

Fostering the entrepreneurial intention of university students: the role of challenge-based learning approach

Original

Fostering the entrepreneurial intention of university students: the role of challenge-based learning approach / Cannata, Eugenio; Colombelli, Alessandra; Serraino, Francesco. - ELETTRONICO. - (2022), pp. 199-214. (SEFI 50th Annual Conference: Towards a new future in engineering education, new scenarios that European alliances of tech universities open up Barcellona (ES) 19-22 September 2022) [10.5821/conference-9788412322262.1264].

Availability:

This version is available at: 11583/2976255 since: 2023-02-21T20:23:28Z

Publisher:

Universitat Politècnica de Catalunya · BarcelonaTech (UPC)

Published

DOI:10.5821/conference-9788412322262.1264

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)



FOSTERING THE ENTREPRENEURIAL INTENTION OF UNIVERSITY STUDENTS: THE ROLE OF CHALLENGE-BASED LEARNING APPROACH

E. Cannata

Department of Management and Production Engineering; Entrepreneurship and Innovation Center (EIC), Politecnico di Torino
Turin, Italy

A. Colombelli

Department of Management and Production Engineering; Entrepreneurship and Innovation Center (EIC), Politecnico di Torino
Turin, Italy

F. Serraino¹

Department of Management and Production Engineering; Entrepreneurship and Innovation Center (EIC), Politecnico di Torino
Turin, Italy

Conference Key Areas: *Entrepreneurship Education*

Keywords: *Entrepreneurship education; Challenge-Based Learning; Entrepreneurial intention; Student entrepreneurship; Theory of Planned Behavior*

ABSTRACT

Building on the Theory of Planned Behavior, the aim of this paper is to investigate the moderating effect of entrepreneurship education in the relationship between attributes like attitude, social norms and perceived behavioral control, and the entrepreneurial intention of university students. Specifically, the moderation effect of entrepreneurship

¹ *Corresponding Author*

F. Serraino

francesco.serraino@polito.it



programs that adopt a Challenge-Based Learning approach is analyzed. To do so, the Italian sample of university students who participated in the 2021 Global University Entrepreneurial Spirit Students' Survey (GUESSS) was used. Results confirm that participation in entrepreneurial programs that adopt a Challenge-Based Learning positively moderate the relationship between Theory of Planned Behavior attributes and entrepreneurial intention of the students. Specifically, the results show that participation in Challenge-Based programs increases the positive effect of attitude on entrepreneurial intention.

1 INTRODUCTION

Increasingly in recent years, particular attention has been paid to the phenomenon of venture creation by young people and especially university students (Loan et al. 2021; Meyer and Krüger 2021; Wach and Bilan 2021). This phenomenon, defined as student entrepreneurship, is of particular interest because of the positive impact it can have on the local economy, especially in terms of youth employment, but also because of the important role entrepreneurship plays as a source of innovation and technological change (Schumpeter 1934). Entrepreneurship, and in particular the identification of an entrepreneurial opportunity, is crucial for technological innovation to influence economic development (Shane 2000) and high-skilled young people can give a strong contribution in this direction.

In order to foster the growth of entrepreneurship among students, universities play a key role in terms of Entrepreneurship Education (EE) (Zahra and George 2002; Colombelli et al. 2021b). In this context, it is crucial to identify both behavioral and skills-related aspects that can influence students' decisions to pursue entrepreneurial careers. Many studies show that Entrepreneurship Education fosters students' propensity to pursue entrepreneurial careers and is effective in enabling students to acquire or improve their entrepreneurial skills and abilities (Martin et al. 2013; Bae et al. 2014). Kuratko (2005) through his study demonstrated how such competencies and skills can be shaped by education. Other works have tried to develop models capable of predicting entrepreneurial behavior through entrepreneurial intention (Shapero and Sokol 1982; Krueger and Brazeal 1994). Intention is indeed considered the best predictor of behavior (Krueger et al. 2000). In particular, in the context of entrepreneurship, entrepreneurial intention is able to predict entrepreneurial action (Kautonen et al. 2015).

In the context of student entrepreneurship, the understanding of the elements that influence entrepreneurial intention is of particular importance, so as to design EE programs that are more effective in improving that intention. The most widespread model that allows us to investigate the drivers that guide the development of an intention and consequently a behavior is the Theory of Planned Behavior (TPB) (Ajzen 1991). This theory is based on three elements: attitude, social norms and perceived behavioral control. Schlaegel and Koenig (2014) suggest that these three elements underpin the development of entrepreneurial intention. The model of intention based on the Theory of Planned Behavior can be moderated by other elements and situations that influence the relationship between the three predictors and intention (Mathur 1998). One of these elements is Entrepreneurship Education. Previous works have revealed that TPB and EE can influence each other in order to improve students' entrepreneurial characteristics, including intention (Gorman et al. 1997; Kuratko 2005; Rauch and Hulsink 2015).

However, the literature investigating the effectiveness of EE on entrepreneurial intention and in relation to the Theory of Planned Behavior, has mainly neglected the impact of individual educational approaches. Consequently, the impact of entrepreneurial education programs could be investigated in relation to specific

learning approaches, because different approaches may have different effectiveness in improving skills and intention of students (Rae and Carswell 2000). One of the approaches implemented in EE is Challenge-Based Learning, a learning methodology in which students learn in a real context, and deal with challenges and real problems proposed by them or by existing firms (Chanin et al. 2018; Colombelli et al. 2022a).

In line with these arguments, the aim of this article is to investigate the effectiveness of the Challenge-Based Learning approach on the development of entrepreneurial intention in the context of the Theory of Planned Behavior. Specifically, we sought to understand whether participation in a Challenge-Based Learning entrepreneurship program can intensify the effect of attitude, social norms and perceived behavioral control on students' entrepreneurial intention.

To investigate this, the database of the GUESSS (Global University Entrepreneurial Spirit Students' Survey) 2021 project was used, specifically the data collected in Italy on about 30 universities for a total of 346 valid observations. The data were analyzed through t-tests and multiple linear regressions. The results show that participation in a Challenge-Based Learning program increases the positive effect of entrepreneurial attitude on students' entrepreneurial intention.

The article is structured as follows. In section 2 the theoretical framework is described. Section 3 presents the methodology, describing in detail the sample used and the analyses carried out. Then, in section 4, the results of the study are analyzed. Finally, in section 5, the conclusions and limitations of the study are presented.

2 THEORETICAL FRAMEWROK

In the literature, there is an increasing interest in investigating the drivers that lead young people, and in particular students, to embark on an entrepreneurial career by starting their own business. This interest is also focused on identifying EE practices in order to exploit these drivers. In this context, scholars place great attention on intention models, because they are the most robust models to predict the intention to start a business (Krueger 2007; Koe and Majid 2014). Ajzen (1991) developed what is considered the theoretical reference model regarding intentions as main predictors of behavior, also in the entrepreneurial field (Entrialgo and Iglesias 2016). This model is based on the Theory of Planned Behavior and states that the greater the intention of an individual in undertaking a certain behavior, the greater the probability that this behavior will be performed. The TPB model adds a second concept to this first statement, namely that an individual's intention is in turn influenced by three elements: attitude, social norms and perceived behavioral control.

Attitude is the concept that represents perceptions of personal convenience with regard to performing a behavior. The more positive the perception of the outcome that can be obtained from a behavior, the greater should be the attitude towards that behavior and consequently the intention to perform it (Autio et al. 1997; Krueger et al. 2000; Luthje and Franke 2003; Segal et al. 2005; Pruett et al. 2009). The second

concept is social norms, i.e. the social pressures from social reference groups (e.g. family and friends) that one perceives when performing a certain behavior (Ajzen 1991). With respect to attitude, social norms are not always agreed upon by researchers with regard to their impact on entrepreneurial intention. Ozaralli and Rivenburgh (2016) and Kautonen et al. (2015) in their studies point out that social norms are a relevant predictor of entrepreneurial intention. At the same time, in other studies a weak or even non-significant relationship between these two elements emerges (Krueger et al. 2000; Autio et al. 2001; Liñán and Chen 2009; Nishimura and Tristán 2011; Wach and Wojciechowski 2016). The third and final concept underlying the Theory of Planned Behavior is perceived behavioral control. This concept represents the ease or difficulty that the individual perceives in performing a certain behavior (Bandura 1986; Swan et al. 2007). The literature shows how perceived behavioral control has a positive and significant impact on entrepreneurial intention (Fayolle and Gailly 2004).

Several studies in the literature demonstrate the direct impact of the three constructs of the TPB on entrepreneurial intention (Kolvereid 1996; Krueger et al. 2000; Lüthje and Franke 2003; Souitaris et al. 2007; Kautonen et al. 2015). Yet, the impact of attitude and perceived behavioral control is more widespread and relevant than that of social norms. Consequently, this evidence allows the following hypothesis to be formulated:

H1: There is a positive relationship between attitude, social norms and perceived behavioral control, and entrepreneurial intention.

Within the context of TPB and entrepreneurial intention, entrepreneurship education plays a key role. Studies in the literature show that there is a positive and significant impact between Entrepreneurship Education and entrepreneurial intention (Turker and Selcuk 2009; Gubik 2014; Maresch et al. 2016; Kramarz et al. 2019; Karyaningsih et al. 2020). In particular, Bae et al. (2014) state that knowledge acquired through education is decisive in developing entrepreneurial intention. Furthermore, Entrepreneurship Education acts as a moderator by influencing the relationship between the elements of the Theory of Planned Behavior and entrepreneurial intention. This moderating effect is found to enhance the positive impact of attitude on entrepreneurial intention (Maresch et al. 2016; Shah et al. 2020), because in EE programs entrepreneurship is positively positioned relative to other career options, reinforcing positive attitudes for an entrepreneurial career. In addition, participation in EE programs allows students to improve their knowledge about entrepreneurship by becoming more aware of embarking on an entrepreneurial career and thus making them less dependent on the opinions of social groups (Kautonen et al. 2015). Consequently, the moderation effect in this case leads to a reduction in the positive effect of social norms on entrepreneurial intention (Shah et al. 2020). Regarding to perceived behavioral control, EE enables the acquisition of knowledge and skills, increasing confidence in own abilities and further improving entrepreneurial intention (Shah et al. 2020).

This evidence allows to understand the relevance of Entrepreneurship Education. However, when analyzing the impact of Entrepreneurship Education in these studies, it is done by considering education programs without distinguishing between different training approaches. Within this study we want to focus on the Challenge-Based Learning approach, an experiential learning methodology that allows students to apply knowledge and skills in a real context. Compared to other learning approaches, such as Project-Based Learning and Problem-Based Learning, it is characterized by the joint presence of a practice-based methodology and a real context due to the presence of a challenge proposed by existing companies.

Studies in the literature demonstrate the positive impact of Challenge-Based Learning on students' entrepreneurial intention (Johnson et al. 2009; Palma-Mendoza et al. 2019; Martinez and Crusat 2020; Colombelli et al. 2021a; Colombelli et al. 2022a). Moreover, these studies show that Challenge-Based Learning improves students' entrepreneurial skills and competences. A result that according to Bae et al. (2014) would favor the development of entrepreneurial intention.

Given the evidence from the literature on the moderating effect of EE in the relationship between TPB and entrepreneurial intention and the relevance of the Challenge-Based Learning in the context of EE. The study presented in this paper aims to investigate the influence of the Challenge-Based Learning approach within the relationship between Theory of Planned Behavior and entrepreneurial intention. Accordingly, the following hypothesis are proposed:

H2: Participation in a Challenge-Based Learning course increases the positive effect of attitude on entrepreneurial intention.

H3: Participation in a Challenge-Based Learning course decreases the positive effect of social norms on entrepreneurial intention.

H4: Participation in a Challenge-Based Learning course increases the positive effect of perceived behavioral control on entrepreneurial intention.

3 METHODOLOGY

3.1 Sample

This study was carried on using the data collected through the survey conducted by GUESSS in 2021 in Italy.

The GUESSS survey is part of an international research project on student entrepreneurship, conducted since 2003 by the "Swiss Institute for Small Business and Entrepreneurship" of St. Gallen University: it covers different research topics, from entrepreneurial intention to nascent entrepreneurship, highlighting factors of influence at the individual, family, contextual and university levels.

The sample includes 3294 students who answered the questionnaire and of these 32% declare to have at least a parent who is an entrepreneur; the average age of the participants is 24 years and in terms of gender, males represent 52% of the sample

while females are 48% (Fig. 1). The survey has been proposed to all the students of the Italian participating universities, thus belonging to different fields of studies. The distribution of students by fields of study (Fig. 2) is skewed toward the engineering (incl. architecture) and economics areas (58,4%), compared to the other areas, which individually count less than 10%. Considering the level of studies, more than 63% of participants are pursuing a Bachelor's degree, 35% a Master's degree and less than 2% a PhD or an MBA (Fig. 3). Finally, analyzing the role of Entrepreneurial Education (EE), Figure 4 shows that 1829 students (~55% of the total) have never taken a general entrepreneurship course while 346 have at least once participated in a Challenge-Based Learning course.

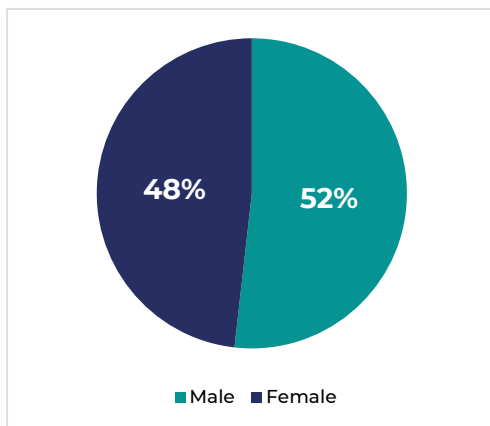


Fig. 1. % distribution of students by gender

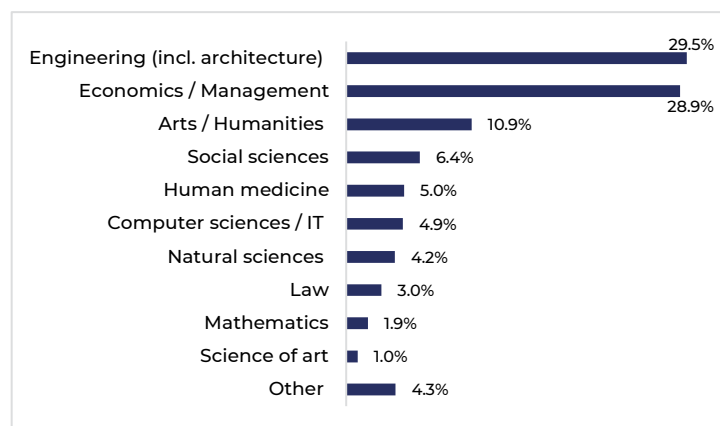


Fig. 2. % distribution of students by field of study

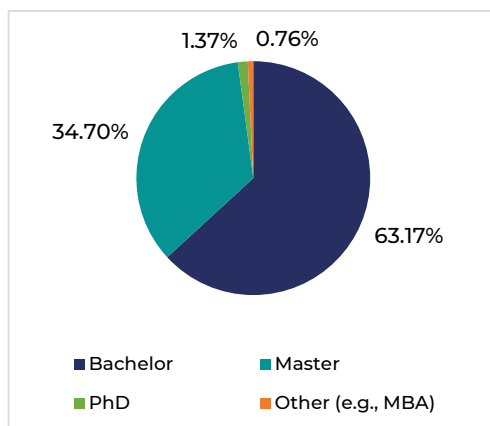


Fig. 3. % distribution of students by level of study

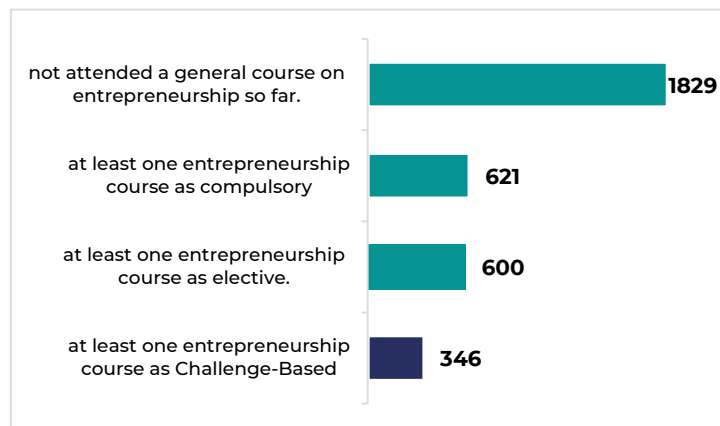


Fig. 4. % distribution of students by participation to EE courses

3.2 Description of variables and analysis

The variables of the econometric analysis of regression were built starting from the proposed research model in the theoretical framework section.



The dependent variable of the model is the Entrepreneurial Intention (EI) which is assumed to capture the motivational factors that influence a behavior: EI is an indication of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior.

The variables of the Theory of Planned Behaviour, in this research considered independent, are Attitude (ATT), Perceived Behavioral Control (PBC) and Social Norms (SN): they respectively refer to the perception of personal convenience, perceived ease or difficulty and perceived social pressure to perform or not to perform the entrepreneurial behavior.

The GUESSS questionnaire has a set of questions (or items) – prevalidated by literature - for each of these 4 variables cited above. Each question allows for the measurement of a single item of the considered variable and each question can be answered on a Likert scale from 1 to 7 (1=totally disagree, 7=totally agree). The arithmetic mean of the item values was calculated to obtain the value of these variables.

The Confirmatory Factor Analysis and the Cronbach's α - calculated for each of these 4 variables and higher than 0.7 for all of them - gave further confirmation of the reliability of the scales used.

Given the continuous nature of the dependent variable, the model's assumptions has been tested via a multiple linear regression.

Considering that the main focus of this work is to analyze the impact of Entrepreneurship Education courses, four dichotomous independent variable keys have been built, namely EE_general, EE_elective, EE_compulsory, EE_challenge: they respectively assume the value 1 if the subject has participated at least once in a general, elective, compulsory or Challenge-Based Learning course and 0 otherwise.

In addition, control variables such as age (continuous), gender (dummy), level_study (categorical), field_study (categorical), parent_entrepreneur (dummy) and home_university (dummy) were included to investigate aspects of individual character and socio-demographics and to improve the inference of the OLS estimator.

Finally, in order to meet the requirements of multiple regression, the correlation matrix and the calculation of Variance Inflation Factors – all less than 5 – excluded the existence of imperfect collinearity or multicollinearity.

4 RESULTS

T-test

As anticipated in the methodology section, statistics were initially developed to compare the average values of students' entrepreneurial variables distinguishing between those who participated and those who did not participate in Challenge-Based Learning courses.

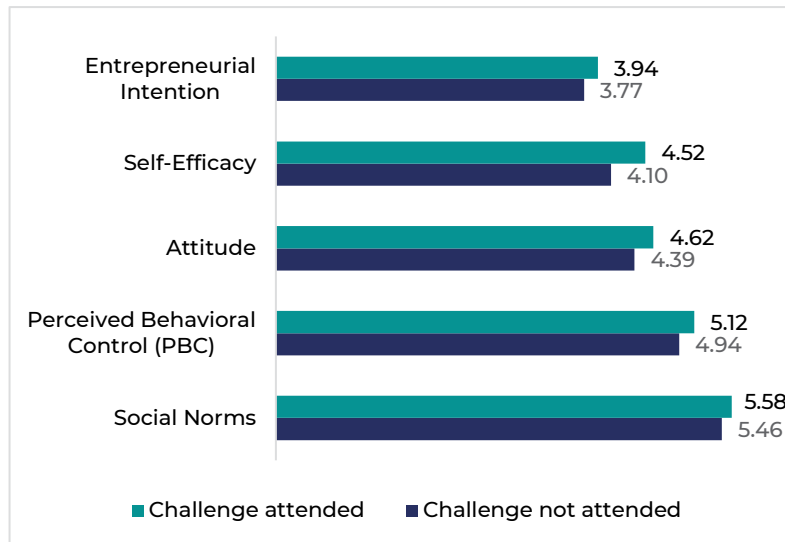


Fig. 5. Entrepreneurial characteristics by participation in challenge-based courses

Figure 5 reveals the existence of an always positive difference between the averages of entrepreneurial attributes distinguished for participation in a Challenge-Based Learning course. Similarly, the same trend emerged distinguishing by participation in general, elective or compulsory courses.

To test whether such differences between entrepreneurial attributes, in addition to being positive, were also statistically significant, a t-test was performed.

With regard to the Challenge-Based Learning courses, between participants and non-participants, there was a positive and statistically significant difference, at the minimum level of 5%, between the averages of all entrepreneurial attributes; an exception is the difference between the averages on entrepreneurial intention, which was only significant at the 10% level. The most marked increase concerned entrepreneurial self-efficacy: this preliminary evidence shows how the practical approach of Challenge-Based Learning courses instils a greater awareness of one's entrepreneurial skills.

Table 1. Output t-test by (EE_challenge)

Variables	Average Challenge attended	Average Challenge NOT attended	diff = Avg Challenge Attended - Avg Challenge NOT Attended (H0: diff=0)	p-value Ha: diff>0
Entrepreneurial Intention	3,94	3,77	0,17	0,06
Self-Efficacy	4,52	4,10	0,42	0,000
Attitude (ATT)	4,62	4,39	0,23	0,009

Perceived Behavioral Control (PBC)	5,12	4,94	0,19	0,007
Social Norms (SN)	5,58	5,46	0,12	0,037

The results obtained are in line with the reference literature (Colombelli et al. 2021a, 2022a, 2022b). Further distinguishing by field of study, Challenge-Based Learning courses even have negative effects on social or natural sciences students; on the other hand, the only category on which the effects are all positive is the sample of engineering (incl. architecture) and business students. On these categories, the most statistically significant effects of CBL courses concern the PBC, social norms and self-efficacy variables. These preliminary results confirm that the range of action of the Challenge-Based Learning courses is still limited to the sphere of entrepreneurial skills and less oriented to that of intentions-actions.

Finally, distinguishing by participation in general, optional and compulsory entrepreneurship courses, with the exception of social norms, the differences between the averages of the two groups were all positive and statistically significant at the level of 1%.

Regression Analysis

Results of the regression analysis are shown in Table 5. Models I and II are calculated in the absence of moderation effects while III and IV are the full models.

The results show that the Theory of Planned Behaviour is confirmed: having a positive entrepreneurial attitude (ATT) and a high perceived behavioral control (PBC) - that is, believing in the feasibility of one's idea - increases entrepreneurial intention (EI). A social opinion that encourages entrepreneurship more, on the other hand, would lower the level of entrepreneurial intention but the effect is not statistically significant except in model IV: however, in this model, the joint hypothesis test ($F = 1.19$; $p\text{-value} = 0.3133$) - conducted by imposing social norms = 0 & its interactions ($EE_{elective} \times SN$, $EE_{compulsory} \times SN$, $EE_{challenge} \times SN$) = 0 - confirms the null hypothesis: the overall effect of social norms on entrepreneurial intention is therefore not significant.

Let us now consider the effect of entrepreneurship courses. As shown in model I, participation in general entrepreneurship courses has a positive and significant effect ($p < 5\%$) on entrepreneurial intention. Although in model III the coefficient of $EE_{general}$ is not statistically significant, the joint hypothesis test ($F = 2.37$; $p\text{-value} = 0.0507$) - conducted by imposing $EE_{general} = 0$ & its interactions ($EE_{general} \times Attitude$, $EE_{general} \times PBC$, $EE_{general} \times SN$) = 0 - confirms the significance of the overall positive effect of $EE_{General}$ on EI.

Unlike elective or Challenge-Based Learning courses, in general entrepreneurship courses there is less self-selection: participants in general courses usually arrive with a low level of entrepreneurial intention that is increased by participation in the course.

Also, for this reason, participation in specific entrepreneurship courses (elective, compulsory, challenge-based) has not statistically significant effect on entrepreneurial intention. However, considering the time gap between intention and its translation into entrepreneurial action, it is good to conduct longitudinal studies to assess the direct impact of these specific entrepreneurship courses. Considering instead the moderating role played by Entrepreneurship Education, it emerges that only participation in a Challenge-Based Learning course modestly increases the positive effect of attitude ($\beta = 0.0677$, $p < 0.10$) on entrepreneurial intention; the remaining interactions are not statistically significant. Finally, the analysis of the control variables shows that graduates compared to postgraduates, males compared to females, those who have a parent who is an entrepreneur compared to those who do not, the former all have a higher level of entrepreneurial intention than the latter.

Dependent Variable	Entrepreneurial Intention (EI)			
	Model I	Model II	Model III	Model IV
<i>Attitude (ATT)</i>	0,9099*** (0,1265)	0,9124*** (0,0126)	0,9185*** (0,0154)	0,9144*** (0,0148)
<i>Perceived Behavioral Control (PBC)</i>	0,0669*** (0,0184)	0,0700*** (0,0184)	0,0474** (0,0231)	0,0677*** (0,0222)
<i>Social norms (SN)</i>	-0,0242 (0,0166)	-0,0247 (0,0167)	-0,0231 (0,0216)	-0,0376* (0,0200)
<i>EE_general (Base: Not Attended)</i>	0,1020** (0,0399)		0,0667 (0,2178)	
<i>EE_general X Attitude</i>			-0,0253 (0,0258)	
<i>EE_general X PBC</i>			0,0559 (0,0375)	
<i>EE_general X Social_norms</i>			0,0002 (0,0334)	
<i>EE_challenge (Base: Not Attended)</i>		-0,0537 (0,0594)		-0,3392 (0,3343)
<i>EE_challenge X Attitude</i>				0,0677* (0,0411)
<i>EE_challenge X PBC</i>				0,0217 (0,0531)
<i>EE_challenge X Social_norms</i>				-0,0234 (0,0533)
<i>EE_elective, EE_compulsory</i>		YES		YES
<i>EE_elective ## (ATT, PBC, SN)</i>				YES
<i>EE_compulsory ## (ATT, PBC, SN)</i>				YES
<i>Control Variables</i>	YES	YES	YES	YES
<i>_cons</i>	-0,9908	-0,6519	-0,9691	-1,8044

	(9,9359)	(10,1271)	(9,8542)	(10,1619)
Observations	2473	2473	2473	2473
R-squared	72,15%	72,09%	72,18%	72,18%

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5 CONCLUSIONS

This paper investigates the effectiveness of Entrepreneurship Education methodologies. In particular, the effectiveness of the Challenge-Based Learning approach was investigated within the relationship between the Theory of Planned Behavior and students' entrepreneurial intention. The study was based on data collected through the GUESSS (Global University Entrepreneurial Spirit Students' Survey) 2021 project, specifically on data collected in Italy on about 30 universities. The results show that students who attended a Challenge-Based Learning program show a greater positive effect of entrepreneurial attitude on their entrepreneurial intention, compared to students who attended a program with a different approach. In general, the results confirm the findings of studies in the literature, i.e., the Theory of Planned Behavior positively influences entrepreneurial intention.

The contributions to the literature from this study are several. The first concerns the impact of the Challenge-Based Learning approach in the context of Entrepreneurship Education. This impact is still under-explored in the literature and it is essential for universities to understand it in order to foster the creation of enterprises by students (Zahra and George 2002; Colombelli et al. 2021b) and consequently foster an improvement in the economic context. A second contribution concerns the Theory of Planned Behavior, where we provide further evidence of how this theory can be a predictor of entrepreneurial intention (Schlaegel and Koenig 2014). A further contribution concerns the interaction between the Theory of Planned Behavior and Entrepreneurship Education. There are still few studies in the literature that investigate this interaction, and a closer look in this direction helps to understand the conditions for achieving a high level of effectiveness in Entrepreneurship Education.

After summarizing the results of the study and highlighting the contributions to the literature it is useful to describe the limitations of the study in the hope that they will become insights for future studies. In the literature, intention is referred to as a predictor of behavior and in this study the predictors of intention were investigated. However, there is a time lag between intention and its translation into entrepreneurial action. Consequently, it may be useful to conduct longitudinal studies in order to assess the actual impact of the Challenge-Based Learning approach on the phenomenon of venture creation by students.

REFERENCES

- [1] Ajzen, I. (1991), The theory of planned behavior, *Organizational Behavior and Human Decision Processes*, 50, 179–211.



- [2] Autio, E., Keeley, R.H., Klofsten, M. and Ulfstedt, T. (1997), Entrepreneurial intent among students: testing an intent model in Asia, Scandinavia, and USA. In: Sexton, D.L., Kasarda, J.D. (Eds.), *Frontiers of Entrepreneurial Research*. Babson College Publications, Babson, MA.
- [3] Autio, E., Keeley, R.H., Klofsten, M., Parker, G.C. and Hay, M. (2001), Entrepreneurial Intent among Students in Scandinavia and in the USA, *Enterprise and Innovation Management Studies*, 2(2), 145-160. <https://doi.org/10.1080/14632440110094632>
- [4] Bae, T.J., Qian, S., Miao, C. and Fiet, J.O. (2014), The relationship between entrepreneurship education and entrepreneurial intentions: a meta-analytic review, *Entrepreneurship Theory and Practice*, 38, 217–254.
- [5] Bandura, A. (1986), *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Englewood Cliffs.
- [6] Chanin, R., Santos, A.R., Nascimento, N., Sales, A., Pompermaier, L. and Prikladnicki, R. (2018), Integrating Challenge Based Learning into a Smart Learning Environment: Findings from a Mobile Application Development Course. Paper presented at the International Conference on Software Engineering and Knowledge Engineering, SEKE, San Francisco, CA, USA, July 1–3; pp. 704–6.
- [7] Colombelli A., Loccisano S., Panelli A., Pennisi O.A.M. and Serraino F (2022a), Entrepreneurship Education: The Effects of Challenge-Based Learning on the Entrepreneurial Mindset of University Students, *Administrative Science*, 12, no. 1: 10. <https://doi.org/10.3390/admsci12010010>
- [8] Colombelli A., Panelli A. and Paolucci E. (2021a), The implications of entrepreneurship education on the careers of PhDs: Evidence from the challenge-based learning approach, *CERN IdeaSquare Journal of Experimental Innovation*, 5, pp. 49–55.
- [9] Colombelli A., Panelli A. and Serraino F. (2022b), A Learning-by-Doing Approach to Entrepreneurship Education to Develop the Entrepreneurial Characteristics of University Students, *Administrative Science*, 12, no. 1: 16. <https://doi.org/10.3390/admsci12010016>
- [10] Colombelli, A., De Marco, A., Paolucci, E., Ricci, R. and Scellato, G. (2021b), University technology transfer and the evolution of regional specialization: The case of Turin, *Journal of Technology Transfer*, 46: 933–60.
- [11] Entrialgo, M. and Iglesias., V. (2016), The Moderating Role of Entrepreneurship Education on the Antecedents of Entrepreneurial Intention, *International Entrepreneurship and Management Journal*, 12 (4): 1209–1232.
- [12] Fayolle, A. and Gailly, B. (2004), Using the theory of planned behaviour to assess entrepreneurship teaching programs: a first experimentation, *IntEnt2004 Conference*, pp. 5-7.
- [13] Gorman, G., Hanlon, D. and King, W. (1997), Some research perspectives on entrepreneurship education, enterprise education, and education for small business



management: a ten-year literature review, *International Small Business Journal*, 15, 56–77.

[14] Gubik, S.A. (2014), The Role of Higher Education Institutions in the Entrepreneurship of Hungarian Students, *Theory Methodology Practice*, Club of Economics in Miskolc, 10(1), 71-79.

[15] Johnson, L.F., Smith, R.S., Smythe, J.T. and Varon, R.K. (2009), Challenge-Based Learning: An Approach for Our Time. Available online: <https://files.eric.ed.gov/fulltext/ED505102.pdf>

[16] Karyaningsih, R.P.D., Wibowo, A., Saptono, A. and Narmaditya, B.S. (2020), Does entrepreneurial knowledge influence vocational students' intention? Lessons from Indonesia, *Entrepreneurial Business and Economics Review*, 8(4), 138-155. <https://doi.org/10.15678/EBER.2020.08>

[17] Kautonen, T., van Gelderen, M. and 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>

[18] Koe, W.L. and Majid, I.A. (2014), A Model for Predicting Intention Towards Sustainable Entrepreneurship, *International Journal of Information, Business and Management*, 6 (2): 256–269.

[19] Kolvereid, L. (1996), Prediction of employment status choice intentions, *Entrepreneurship Theory and Practice*, 21, 47–57.

[20] Kramarz, P., Dębski, M. and Luty, L. (2019), Trends in entrepreneurial behaviour among immigrant students: Conclusions from research conducted at the University of Social Sciences, *International Entrepreneurship Review*, 5(4), 25-39. <https://doi.org/10.15678/IER.2019.0504.02>

[21] Krueger, N. F. (2007), What Lies Beneath? The Experiential Essence of Entrepreneurial Thinking, *Entrepreneurship Theory and Practice*, 31: 123–138.

[22] Krueger, N., Reilly, M.D. and Carsrud, A.L. (2000), Competing Models of Entrepreneurial Intentions, *Journal of Business Venturing*, 15(5-6), 411-432. [https://doi.org/10.1016/s0883-9026\(98\)00033-0](https://doi.org/10.1016/s0883-9026(98)00033-0)

[23] Krueger, N.F. Jr and Brazeal, D.V. (1994), Entrepreneurial potential and potential entrepreneurs, *Entrepreneurship Theory and Practice*, Vol. 18 No. 3, pp. 91-104.

[24] Kuratko, D.F. (2005), The emergence of entrepreneurship education: development, trends, and challenges, *Entrepreneurship Theory and Practice*, 29, 577–597.

[25] Liñán, F. and Chen, Y.W. (2009), Development and Cross-Cultural Application of a Specific Instrument to Measure Entrepreneurial Intentions, *Entrepreneurship Theory and Practice*, 33(3), 593-617. <https://doi.org/10.1111/j.1540-6520.2009.00318.x>

[26] Loan, L.T., Doanh, D.C., Thang, H.N., Viet Nga, N.T., Van, P.T. and Hoa, P.T. (2021), Entrepreneurial behaviour: The effects of fear and anxiety of Covid-19 and



- business opportunity recognition, *Entrepreneurial Business and Economics Review*, 9(3), 7-23. <https://doi.org/10.15678/EBER.2021.090301>
- [27] Luthje, C. and Franke, N. (2003), The 'making' of an entrepreneur: testing a model of entrepreneurial intent among engineering students at MIT, *R&D Management*, Vol. 33 No. 2, pp. 135-147.
- [28] Maresch, D., Harms, R., Kailer, N. and Wimmer-Wurm, B. (2016), The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs, *Technological Forecasting and Social Change*, 104(3), 172-179. <https://doi.org/10.1016/j.techfore.2015.11.006>
- [29] Martin, B.C., McNally, J.J. and Kay, M.J. (2013), Examining the formation of human capital in entrepreneurship: a meta-analysis of entrepreneurship education outcomes, *Journal of Business Venturing*, 28, 211–224.
- [30] Martinez, I.M. and Crusat, X. (2020), How Challenge Based Learning Enables Entrepreneurship. Paper presented at the IEEE Global Engineering Education Conference, EDUCON, Porto, Portugal, April 27–30; pp. 210–13.
- [31] Mathur, A. (1998), Examining Trying as a Mediator and Control as a Moderator of Intention Behavior Relationship, *Psychology and Marketing*, 15 (3): 241–259.
- [32] Meyer, N. and Krüger, N. (2021), South African female entrepreneurs' motivational factors: Differences between young and established businesses owners. *Forum Scientiae Oeconomia*, 9(1), 75-90. https://doi.org/10.23762/FSO_VOL9_NO1_5
- [33] Nishimura, J.S. and Tristán, O.M. (2011), Using the Theory of Planned Behavior to Predict Nascent Entrepreneurship, *Academia. Revista Latinoamericana de Administración*, 46, 55-71. Retrieved from <https://www.redalyc.org/articulo.oa?id=71617238005>
- [34] Ozaralli, N. and Rivenburgh, N.K. (2016), Entrepreneurial Intention: Antecedents to Entrepreneurial Behavior in the U.S.A. and Turkey. *Journal of Global Entrepreneurship Research*, 6(3), 2-32. <https://doi.org/10.1186/s40497-016-0047-x>
- [35] Palma-Mendoza, J.A., Rivera, T.C., Solares, I.A., Viscarra Campos, S. and Velazquez, E.P. (2019), Development of Competences in Industrial Engineering Students Immersed in SME's through Challenge Based Learning. Paper presented at the TALE 2019—2019 IEEE International Conference on Engineering, Technology and Education, Yogyakarta, Indonesia, December 10–13.
- [36] Pruett, M., Shinnar, R., Toney, B., Llopis, F. and Fox, J. (2009), Explaining entrepreneurial intentions of university students: a cross-cultural study, *International Journal of Entrepreneurial Behavior & Research*, 15, 571–594.
- [37] Rae, D. and Carswell, M. (2000), Using a life-story approach in entrepreneurial learning: The development of a conceptual model and its implications in the design of learning experiences, *Education and Training*, 42: 220–27.
- [38] Rauch, A.J. and Hulsink, W. (2015), Putting entrepreneurship education where the intention to act lies. An Investigation into the Impact of Entrepreneurship Education



- on Entrepreneurial Behaviour, *Academy of Management Learning & Education*, 14(2), 187-204. <http://dx.doi.org/10.5465/amle.2012.0293>
- [39] Schlaegel, C. and Koenig, M. (2014), Determinants of entrepreneurial intent: a meta-analytic test and integration of competing models, *Entrepreneurship Theory and Practice*, 38, 291–332.
- [40] Schumpeter, J.A. (1934), The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle (1912/1934). Transaction Publishers.–1982.–January, 1, 244.
- [41] Segal, G., Borgia, D. and Schoenfeld, J. (2005), The motivation to become an entrepreneur, *International Journal of Entrepreneurial Behavior & Research*, 11, 42–57.
- [42] Shah I.A., Amjed S. and Jabooob S. (2020), The moderating role of entrepreneurship education in shaping entrepreneurial intentions, *Journal of Economic Structures*, 9(1).
- [43] Shane, S. (2000), Prior knowledge and the discovery of entrepreneurial opportunities, *Organization Science*, Vol. 11 No. 4, pp. 448-469.
- [44] Shapero, A. and Sokol, L. (1982), The social dimensions of entrepreneurship. in Kent, C.A., Sexton, D.L. and Vesper, K.H. (Eds), *Encyclopedia of Entrepreneurship*, Prentice-Hall, Englewood Cliffs, NJ, pp. 72-90.
- [45] Souitaris, V., Zerbinati, S. and 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, 566–591.
- [46] Swan, W., Chang-Schneider, C. and McClarity, K. (2007), Do people's self-views matter?, *American Psychologist*, 62(2), 84–94.
- [47] Turker, D. and Sonmez Selcuk, S. (2009), Which factors affect entrepreneurial intention of university students?, *Journal of European Industrial Training*, 33(2), 142-159. <https://doi.org/10.1108/03090590910939049>
- [48] Wach, K. and Bilan, S. (2021), Public support and administration barriers towards entrepreneurial intentions of students in Poland, *Administratie si Management Public*, 36(1).
- [49] Wach, K. and Wojciechowski, L. (2016), Entrepreneurial Intentions of Students in Poland in the view of Ajzen's Theory of Planned Behaviour, *Entrepreneurial Business and Economics Review*, 4(1), 83-94. <https://doi.org/10.15678/eber.2016.040106>
- [50] Zahra, S.A. and George, G. (2002), Absorptive Capacity: A Review, Reconceptualization, and Extension, *The Academy of Management Review*, 27: 185–203.