confirmatory factor analysis framework. *Psychological Methods, 19*(1), 72–91. https://doi.org/10.1037/a0032138

Gendron, G. (2004). Practitioners' perspectives on entrepreneurship education: An interview with Steve case, Matt Goldman, Tom Golisano, Geraldine Laybourne, Jeff Taylor, and Alan Webber. *The Academy of Management Learning and Education, 3*(3), 302–314. https://doi.org/10.5465/amle.2004.14242231

Gielnik, M. M., Frese, M., Kahara-Kawuki, A., Wasswa Katono, I., Kyejjusa, S., Ngoma, M., Munene, J., Namatovu-Dawa, R., Nansubuga, F., Orobia, L., Oyugi, J., Sejjaaka, S., Sserwanga, A., Walter, T., Bischoff, K. M., & Dlugosch, T. J. (2015). Action and action-regulation in entrepreneurship: Evaluating a student training for promoting entrepreneurship. *The Academy of Management Learning and Education, 14*(1), 69–94. https://doi.org/10.5465/amle.2012.0107

Gielnik, M. M., Spitzmuller, M., Schmitt, A., Klemann, D. K., & Frese, M. (2015). I put in effort, therefore i am passionate": Investigating the path from effort to passion in entrepreneurship. *Academy of Management Journal, 58*(4), 1012–1031. https://doi.org/10.5465/amj.2011.0727

Gielnik, M. M., Uy, M. A., Funken, R., & Bischoff, K. M. (2017). Boosting and sustaining passion: A long-term perspective on the effects of entrepreneurship training. *Journal of Business Venturing, 32*(3), 334–353. https://doi.org/10.1016/j.jbusvent.2017.02.003

von Graevenitz, G., Harhoff, D., & Weber, R. (2010). The effects of entrepreneurship education. *Journal of Economic Behavior & Organization, 76*(1), 90–112. https://doi.org/10.1016/j.jebo.2010.02.015

Henry, C., Hill, F., & Leitch, C. (2005). Entrepreneurship education and training: Can entrepreneurship be taught? Part II. *Education + Training, 47*(3), 158–169. https://doi.org/10.1108/00400910510592211

He, P., Sun, R., Zhao, H., Zheng, L., & Shen, C. (2020). Linking work-related and non-work-related supervisor–subordinate relationships to knowledge hiding: A psychological safety lens. *Asian Business & Management, 1*, 1–16.

Hoegl, M., Parboteeah, K. P., & Munson, C. L. (2003). Team-level antecedents of individuals' knowledge networks. *Decision Sciences, 34*(4), 741–770. https://doi.org/10.1111/j.1540-5414.2003.02344.x

Horng, J. S., Liu, C. H., Chou, S. F., & Huang, Y. C. (2020). The roles of university education in promoting students' passion for learning, knowledge management and entrepreneurialism. *Journal of Hospitality and Tourism Management, 44*, 162–170. https://doi.org/10.1016/j.jhtm.2020.06.005

Huber, L. R., Sloof, R., & Van Praag, M. (2014). The effect of early entrepreneurship education: Evidence from a field experiment. *European Economic Review, 72*, 76–97. https://doi.org/10.1016/j.euroecorev.2014.09.002

James, L. R., Demaree, R. G., Mulaik, S. A., & Ladd, R. T. (1992). Validity generalization in the context of situational models. *Journal of Applied Psychology, 77*(1), 3–14. https://doi.org/10.1037/0021-9010.77.1.3

Jusoh, R., Ziyae, B., Asimiran, S., & Kadir, S. A. (2011). Entrepreneur training needs analysis: Implications on the entrepreneurial skills needed for successful entrepreneurs. *International Business & Economics Research Journal, 10*(1), 143–148. https://doi.org/10.19030/iber.v10i1.933

Kautonen, T., van Gelderen, M., & Fink, M. (2015). Robustness of the theory of planned behavior in predicting entrepreneurial intentions and actions. *Entrepreneurship: Theory and Practice, 39*(3), 655–674. https://doi.org/10.1111/etap.12056

Keith, N., Unger, J. M., Rauch, A., & Frese, M. (2016). Informal learning and entrepreneurial success: A longitudinal study of deliberate practice among small business owners. *Applied Psychology, 65*(3), 515–540. https://doi.org/10.1111/apps.12054

Klaukien, A., Shepherd, D. A., & Patzelt, H. (2013). Passion for work, nonwork-related excitement, and innovation managers' decision to exploit new product opportunities. *Journal of Product Innovation Management, 30*(3), 574–588. https://doi.org/10.1111/jpim.12010

Kolvereid, L. (1996). Prediction of employment status choice intentions. *Entrepreneurship: Theory and Practice, 21*(1), 47–58. https://doi.org/10.1177/104225879602100104

Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship: Theory and Practice, 18*(3), 91–104. https://doi.org/10.1177/104225879401800307

Kuckertz, A., & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions — investigating the role of business experience. *Journal of Business Venturing, 25*(5), 524–539. https://doi.org/10.1016/j.jbusvent.2009.09.001

Kuratko, D. F. (2005). The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship: Theory and Practice, 29*(5), 577–597. https://doi.org/10.1111/j.1540-6520.2005.00099.x

Lackéus, M. (2015). *Entrepreneurship in education: What, why, when, how. OECD report.* OECD.

Lanaj, K., Johnson, R. E., & Barnes, C. M. (2014). Beginning the workday yet already depleted? Consequences of late-night smartphone use and sleep. *Organizational Behavior and Human Decision Processes, 124*(1), 11–23. https://doi.org/10.1016/j.obhdp.2014.01.001

LeBreton, J. M., & Senter, J. L. (2008). Answers to 20 questions about interrater reliability and interrater agreement. *Organizational Research Methods, 11*(4), 815–852. https://doi.org/10.1177/1094428106296642

Lee, S. H., & Wong, P. K. (2004). An exploratory study of technopreneurial intentions: A career anchor perspective. *Journal of Business Venturing, 19*(1), 7–28. https://doi.org/10.1016/s0883-9026(02)00112-x

Lennard, A. C., Scott, B. A., & Johnson, R. E. (2019). Turning frowns (and smiles) upside down: A multilevel examination of surface acting positive and negative emotions on well-being. *Journal of Applied Psychology, 104*(9), 1164–1180. https://doi.org/10.1037/apl0000400

Liñán, F., & Fayolle, A. (2015). A systematic literature review on entrepreneurial intentions: Citation, thematic analyses, and research agenda. *The International Entrepreneurship and Management Journal, 11*(4), 907–933. https://doi.org/10.1007/s11365-015-0356-5

Liu, D., Chen, X. P., & Yao, X. (2011). From autonomy to creativity: A multilevel investigation of the mediating role of harmonious passion. *Journal of Applied Psychology, 96*(2), 294–309. https://doi.org/10.1037/a0021294

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*(9), 705–717. https://doi.org/10.1037/0003-066x.57.9.705

Longva, K. K., & Foss, L. (2018). Measuring impact through experimental design in entrepreneurship education: A literature review and research agenda. *Industry and Higher Education, 32*(6), 358–374. https://doi.org/10.1177/0950422218804912
Louis, K. S., Blumenthal, D., Gluck, M. E., & Stoto, M. A. (1989). Entrepreneurs in academe: An exploration of behaviors among life scientists. *Administrative Science Quarterly, 34*(1), 110–131. https://doi.org/10.2307/2392988
Mageau, G. A., Vallerand, R. J., Charest, J., Salvy, S. J., Lacaille, N., Bouffard, T., & Koestner, R. (2009). On the development of harmonious and obsessive passion: The role of autonomy support, activity specialization, and identification with the activity. *Journal of Personality, 77*(3), 601–646. https://doi.org/10.1111/j.1467-6494.2009.00559.x
Man, T. W. Y., Lau, T., & Chan, K. F. (2002). The competitiveness of small and medium enterprises: A conceptualization with focus on entrepreneurial competencies. *Journal of Business Venturing, 17*(2), 123–142. https://doi.org/10.1016/s0883-9026(00)00058-6
Martínez-Gregorio, S., Badenes-Ribera, L., & Oliver, A. (2021). Effect of entrepreneurship education on entrepreneurship intention and related outcomes in educational contexts: A meta-analysis. *International Journal of Management in Education, 19*(3), Article 100545. https://doi.org/10.1016/j.ijme.2021.100545
Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing, 28*, 211–224.
Martins, I., Perez, J. P., & Novoa, S. (2022). Developing orientation to achieve entrepreneurial intention: A pretest-post-test analysis of entrepreneurship education programs. *International Journal of Management in Education, 100593*. https://doi.org/10.1016/j.ijme.2021.100593
Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of Political Economy, 66*(4), 281–302. https://doi.org/10.1086/258055
Mitton, D. G. (1989). The compleat entrepreneur. *Entrepreneurship: Theory and Practice, 13*(3), 9–20. https://doi.org/10.1177/104225878901300303
Mojab, F., Zaefarian, R., & Azizi, A. H. D. (2011). Applying competency based approach for entrepreneurship education. *Procedia - Social and Behavioral Sciences, 12*, 436–447. https://doi.org/10.1016/j.sbspro.2011.02.054
Muzychenko, O. (2008). Cross-cultural entrepreneurial competence in identifying international business opportunities. *European Management Journal, 26*(6), 366–377. https://doi.org/10.1016/j.emj.2008.09.002
Nabi, G., Liñán, F., Fayolle, A., Krueger, N., & Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *The Academy of Management Learning and Education, 16*(2), 277–299. https://doi.org/10.5465/amle.2015.0026
Nabi, G., Walmsley, A., Liñán, F., Akhtar, I., & Neame, C. (2018). Does entrepreneurship education in the first year of higher education develop entrepreneurial intentions? The role of learning and inspiration. *Studies in Higher Education, 43*(3), 452–467. https://doi.org/10.1080/03075079.2016.1177716
Oosterbeek, H., van Praag, M., & Ijsselstein, A. (2010). The impact of entrepreneurship education on entrepreneurship skills and motivation. *European Economic Review, 54*(3), 442–454. https://doi.org/10.1016/j.euroecorev.2009.08.002
Parry, K. W. (1998). Grounded theory and social process: A new direction for leadership research. *The Leadership Quarterly, 9*(1), 85–105. https://doi.org/10.1016/s1048-9843(98)90043-1
Pham, D., Jones, P., Dobson, S., Liñán, F., & Viala, C. (2021). Entrepreneurial implementation intention as a tool to moderate the stability of entrepreneurial goal intention: A sensemaking approach. *Journal of Business Research, 123*, 97–105. https://doi.org/10.1016/j.jbusres.2020.09.051
Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879
Politis, D. (2005). The process of entrepreneurial learning: A conceptual framework. *Entrepreneurship: Theory and Practice, 29*(4), 399–424. https://doi.org/10.1111/j.1540-6520.2005.00091.x
Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209–233. https://doi.org/10.1037/a0020141
Rae, D. (2010). Universities and enterprise education: Responding to the challenges of the new era. *Journal of Small Business and Enterprise Development, 17*(4), 591–606. https://doi.org/10.1108/14626001011088741
Rae, D., & Carswell, M. (2001). Towards a conceptual understanding of entrepreneurial learning. *Journal of Small Business and Enterprise Development, 8*(2), 150–158. https://doi.org/10.1108/eum0000000006816
Rasmussen, E., Mosey, S., & Wright, M. (2011). The evolution of entrepreneurial competencies: A longitudinal study of university spin-off venture emergence. *Journal of Management Studies, 48*(6), 1314–1345. https://doi.org/10.1111/j.1467-6486.2010.00995.x
Rasmussen, L. B., & Nielsen, T. (2004). Entrepreneurial capabilities: Is entrepreneurship action research in disguise? *AI & Society, 18*(2), 100–112. https://doi.org/10.1007/s00146-003-0270-1
Rauch, A., & Hulsink, W. (2015). Putting entrepreneurship education where the intention to act lies: An investigation into the impact of entrepreneurship education on entrepreneurial behavior. *The Academy of Management Learning and Education, 14*(2), 187–204. https://doi.org/10.5465/amle.2012.0293
Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Sage.
Sánchez, J. C. (2013). The impact of an entrepreneurship education program on entrepreneurial competencies and intention. *Journal of Small Business Management, 51*(3), 447–465. https://doi.org/10.1111/jsbm.12025
Schlaegel, C., & Koenig, M. (2014). Determinants of entrepreneurial intent: A meta-analytic test and integration of competing models. *Entrepreneurship: Theory and Practice, 38*(2), 291–332. https://doi.org/10.1111/etap.12087
Seo, M. G., Barrett, L. F., & Bartunek, J. M. (2004). The role of affective experience in work motivation. *Academy of Management Review, 29*(3), 423–439. https://doi.org/10.5465/amr.2004.13670972
Shane, S. A. (2004). *Academic entrepreneurship: University spinoffs and wealth creation*. Edward Elgar.
Shane, S., Nicolaou, N., Cherkas, L., & Spector, T. D. (2010). Genetics, the big five, and the tendency to be self-employed. *Journal of Applied Psychology, 95*(6), 1154–1162. https://doi.org/10.1037/a0020294
Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review, 25*(1), 217–226. https://doi.org/10.5465/amr.2000.2791611
Sherkat, A., & Chenari, A. (2022). Assessing the effectiveness of entrepreneurship education in the universities of Tehran province based on an entrepreneurial intention model. *Studies in Higher Education, 47*(1), 97–115. https://doi.org/10.1080/03075079.2020.1732906
Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing, 22*(4), 566–591. https://doi.org/10.1016/j.jbusvent.2006.05.002
Thompson, J. L. (2004). The facets of the entrepreneur: Identifying entrepreneurial potential. *Management Decision, 42*(2), 243–258. https://doi.org/10.1108/00251740410515861
Thurik, R., & Wennekers, S. (2004). Entrepreneurship, small business and economic growth. *Journal of Small Business and Enterprise Development, 11*(1), 140–149. https://doi.org/10.1108/14626000410519173
Ucbasaran, D., Westhead, P., & Wright, M. (2008). Opportunity identification and pursuit: Does an entrepreneur's human capital matter? *Small Business Economics, 30*(2), 153–173. https://doi.org/10.1007/s11187-006-9020-3
Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing, 26*(3), 341–358. https://doi.org/10.1016/j.jbusvent.2009.09.004
Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Léonard, M., Gagné, M., & Marsolais, J. (2003). Les passions de l'âme: On obsessive and harmonious passion. *Journal of Personality and Social Psychology, 85*(4), 756–767. https://doi.org/10.1037/0022-3514.85.4.756
Varamäki, E., Joensuu-Salo, S., Tornikoski, E., & Viljamaa, A. (2015). The development of entrepreneurial potential among higher education students. *Journal of Small Business and Enterprise Development, 22*, 563–589. https://doi.org/10.1108/JSBED-02-2012-0027
Walter, S. G., & Block, J. H. (2016). Outcomes of entrepreneurship education: An institutional perspective. *Journal of Business Venturing, 31*(2), 216–233. https://doi.org/10.1016/j.jbusvent.2015.10.003
Walter, S. G., Parboteeah, K. P., & Walter, A. (2013). University departments and self-employment intentions of business students: A cross-level analysis. *Entrepreneurship: Theory and Practice, 37*(2), 175–200. https://doi.org/10.1111/j.1540-6520.2011.00460.x

Wang, S. M., Yueh, H. P., & Wen, P. C. (2019). How the new type of entrepreneurship education complements the traditional one in developing entrepreneurial competencies and intention. *Frontiers in Psychology, 10*, 2048. https://doi.org/10.3389/fpsyg.2019.02048

Weaver, K. M., Marchese, A., Vozikis, G. S., & Dickson, P. (2010). Promoting entrepreneurship across the university: The experiences of three diverse academic institutions. *Journal of Small Business and Entrepreneurship, 23*, 797–806. https://doi.org/10.1080/08276331.2010.10593518

Westhead, P., & Solesvik, M. Z. (2016). Entrepreneurship education and entrepreneurial intention: Do female students benefit? *International Small Business Journal: Researching Entrepreneurship, 34*(8), 979–1003. https://doi.org/10.1177/0266242615612534

Wu, W., Wang, H., Zheng, C., & Wu, Y. J. (2019). Effect of narcissism, psychopathy, and machiavellianism on entrepreneurial intention-the mediating of entrepreneurial self-efficacy. *Frontiers in Psychology, 10*, 360. https://doi.org/10.3389/fpsyg.2019.00360

Zahra, S. A., Abdelgawad, S. G., & Tsang, E. W. K. (2011). Emerging multinationals venturing into developed economies: Implications for learning, unlearning, and entrepreneurial capability. *Journal of Management Inquiry, 20*(3), 323–330. https://doi.org/10.1177/1056492611408266

Zhang, Y., Duysters, G., & Cloodt, M. (2014). The role of entrepreneurship education as a predictor of university students' entrepreneurial intention. *The International Entrepreneurship and Management Journal, 10*(3), 623–641. https://doi.org/10.1007/s11365-012-0246-z

Zhang, S. N., Li, Y. Q., Liu, C. H., & Ruan, W. Q. (2020). Critical factors identification and prediction of tourism and hospitality students' entrepreneurial intention. *Journal of Hospitality, Leisure, Sports and Tourism Education, 26*, Article 100234. https://doi.org/10.1016/j.jhlste.2019.100234

Zhao, H., Seibert, S. E., & Hills, G. E. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology, 90*(6), 1265–1272. https://doi.org/10.1037/0021-9010.90.6.1265