jeems.nomos.de

JEEMS

Journal of East European Management Studies

Loretta Huszák | Antti Kauppinen
Sean Patrick Saßmannshausen
Tetiana Sobolieva | Thomas Steger [Eds.]

Special Issue
2024

Entrepreneurship Education in Central and East Europe

Nomos

Table of Contents

Editorial

Loretta Huszák, Antti Kauppinen, Sean Patrick Saßmannshausen, Tetiana Sobolieva, Thomas Steger
Entrepreneurship Education in the Danube Region 7

Articles

Janez Gorenc, Blaž Zupan, Alenka Slavec Gomezel
Analysing the Genesis of Entrepreneurial Intentions for Early Adolescents 15

Janez Gorenc, Alenka Slavec Gomezel, Blaž Zupan
Unveiling the Power of Constructivist Pedagogy in Entrepreneurship Education for Early Adolescents 38

Judit Csákné Filep, Áron Szennay
Entrepreneurship Education Differences between the Generations of Socialism and Post-Socialism 63

Ana Miličević, Milica Simić, Zorica Bogdanović, Marijana Despotović-Zrakić, Marko Suvajdžić
Entrepreneurship Education Approaches: Hackathon and Project-Based Learning 83

Ivan Todorović, Milan Okanović, Slavica Cicvarić Kostić, Igor Pihir, Miha Marič
Entrepreneurial Mindset of Students in Central and Eastern Europe: Factors that Determine Intentions and Actions 112

Katarina Milosavljević, Zoran Rakićević, Jovana Rakićević
Entrepreneurship Education at University: Towards a Review of Effective Learning Models 136

Milica Jovanović, Jelena Anđelković Labrović, Ivana Kužet, Jasna Petković
Roadmap for Competency Development in Entrepreneurship Education: An Action Research 157

Blaž Zupan, Anja Svetina Nabergoj
Designing for Success: A Framework for Integrating Design Thinking into University Entrepreneurship Course 185

Entrepreneurship Education in the Danube Region

*Loretta Huszák, Antti Kauppinen, Sean Patrick Saßmannshausen, Tetiana Sobolieva, Thomas Steger**

Resources for entrepreneurship education are not evenly distributed around the world, and territorial cooperation is often necessary. This is particularly true for the Eastern European region and especially for the Danube region. Entrepreneurship research (including entrepreneurship education) has a long tradition in Western countries but catching up and integration into international networks poses a challenge, especially for Eastern countries. The aim of this special issue is to contribute to the development of this international cooperation by presenting research and best practices in entrepreneurship education in Central and Eastern Europe. The special issue is part of the Danube Cup initiative, which combines entrepreneurship teaching and research to provide opportunities for entrepreneurship educators to benchmark best educational practices and develop inspiring research results in the field of entrepreneurship education.

Keywords: entrepreneurship, entrepreneurship education, entrepreneurship research
JEL Codes: M10, M13, A20

1. Introduction: Designing Entrepreneurship Education Regionally

The development of entrepreneurship programs is ongoing. A comprehensive review of the literature on entrepreneurship education is challenging at best, as educational design is constantly evolving and encompasses an increasing number of disciplines. Research suggests that modern entrepreneurship education needs to provide learning experiences to students rather than only knowledge (e. g., Bell/Bell 2020). One goal of a relevant learning experience is to teach students how to apply the lessons learned in industry (Duh et al. 2020). For example, recent discussions in the literature on the topic of entrepreneurial university refer to education organizations which implement industry-relevant strategies (Majoor-Kozlinska et al. 2024). Such strategies could include actions in which university students and researchers work on projects whose contents (e. g., technological solutions or management knowledge) could be applied in real organizations during and after the courses (see Fuster et al. 2019).

When decision-makers in educational institutions consider adopting an entrepreneurial approach, educators must be strongly committed to using updated working methods (Hadziahmetovic/Dinc 2020). For example, entrepreneurial project work differs from traditional lecturing, where successful participation

* Loretta Huszák (Corvinus University of Budapest)
Antti Kauppinen (Regensburg University of Applied Sciences)
Sean Patrick Saßmannshausen (Regensburg University of Applied Sciences)
Tetiana Sobolieva (Corvinus University of Budapest &
Kyiv National Economic University named after Vadym Hetman)
Thomas Steger (University of Regensburg)

is measured by remembering materials for exams after the course (Laukkanen 2000). In such project work, entrepreneurship educators might consider using regionally known entrepreneurs as motivating mentors and coaches for students who could become entrepreneurs (Rasmussen/Sorheim 2006). In fact, an informed educator could use such role models to encourage students to learn entrepreneurial skills (e. g., conscious risk-taking and creativity) which can contribute to considering entrepreneurship as a career option (Djordjevic et al. 2021).

However, although role models and other resources (e. g., access to capital, information about regulations etc.) are components of entrepreneurship education, they are often not equally distributed across the world (e. g., Thomassen et al. 2020). It is therefore challenging to outline a general model for how entrepreneurship educators could develop new or tailor existing instructional methods, courses, or programs to meet the specific needs of the societies of which their institutions are a part of (see Fayolle, 2013). The regional aspect is crucial because, in addition to resources, national cultures and ecosystems can also affect the development of entrepreneurial skills. For example, national culture can affect entrepreneurial orientation (EO) of teams (Engelen et al. 2014). Research also indicates that country-specific entrepreneurial habits can also affect entrepreneurial intentions (EI) of individual students (Rajkovic et al. 2020). Consequently, entrepreneurship education should carefully consider the regional aspect on multiple levels. This special issue aims to contribute to this regional aspect.

2. Danube Cup Initiative as an Initiator of this Special Issue

The aim of this special issue is to address the challenge faced by entrepreneurship educators in developing and offering relevant entrepreneurship education solutions for the Danube region. It is part of the Danube Cup initiative, which combines entrepreneurship teaching and research in the Danube region. More specifically, the vision of Danube Cup organization is to build a network of higher education institutions which are both committed to scientific rigor and practical relevance. To achieve this vision, the research pillar of the Danube Cup provides an international stage for entrepreneurially-minded students, researchers, and educators (Danube Cup 2024). The hope is that researchers will develop entrepreneurship education solutions which can be tested and used as best practices in various education institutions, particularly in countries along the Danube River. The Danube Cup conferences on entrepreneurship research aim to highlight trends in entrepreneurship/startup education, share experiences and knowledge, and highlight measures which can be implemented at other higher education institutions and accelerators (Huszák/Jáki 2022). The special issue is in keeping with the vision of the Danube Cup research pillar. In fact, the

goal of this special issue is to reveal new entrepreneurship education solutions which could help entrepreneurship educators generate regional impacts.

The 2nd Danube Cup research conference was hosted by the University of Belgrade on 24th and 25th November 2023. The conference organizers collaborated with journals such as *Journal of East European Management Studies* (JEEMS), which aims to promote dialogue and cooperation among scholars seeking to examine, explore and explain the behavior and practices of management within the transforming societies of CEE. In line with the conference session themes, we, as the guest editor team of JEEMS, called for papers for a special issue on entrepreneurship education in the Central and East European region because we believe that entrepreneurship education is a tool which could significantly affect economical and societal transformation processes in the Danube region (Hashi/Krasniqi 2011). In fact, we believe that the cooperative and entrepreneurial efforts of young people (e. g., students) could lead not only to new startups but also result in projects that could bring innovations to existing companies (see Van Vuuren/Alemayehu 2018).

3. Interdisciplinary European Conferences on Entrepreneurship Research – the Missing Link between East and West

In comparison to the United States, the issue of entrepreneurship has reached Europe with a considerable delay. When the first Chair of Entrepreneurship was established in Germany in 1998 at the Oestrich-Winkel Business School (today: EBS University), there were already around 50 such departments in the U.S. (Schmude/Welter/Heumann 2008). The expansion of entrepreneurship research in the western half of Europe also marks the establishment of the Interdisciplinary Conference on Entrepreneurship, Innovation and SMEs ('G-Forum') as an annual national conference in 1997. A further research forum dedicated to entrepreneurship, the Interdisciplinary European Conference on Entrepreneurship Research (IECER), was created in 2005 when academic entrepreneurship research in Western Europe reached a critical mass. IECER was initiated by Michael Dowling (Business Administration, University of Regensburg) and Jürgen Schmude (Economic Geography, University of Regensburg) (Schmude et al. 2008).

Since this critical time in 2005, both conferences have been held on an annual basis, with a different Western European location chosen each year. In our research, we were particularly interested in the proportion of Eastern European researchers as participants at the latest conferences of the two international research networks. The 22. IECER conference was held from September 18–20, 2024, in Innsbruck, Austria at the Management Center Innsbruck | The Entrepreneurial School. The 27th 'G-Forum' was held from September 25–27,

2024, in Ingolstadt, Germany at the Catholic University of Eichstätt-Ingolstadt and the Technische Hochschule Ingolstadt.

As Table 1 reveals (participant numbers were obtained from attendance lists shared with all event participants), there is a noticeable regional concentration of participants from Western Europe. This observation applies to both conferences, with an even higher concentration at the 'G-Forum'. In the case of the 'G-Forum', the high proportion of German participants is due to the 'home-market effect'. In short, we feel that the international character of both conferences can only be demonstrated along Western European dimensions. The proportion of Eastern European participants was notably low (25,83 % at IECER and 11,99 % at 'G-Forum', respectively), which in our view indicates the perceived East-West divide in the field of entrepreneurship research (including entrepreneurship education). In other words, such a strong participation of Western European researchers in major research forums could have such an impact on entrepreneurship education research findings which emphasise a Western approach. In the worst scenario, an overemphasis might result in taken-for-granted insights which might not be applicable worldwide (c. f., Fayolle 2013). As discussed above, cultural and regional differences affect the ways in which students develop their entrepreneurial qualities (Rajkovic/Nikolic/Cockalo/Stojanovic/Kovacic 2020). Therefore, the field of entrepreneurship education would benefit from research and best practices which specifically consider the East European context and its impact on the methods and techniques used by entrepreneurship educators.

Table 1: Regional patterns at IECER and G-forum, 2024

	IECER conference 2024[1]		G-Forum conference 2024[2]	
Total number of participants	120	100.00 %	292	100.00 %
Other than CEE participants	89	74.17 %	257	88.01 %
of which German participants	27	22.50 %	200	68.49 %
CEE participants	31	25.83 %	35	11.99 %

Notes: CEE stands for Central and Eastern Europe and includes countries comprising Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, and the three Baltic States: Estonia, Latvia and Lithuania.

Although the methods of entrepreneurship education are frequently applied and further developed in the CEE region, cooperation between higher education institutions and researchers in Eastern and Western Europe could be stronger. Cooperation is crucial in entrepreneurship education because cooperative activities are often part of key strategies, which can provide critical resources (e. g., university researchers´ innovations) for startups (Fuster et al. 2019). Utilizing

1 https://www.iecer-conference.org/.

2 https://www.fgf-ev.de/en/g-forum-2024-ingolstadt-germany/.

such innovations is important for many startups, but especially for those operating in transition economies, such as countries in the CEE region (Peng 2001). We hope that this special issue will help to fill these gaps by sharing new best practices which entrepreneurship educators could apply when developing and offering regionally relevant entrepreneurship education.

4. Contributions of This Special Issue

The first article in this special issue explores a novel context for entrepreneurship education: primary school. *Janez Gorenc, Blaž Zupan,* and *Alenka Slavec Gomezel* use survey data from Slovenia to explain how primary school education interventions (e. g., weekend events) can support early adolescents´ entrepreneurial intentions and attitudes. In the second article of this special issue, *Janez Gorenc, Alenka Slavec Gomezel,* and *Blaž Zupan* use semi-structured interview data from pupils, their teachers, and principals, again from Slovenia. The authors explicate how a constructivist pedagogy, together with its collaborative and resource mobilizing functions, can improve the entrepreneurial qualities of 11–14-year-old pupils in Slovenia. Thus, the first two papers of this special issue shed light on complex personal and external factors which play a role in entrepreneurship education interventions in the rarely studied context of primary schools (see Salavou/Mamakou/Douglas 2023).

The third article in this special issue also deals with interesting context-based details—not at a specific education level (as in the first two articles) but by analyzing contexts over time. In fact, *Judit Csákné Filep* and *Áron Szennay* analyze entrepreneurship education from the perspective of generational differences. They use Hungary-specific data from the Global Entrepreneurship Monitor (GEM) dataset. The authors suggest that tailored entrepreneurship training programs would be important, as their results revealed a positive correlation between participation in entrepreneurship education and entrepreneurial activity. This finding is interesting because, as discussed in the study, formal entrepreneurship education was less accessible to generations raised during socialism than for generations raised after socialism, which affects entrepreneurial pursuits in such contexts (c. f., Smallbone/Welter 2009; Smallbone et al. 2014).

The fourth article in this special issue compares hackathons and project-based learning (PBL) instruction methods. Using their survey data from Serbia, *Ana Miličević, Milica Simić, Zorica Bogdanović, Marijana Despotović-Zrakić,* and *Marko Suvajdžić´* suggest that both hackathons and PBL can influence entrepreneurial behavior and mindset. However, the authors also add that these methods might support different entrepreneurial skills. Among their implications, the authors reveal that hackathons (i. e., informal education) are particularly effective at fostering creativity while PBL (i. e., formal education) might be more efficient in developing students´ soft skills. Additionally, the authors

found that their sample of students preferred hackathons over PBL. The topic of student experiences could be an interesting avenue for future research, for example, to test whether students´ positive course experiences affect their competitiveness and effectiveness outside the education environment after the educational interventions (Huq/Gilbert 2017).

In the fifth article of this special issue, *Ivan Todorović, Milan Okanović, Slavica Cicvarić Kostić, Igor Pihir,* and *Miha Marič* contribute to the discussion on informal versus formal types of entrepreneurship education. One of their implications suggests that extracurricular activities can affect different entrepreneurial mindset types (e. g., elaborating mindset, implementation mindset, and compulsiveness) more strongly than formal entrepreneurship education does. The authors collected their data in Slovenia, Croatia, and Serbia, and they discuss their results in light of demographics (e. g., gender, startup experience, family background). Such a multinational data analysis provides interesting insights into how cultural differences impact on the development of entrepreneurial qualities in the CEE region (c. f., Mali/Kuzmanovic/Nicolic/Mitic/Stojanovic 2020).

In the sixth article of this special issue, *Katarina Milosavljević, Zoran M. Rakićević,* and *Jovana Rakićević* review existing research on effective learning models used in entrepreneurship education at universities. The authors take a global approach and conclude that effective learning models can be classified as generalized, augmented, motivational, or training types. They outline an agenda for how these learning model types could be used effectively to achieve entrepreneurship education goals. Although some literature reviews have been published, such as Thomassen et al.´s (2020) literature review on entrepreneurship education contexts, Milosavljević and colleagues´ specific focus on effective learning models provides details for entrepreneurship educators´ course design purposes in the higher education context.

In the seventh article of this special issue, *Milica Jovanović, Jelena Anđelković Labrović, Ivana Kužet,* and *Jasna Petković* also present a model which could help design higher education courses. The authors develop a "multidisciplinary roadmap" which represents a pedagogical strategy for developing entrepreneurial competencies. Their "roadmap" includes soft and technical skills and incorporates technology entrepreneurship and human resource management tools. The authors designed and tested their pedagogical strategy contribution through action research conducted over two cycles and with two generations of students in Serbia. The "roadmap" aims to foster students´ creativity, idea validation, and teamwork. The authors contribute to the understanding of learning-by-doing as an effective instruction method for entrepreneurship education in higher education (c. f., Rasmussen/Sorensen 2006).

The final article in this special issue tests and reports on how entrepreneurship educators could integrate a design thinking-based instruction method into uni-

versity teaching. More specifically, *Blaž Zupan* and *Anja Svetina Nabergoj* conducted in-depth interviews with educators and students at universities in Slovenia, United Kingdom, and the United States. They found that both environmental factors (e. g., mentoring, tools, and spaces as well as external recognition) and process factors (e. g., interdisciplinarity, fieldwork, experimentation, and user-centered research) are key components of university courses applying design thinking. The authors state that these components might support students´ entrepreneurial work as their university courses conclude. The implications are intended to help future entrepreneurship educators apply Brown´s (2008) design thinking concepts to ensure the continuity of entrepreneurship education participants´ projects and improve their learning experiences (c. f., Sarooghi et al. 2019).

Literature

Bell, R./Bell, H. (2020): Applying educational theory to develop a framework to support the delivery of experiential entrepreneurship education. Journal of Small Business and Enterprise Development, 27(6), 987- 1004.

Brown, T. (2008): Design thinking. Harvard Business Review, 86(6), 84–92.

Danube Cup (2024): Home: https://danubecup.eu/

Djordjevic, D./Cockalo, D./Bogetic, S./Bakator, M. (2021): Modeling youth entrepreneurship intentions. Journal of East European Management Studies, 26(4), 617 – 638.

Duh, M./Belak, J./Strukelj, T. (2020): Innovative approach to developing competencies for business practice. In: Babić, V. & Nedelko, Z. (Eds.): Handbook of Research on Enhancing Innovation in Higher Education Institutions, IGI Global, pp. 428 – 463.

Engelen, A./Flatten, T. C./Thalmann, J./Brettel, M. (2014): The effect of organizational culture on entrepreneurial orientation: a comparison between Germany and Thailand. Journal of Small Business Management, 52(4), 732 – 752.

Fayolle, A. (2013): Personal views on the future of entrepreneurship education. Entrepreneurship & Regional Development, 25(7), 692 – 701.

Fuster, E./Padilla-Melendez, A./Lockert, N./del-Aquira-Obra, A. R. (2019): The emerging role of university spin-off companies in developing regional entrepreneurial university ecosystems: the case of Andalusia. Technological Forecasting & Social Change, 141, 219 – 231.

Hadziahmetovic, N./Dinc, M. S. (2020): Linking reward types to organizational performance in Central and East European universities. Journal of East European Management Studies, 25(2), 325 – 359.

Hashi, I./Krasniqi, B. A. (2011): Entrepreneurship and SME growth: evidence from advanced and laggard transition economies. International Journal of Entrepreneurial Behavior & Research, 17(5), 456 – 487.

Huszák, L./Jáki, E./Borda, Á./Vecsenyi, J. (2022): Quo vadis entrepreneurship education? Conference Aims and Subject Areas. In: Huszák, L./Jáki. E. (Eds.), Danube Cup Conference 2022: Book of Abstract, Corvinus University of Budapest, 11–15.

Huq, A./Gilbert, D. (2017): All the world´s stage: transforming entrepreneurship education through design thinking. Education + Training, 59(2), 155 – 170.

Kalar, B. (2020): The entrepreneurial university and academics´ engagement in industry interactions. Journal of East European Management Studies, 25(4), 671 – 697.

Laukkanen, M. (2000): Exploring alternative approaches in high-level entrepreneurship education: creating micromechanisms for endogenous regional growth. Entrepreneurship & Regional Development, 12(1), 25- 47.

Majoor-Kozlinska, I./Hytti, U./Stenholm, P. (2024): Academics and entrepreneurs: enablers of hybrid identity centrality among university researchers. Journal of Small Business Management, DOI: https://dx.doi.org/10.2139/ssrn.4483028.

Mali, P./Kuzmanovic, B./Nicolic, M./Mitic, S./Stojanovic, E. T. (2020): The influence of organizational culture on the entrepreneurial intentions of employed person: the Serbian case. Journal of East European Management Studies, 25(4), 753 – 791.

Peng, M. W. (2001): How entrepreneurs create wealth in transition economies. Academy of Management Perspectives, 15(1), 95–108.

Rajkovic, J./Nikolic/M./Cockalo, D./Stojanovic, T./Kovacic, S. (2020): National culture and the entrepreneurial intentions of students in Serbia. Journal of East European Management Studies, 25(1), 105 – 141.

Rasmussen, E. A./Sorheim, R. (2006): Action-based entrepreneurship education. Technovation, 26, 185 – 194.

Salavou, H./Mamakou, X./Douglas, E. (2023): Entrepreneurial intention in adolescents: The impact of psychological capital. Journal of Business Research, 164, 114017.

Sarooghi, H./Sunny, S./Hornsby, J./Fernbaker, S. (2019): Design thinking and entrepreneurship education: where are we, and what are the possibilities? Journal of Small Business Management, 57(1), 78 – 93.

Schmude, J./Welter, F./Heumann, S. (2008): Entrepreneurship research in Germany. Entrepreneurship Theory and Practice, 32(2), 289 – 311.

Smallbone, D./Welter, F. (2009): Entrepreneurship and Small Business Development in Post-Socialist Economies: London, UK: Routledge.

Smallbone, D./Welter, F./Ateljevic, J. (2014): Entrepreneurship in emerging market economies: contemporary issues and perspectives. International Small Business Journal, 32(2), 113 – 116.

Srivastava, M./Scali, M. (2024): The effect of leadership on entrepreneurial orientation, learning and internationalisation performance: a case of Czech firms. Journal of East European Management Studies, 29(1), 181 – 208.

Thomassen, M. L./Williams-Middleton, K./Ramsgaard, M. B./Neergaard, H./Warren, L. (2020): Conceptualizing context in entrepreneurship education: a literature review. International Journal of Entrepreneurial Behavior & Research, 26(5), 863–886.

Van Vuuren, J./Alemayehu, B. Z. (2018): The role of entrepreneurship in transforming efficiency economies into innovation-based economies. The Southern African Journal of Entrepreneurship and Small Business Management, 10(1), 1–12.

Analysing the Genesis of Entrepreneurial Intentions for Early Adolescents*

*Janez Gorenc, Blaž Zupan, Alenka Slavec Gomezel***

Abstract

The study examines the relationships between attitude towards entrepreneurship, entrepreneurship competence, and entrepreneurial self-efficacy in the formation of entrepreneurial intentions among early adolescents participating in entrepreneurship education programs. A theoretical model based on the Theory of planned behaviour was empirically tested using data from a weekend entrepreneurship education program across 13 primary schools. The findings support the proposed model, revealing that entrepreneurship competence positively influences intentions, mediated by attitude and moderated by self-efficacy. The observations offer new insights into applying the Theory of planned behaviour in entrepreneurship education for early adolescents and practical recommendations for educators on key focus areas.

Keywords: Entrepreneurial intentions, Theory of planned behaviour, entrepreneurship education program, primary school, moderated mediation.
JEL Codes: A21, L26, I21

1. Introduction

Learning outcomes of entrepreneurship education (EE) programs are a widely researched phenomenon as they are viewed as a path towards solving many of today's and future societies (Aamir et al., 2019). Entrepreneurial intentions are among the most studied entrepreneurial learning outcomes in EE programs as researchers wish to determine whether the participants plan to embark on a path of entrepreneurial behaviour. Similarly, Ajzen's (1991) Theory of planned behaviour (TPB) is one of the most widely used intention theories to explain the formation of entrepreneurial intentions (Aamir et al., 2019; Galvao et al., 2018). The process of entrepreneurial intention formation as an outcome of EE

* Received: 26.1.24, accepted: 30.8.24, 2 revisions.
This article is based on a research chapter in: Gorenc, J. (2024). *An investigation into the Factors Related to Learning Outcomes in Primary School Entrepreneurship Programs*. [Doctoral Dissertation, University of Ljubljana]. Ljubljana.

** *Janez Gorenc*, M.Sc., Assistant, School of Economics and Business, University of Ljubljana. Email: janez.gorenc@ef.uni-lj.si. Main research interest: learning outcomes of entrepreneurship education, development of entrepreneurship competence, green entrepreneurship.
Blaž Zupan, Ph.D., Assistant Professor, School of Economics and Business, University of Ljubljana. Email: blaz.zupan@ef.uni-lj.si. Main research interest: entrepreneurship education, new product development, family business, design thinking.
Alenka Slavec Gomezel (Corresponding author), Ph.D., Associate Professor, School of Economics and Business, University of Ljubljana. Email: alenka.slavec@ef.uni-lj.si. Main research interest: entrepreneurial personality, entrepreneurial well-being, social entrepreneurship.

programs is typically studied at the university level due to the proximity of the beginning of the student's career, potentially of self-employment (Boubker et al., 2021). Furthermore, at all levels of education, EE programs have been demonstrated to yield a positive development of entrepreneurial learning outcomes (Aamir et al., 2019; Brüne & Lutz, 2020).

However, several researchers point out that early adolescence is the optimal time to start building entrepreneurship competence, attitude towards entrepreneurship, and entrepreneurial self-efficacy (Huber et al., 2014; Rosário et al., 2014). Moreover, early adolescents, thus pupils 10–14 years of age, already have career aspirations (Archer et al., 2014; Lazarides et al., 2020). This age, therefore, can also be seen as essential for developing the pupils' entrepreneurial intentions, which are substantial predictors of future entrepreneurial behaviour and, consequently, careers (Ajzen, 1991). As early adolescents are at a different emotional and cognitive developmental stage than their older peers, research into entrepreneurial intention formation in late adolescents or adults cannot be freely applied to early adolescents (Aamir et al., 2019; Galvao et al., 2018).

The present study thus investigates how entrepreneurial intentions form in early adolescents and what role other entrepreneurial learning outcomes play in shaping entrepreneurial intentions. The contribution of the present study is twofold. Firstly, it investigates the formation of entrepreneurial intentions in early adolescents. Thus, the study contributes to the knowledge of the psychological process of intention formation in early adolescents with budding career aspirations (Archer et al., 2014; Lazarides et al., 2020). Second, utilising TPB to conceptualise a theoretical entrepreneurial intention model for early adolescents and empirically testing it contributes to a broader understanding of TPB. The study also proposes a novel way in which the antecedents in the model interact with intentions and each other.

2. Literature review and hypotheses development

2.1 Theory of planned behaviour and entrepreneurial intentions

Entrepreneurial intentions are generally defined as a self-perceived belief of an individual in the likelihood that they will become entrepreneurs in the future or even as the first step towards becoming an entrepreneur (Krueger et al., 2000; Liñán & Chen, 2009). While this description of entrepreneurial intentions may seem more applicable to university and secondary school students closer to beginning their careers, early adolescents are already starting to shape their career aspirations (Archer et al., 2014; Lazarides et al., 2020). Exposing early adolescents to the dynamic environment of startup weekends may foster entrepreneurial intentions, potentially increasing their propensity towards pursuing self-employment as a viable career path (Ashby & Schoon, 2010), which is one of the aims of the given EE programs (SPIRIT Slovenija, 2019). Entrepreneurial

intentions as an outcome of EE programs usually develop in unison with or as a consequence of other entrepreneurial learning outcomes. Amongst the theoretical models that describe the formation of entrepreneurial intentions and thus predict future entrepreneurial behaviour of individuals, Ajzen's (1991) TPB is the most widely used. According to TPB, intentions are the best predictors of an individual's future behaviour (Ajzen, 1991). In entrepreneurship, many authors have used the theoretical model where three antecedents precede entrepreneurial intentions, the attitude towards entrepreneurship of the individual and the people around them, and subjective norms (Aamir et al., 2019; Boubker et al., 2021). Some researchers have also added entrepreneurship competence as one of the antecedents (Liñán & Chen, 2009).

TPB is often employed to describe how entrepreneurial intentions form with university and secondary EE programs. Also, attitude towards entrepreneurship and entrepreneurial self-efficacy have consistently been demonstrated as antecedents of entrepreneurial intentions (Aamir et al., 2019; Galvao et al., 2018). In primary school EE programs, where entrepreneurship competence is considered to be the most desired learning outcome of the participants because it is believed to improve an individual's social and economic welfare later in life (Cunha & Heckman, 2008; Huber et al., 2014), the process of entrepreneurial intention formation is not the focus of to-date research (Huber et al., 2014). However, entrepreneurial intentions can develop from EE programs in early adolescence as collaborative activities, idea generation and sharing, and other entrepreneurial exercises influence participants' perceptions of and aspirations towards entrepreneurship as a career path. For instance, when early adolescents engage in sandbox entrepreneurship activities like business modelling or prototyping, they gain practical experience with entrepreneurial processes, potentially increasing their interest in entrepreneurial careers (Garcia-Rodriguez et al., 2019; Jardim et al., 2023). Also, early adolescents have often demonstrated improved entrepreneurship competence, entrepreneurial self-efficacy, and attitude towards entrepreneurship due to EE programs (Huber et al., 2014).

2.2 Entrepreneurship Education Programs

Programs for entrepreneurship education worldwide have demonstrated a positive impact on the development of entrepreneurship competence, attitude towards entrepreneurship, entrepreneurial self-efficacy, entrepreneurial intentions themselves (Galvao et al., 2018), and on a higher probability of new resulting businesses (DeGeorge & Fayolle, 2008; Elert et al., 2015). Research also demonstrates that competence is best fostered in early adolescence or sooner, and early adolescents are the most apt population for entrepreneurial learning and benefit most from EE programs. This age group is more closely connected with their peers and teachers, making mentored teamwork more enjoyable for

them than their older counterparts (Clark-Lempers et al., 1991; Ratelle et al., 2023). Also, entrepreneurship competence acquired early is believed to foster an individual's welfare in adulthood (Cunha & Heckman, 2008; Garcia-Rodriguez et al., 2019).

For instance, Huber et al. (2014) studied the *BizWorld* EE program with early adolescents. The study measured the potential increase of different dimensions of entrepreneurship competence, entrepreneurial self-efficacy, and entrepreneurial intentions and demonstrated that all but one measured dimension of entrepreneurship competence had increased, as had entrepreneurial self-efficacy. Entrepreneurial intentions, however, had decreased (Huber et al., 2014).

Analogously, Garcia-Rodriguez et al. (2019) described the success of the Spanish *Enterprise in School* EE program studied with early adolescents. In this EE program, similar to *YESS!* and *BizWorld*, pupils founded and ran a company that produced and sold products to schoolmates at a school fair. The study found that the EE program had fostered specific constructs of entrepreneurial learning, such as attitude towards entrepreneurship, entrepreneurial intention, and some dimensions of entrepreneurship competence (Garcia-Rodriguez et al., 2019). The EE program examples work to demonstrate that such school initiatives for early adolescents do, in fact, foster measurable entrepreneurial learning outcomes.

Other EE programs, such as the startup weekend program, only last a few days and are designed to help participants go from idea through team formation, market research, prototyping, and business modelling to the conception of actual startups. Startup weekends are 3-day (Sergent et al., 2021) or 2-day (Thompson & Illes, 2021) events focusing on the startup stage of a firm or the opportunity identification stage, where uncertainty is high, and there is much stress involved (Sergent et al., 2021). While startup weekends are primarily organised for adult entrepreneurs or students (Krueger, 2014; Thompson & Illes, 2021), it is also suitable for early adolescents who are more prone to view stressful situations, a frequent phenomenon at startup weekends, as an adventure than their older counterparts (Stepánková et al., 2023).

Entrepreneurial intentions, conceptualised as an individual's self-perceived probability of pursuing entrepreneurship, are increasingly recognised as relevant for early adolescents' career path development. Exposure to entrepreneurial environments, such as startup weekends, may catalyse these intentions. TPB provides a theoretical framework for understanding the process of entrepreneurial intention formation, encompassing attitude towards entrepreneurship, entrepreneurial self-efficacy, and entrepreneurship competence as its antecedents. While predominantly applied in tertiary education, research demonstrates that entrepreneurial intentions can be fostered through EE programs promoting collaborative work and practical experience in early adolescence. Empirical evi-

dence from diverse EE programs worldwide demonstrates positive outcomes in entrepreneurship competence, attitude towards entrepreneurship, entrepreneurial self-efficacy, and entrepreneurial intentions. Notably, early adolescence is a critical developmental period for entrepreneurial learning.

2.3 Hypothesis development

2.3.1 Entrepreneurship Competence

Competence represents the amalgam of the knowledge, skills, and attitude needed to accomplish a specific task (Baartman & de Bruijn, 2011). Entrepreneurship competence is often included in various TPB-based intention models in university and secondary-school level EE research with a significant direct or indirect impact on intention formation (Fayolle & Gailly, 2015; Rosique-Blasco et al., 2018). Likewise, An individual's mastery of entrepreneurship competence influences the individual's attitude towards entrepreneurship deeply (Fayolle & Gailly, 2015; Liñán, 2008).

However, early adolescents may face more significant challenges in developing entrepreneurship competence compared to older individuals due to their ongoing emotional and cognitive development and relatively limited life experiences (Sagone et al., 2020; Spiekerman & Rose, 2024; Stepánková et al., 2023). Consequently, lower perceived competence may lead to lower levels of satisfaction with the results of their work, possibly directly affecting entrepreneurial self-efficacy, attitude towards entrepreneurship, and entrepreneurial intentions (Ratelle et al., 2023).

While the process of entrepreneurial intention formation with all antecedents has not yet been researched for early adolescents, nor has a theoretical model of entrepreneurial intentions been proposed for this age group, some studies did contemporaneously measure entrepreneurship competence, attitude towards entrepreneurship, and entrepreneurial intentions. For instance, Barba-Sánchez and Atienza-Sahuquillo (2016) longitudinally studied the entrepreneurial learning outcomes of a three-term EE program with early adolescents in rural Spain. The EE program, explicitly designed to help promote entrepreneurship in a country suffering from unemployment, was carried out in the Rural Schools Grouped Together (*Colegio Rural Agrupado*). The participants founded a company and designed all the accompanying materials like the company name and logo, determined the needed startup capital, designed and manufactured products, and finally marketed and sold them in a real-life market. The study found that the pupils' entrepreneurship competence, attitude towards entrepreneurship, and entrepreneurial intentions had improved during the EE program. However, what separated this age group from their older counterparts, the researchers observed, was that the early adolescents' primary motivation was not money-making but rather doing something they liked.

Similarly, Tsakiridou and Stergiou (2014), in a study of an EE program in Western Macedonia, Greece, demonstrated that the participating pupils' entrepreneurship competence and entrepreneurial intentions had improved. Finally, in the Mexican *My First Company* EE program with 11–12-year-olds, Cárcamo-Solís et al. (2017) found that the pupils had developed both their entrepreneurship competence and attitude towards entrepreneurship. The EE program, where participants, as opposed to older participants of EE programs, mainly learned through playful activities, helped the pupils improve entrepreneurship competence and attitude towards entrepreneurship. We can thus set the following hypotheses.

Hypothesis 1: Entrepreneurship competence will be directly and positively related to entrepreneurial intentions for early adolescents participating in the EE program.

Hypothesis 2: Entrepreneurship competence will be directly and positively related to the attitude towards entrepreneurship of early adolescents participating in the EE program.

2.3.2 Attitude towards entrepreneurship

Goel et al. (2007) define attitude towards entrepreneurship as a construct where the individual's attitude towards entrepreneurship and entrepreneurs coalesce. Studies demonstrate that attitude towards entrepreneurship significantly impacts an individual's entrepreneurial intentions, thus making a future entrepreneurial career appear more attractive and desirable (Ajzen, 1991; Liñán, 2008).

While infrequently, some primary school EE program studies measure attitude towards entrepreneurship and entrepreneurial intentions. For instance, when Garcia-Rodriguez et al. (2019) investigated the impact of their Spanish primary school EE program on attitude towards entrepreneurship and entrepreneurial intentions, they discovered that the two constructs indeed improve. Also, in the study of the *Rural Schools Grouped Together* EE program in Spain by Barba-Sánchez and Atienza-Sahuquillo (2016), the pupils' attitude towards entrepreneurship developed in the sense that they changed their minds about who an entrepreneur was in the sense that they were not merely boss but rather someone who worked hard and took risks to make or lose money. Also, their entrepreneurial intentions changed such that they did not feel averse to the idea of starting a firm in their adulthood. In both the mentioned cases, the pupils stated that they enjoyed getting the job done and working with teammates most and that their prime motivation is the fun of such work, not the financial benefits. This conclusion, which aligns with studies demonstrating that early adolescents have stronger connections to their friends than in later years (Clark-Lempers

et al., 1991; Spiekerman & Rose, 2024), differentiates them from secondary or tertiary education students. Therefore, the following hypothesis can be posited:

Hypothesis 3: Attitude towards entrepreneurship will be directly and positively related to entrepreneurial intentions for early adolescents participating in the EE program.

We also argue that attitude towards entrepreneurship mediates the relationship between entrepreneurship competence and entrepreneurial intentions. In the proposed theoretical model of entrepreneurial intentions, entrepreneurship competence is hypothesised to influence attitude towards entrepreneurship, which in turn predicts entrepreneurial intentions (Liñán, 2008; Liñán & Chen, 2009). This reasoning leads to the following hypothesis:

Hypothesis 4: Attitude towards entrepreneurship will mediate the relationship between entrepreneurship competence and entrepreneurial intentions.

2.3.3 Entrepreneurial self-efficacy

In entrepreneurship, entrepreneurial self-efficacy constitutes an individual's self-perceived capacity to start and run a business successfully (Galvao et al., 2018). For Boyd and Vozikis (1994), entrepreneurial self-efficacy defines how an individual judges internal and external obstacles to success in an entrepreneurial activity. Entrepreneurial self-efficacy can be viewed as a task-specific construct necessary for forming entrepreneurial intentions. Thus, developing entrepreneurial self-efficacy alongside or before entrepreneurial intentions is crucial in early adolescents as they shape their career aspirations (Archer et al., 2014; Lazarides et al., 2020).

While recognised as an antecedent of entrepreneurial intentions in TPB, pupils' entrepreneurial self-efficacy strengthens the positive relationship between entrepreneurship competence and attitude towards entrepreneurship for pupils participating in EE programs. Specifically, entrepreneurial self-efficacy will enhance positive attitudes towards entrepreneurship through beliefs in one's capabilities of successfully performing entrepreneurial tasks during an EE program (Boyd & Vozikis, 1994). Higher entrepreneurial self-efficacy means reinforcing a person's belief that they can perform a specific activity successfully, especially in combination with entrepreneurship competence. Entrepreneurial self-efficacy will allow the early adolescent to assess their entrepreneurship competence higher, which will usher in a positive attitude towards entrepreneurship. Therefore, it can be conjectured that entrepreneurial self-efficacy would moderate the impact entrepreneurship competence has on attitude towards entrepreneurship (Pham et al., 2023).

Some studies of primary school EE programs show that the three constructs are measured contemporaneously. For instance, Cárcamo-Solís et al. (2017), in their research on the rural primary school EE program, determined that not only were entrepreneurship competence and attitude towards entrepreneurship impacted positively, but so was entrepreneurial self-efficacy developed with the other two constructs. Also, Tsakiridou and Stergiou (2014) demonstrated that the development of entrepreneurship competence, attitude towards entrepreneurship, and entrepreneurial self-efficacy are connected. Namely, specific dimensions of entrepreneurship competence increased with entrepreneurial self-efficacy, attitude towards entrepreneurship, and entrepreneurial intentions.

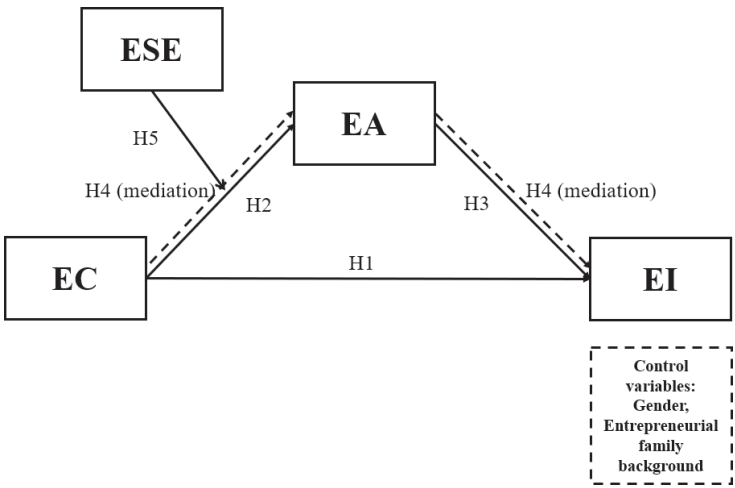
Thus, the following hypothesis can be set:

Hypothesis 5: Entrepreneurial self-efficacy will moderate the relationship between entrepreneurship competence and attitude towards entrepreneurship for pupils participating in the EE program.

2.3.4 Proposed entrepreneurial intentions model

The entrepreneurial intention model that we propose is based on Ajzen's (1991) TPB model but with some adaptations. It is a moderated mediation where entrepreneurial intention (EI) is the dependent variable, entrepreneurship competence (EC) is the independent variable, and attitude towards entrepreneurship (EA) is the mediator. Entrepreneurial self-efficacy (ESE) moderates the relationship between entrepreneurship competence and attitude towards entrepreneurship. Gender and entrepreneurial family background are control variables. The theoretical model is presented in Figure 1.

Figure 1: Proposed Entrepreneurial Intention Model based on Ajzen's TPB



3. Methods

3.1 Research setting

Data were collected at the end of the startup weekend EE program organised within the Slovenian *Creativity, Entrepreneurship, and Innovation* project to improve pupils' entrepreneurship competence, entrepreneurial self-efficacy, and attitude towards entrepreneurship through developing their business ideas. The project also sought to heighten the participants' entrepreneurial intentions by showing entrepreneurship as a possible career choice (SPIRIT Slovenija, 2019).

The studied EE program was a startup weekend event organised for early adolescents. On Friday at noon, pupil teams identified authentic problems that specific groups of people faced. The pupils first participated in a market research workshop, then, with the help of teachers and an outside expert, researched the problem by surveying potential customers and prototyped solutions to the problem that customers would be willing to buy. On Friday evening or Saturday morning, pupils tested the prototypes with potential customers and started collecting their emails for later marketing use. Saturday morning was reserved for the business modelling workshop, allowing pupils to define marketing and sales channels and lay out a financial plan. Finally, on Saturday afternoon, the pupils participated in a pitching workshop, where they learned to pitch their ideas effectively. At the end of the startup weekend on Saturday evening, teams pitched their business models to a panel of entrepreneurs, after which the judges declared the best three teams in terms of most excellent progress. Pupils did much of the work in the city centre, where they interviewed their prospective customers to understand the problem and test the prototypes.

Four outside experts who were trained to work for startup incubators or were startup founders (SPIRIT Slovenija, 2019) and school teachers, who also provided constant assistance to the teams, facilitated the startup weekend EE programs. The teachers had varying levels of experience and training but had all undergone mandatory 16-hour training for entrepreneurship educators (SPIRIT Slovenija, 2017).

3.2 Sample and data collection

In the EE program, 108 pupils aged 9–15 participated; one pupil was nine years old, one was 15, and the rest were 10–14 with an average age of 12.7 years from classes 6–9 from 13 Slovenian primary schools. Most participants, 85, joined the EE program of their own volition. Approximately half had prior experience with EE programs, and about 30 % had plans to attend an entrepreneurship competition four months later. Gender-wise, girls represented 58 % of the participants. In all, 44 % had an entrepreneurial family background. The pupils were sent the

questionnaires in digital form on Saturday evening at the end of the program. Most pupils answered the survey immediately, some a few days later.

3.3 Measures

In our study, we used previously validated measurement scales. The items, translated from English to Slovene using translation-back-translation (Brislin, 1970), were scored on a five-point Likert scale, where 1 = totally disagree and 5 = totally agree. The items featured in the measurement scales are presented in Table 1.

The dependent variable, entrepreneurial intentions, was measured with the following item, adapted from Liñán and Chen (2009): "I might become an entrepreneur someday."

Entrepreneurship competence was measured with 12 items featuring the first-level competence descriptors from EntreComp. The EntreComp comprises 15 entrepreneurship competence dimensions organised into 3 clusters: *Ideas and Opportunities*, *Resources*, and *Into Action*. Each of the 3 clusters consists of five specific entrepreneurship competence dimensions that fit together according to the knowledge, skills, or attitudes they cover (Bacigalupo et al., 2016). One dimension was taken from each cluster to cover as broad a spectrum of entrepreneurship competence as possible. The 12 items in the questionnaire pertained to the following dimensions: *Spotting opportunities*, *Motivation and perseverance*, and *Working with others*.

The *Spotting opportunities* dimension of entrepreneurship competence is the capacity to spot opportunities for creating value for others that other non-entrepreneurial individuals have missed (Dyer et al., 2008; Morris et al., 2013). *Motivation and perseverance* is the ability to persevere in the face of adverse conditions and setbacks that a prospective entrepreneur might face when developing and executing their business model (Huber et al., 2014; Morris et al., 2013). Finally, working with others is the capacity to interact socially and establish relationships to help the individual develop their entrepreneurship project (Dyer et al., 2008; Morris et al., 2013).

The entrepreneurship competence scales with the initial 55 items that measured the original 15 EntreComp dimensions were tested in a pilot study with 21 pupils. The scales proved to be too extensive, so based on the feedback of the pupils and further statistical operations for determining loadings, cross-loadings, and reliability, the number of dimensions was reduced to the three described above as they had the highest reliabilities in each EntreComp cluster. The reliabilities were tested with Cronbach's alpha (α), which were as follows: *Spotting opportunities* =.89, *Motivation and perseverance* =.88, and *Working with* others

=.83. The value of the α is acceptable for research of this sort (Fayolle & Gailly, 2015).

Further, attitude towards entrepreneurship was measured with a four-item scale, scored on a five-point Likert scale, where 1 = totally disagree and 5 = totally agree. Measurement scales developed by Liñán and Chen (2009) were adapted to suit early adolescents. The reliability of the attitude towards entrepreneurship construct was satisfactory at α =.83

Lastly, entrepreneurial self-efficacy was measured by three items taken from the EntreComp first-level descriptors for *Self-awareness and self-efficacy* (Bacigalupo et al., 2016). Although EntreComp includes attitude towards entrepreneurship into its entrepreneurship competence framework, this study sets it as an independent construct as it is such in various intention models (Ajzen, 1991; Krueger et al., 2000; Liñán, 2008). The reliability was satisfactory at α =.83. The items featured in the survey can be seen in Table 1.

To determine whether gender and entrepreneurial family background have any statistically significant effect on the relationships between entrepreneurial intentions and its antecedents, two control variables, *Gender* and *Entrepreneurial family background*, were introduced. They were measured as dichotomous variables where *Male* = 1*, Female* = 0, *Entrepreneurial family background* = 1*, and Non-entrepreneurial family background* = 2, respectively.

3.4 Statistical procedures and data analysis

A confirmatory factor analysis was performed on the measurement model, and the goodness of fit indices of comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardised root mean square residual (SRMR) were observed to inspect the validity and reliability of the constructs comprising the theoretical model. The goodness of fit indices of the final measurement model demonstrated good fit with the following values: X^2 = 293.562, df = 192, CFI =.930, *p* =.000, RMSEA =.070 with the lower end of the 90 % confidence interval at LO90 =.054 and the higher end at HI90 =.086, and SRMR =.0601. The standardised estimates of the measurement model are presented in Table 1.

The confirmatory factor analysis indicated a good fit between the data and the latent and control variables. The items comprising the latent variables were summated for the theoretical model to create composite variables. The composites were also tested in a measurement model that yielded the following fit index values: X^2 = 0.475, df = 1, CFI = 1.000, *p =.491*, RMSEA =.000 with LO90 =.000 and HI90 =.224, and SRMR =.150.

Lastly, the proposed theoretical model with moderated mediation was analysed and tested. The goodness of fit indices demonstrated good fit with the following

values: X^2 = 18.043, df = 11, CFI =.970, p =.081, RMSEA =.077 with LO90 =.000 and HI90 =.218, and SRMR =.068. The Hayes method (Hayes, 2013) was then employed to obtain the lower and upper bounds of the confidence interval. The bootstrap method was used with 5000 simulations to test the hypotheses on the model. The goodness of fit indices demonstrated a very good fit. The IBM SPSS 21.0 and IBM AMOS 20.0 statistical software applications were used to perform the statistical analyses.

4. Results

Hypothesis 1 postulated that entrepreneurship competence would be directly and positively related to entrepreneurial intentions. The analysis yielded the following results: β = -.190, p =.816. Also, after 5000 bootstrapping simulations, the lower and higher limits of the 90 % bias constrained and accelerated (BCa) CI of the direct effect between entrepreneurship competence and entrepreneurial intentions were LI90 = -.161 and HI90 =.100, respectively, with p =.613. H1 can thus not be accepted.

Hypothesis 2 predicted that entrepreneurship competence would positively affect attitude towards entrepreneurship. The results demonstrated that attitude towards entrepreneurship was, in fact, positively related to attitude towards entrepreneurship and that for each unit increase in competence, there is, *ceteris paribus*, an associated average.478 increase in attitude. The relationship is statistically significant at a p =.002 level. Such results allow H2 to be accepted.

Further, Hypothesis 3 predicted that attitude towards entrepreneurship would be positively related to entrepreneurial intentions. The results demonstrate a positive relationship between the two constructs. For each unit increase in attitudes, the associated rise in intentions, *ceteris paribus*, is, on average,.579 at a significance level of p =.000. Such results allow H3 to be accepted.

Hypothesis 4 predicted that attitude towards entrepreneurship would mediate the relationship between entrepreneurship competence and entrepreneurial intentions. The results demonstrate that for every unit increase in entrepreneurship competence, all else remaining equal, entrepreneurial intentions would, through the mediation of attitude, increase on average by.276 at the significance level of p =.005. Further, the results describing the direct effect of entrepreneurship competence on entrepreneurial intentions demonstrated no significant relationship as for β = –.019, the significance level was p =.613. However, results allowed a conclusion that there was a significant total effect of entrepreneurship competence on entrepreneurial intention directly and indirectly, through moderated mediation, i. e., for every unit increase of competence, the associated increase of entrepreneurial intentions, all else remaining equal,.257 on average and at the significance level of p =.057. Therefore, H4, which states that attitude

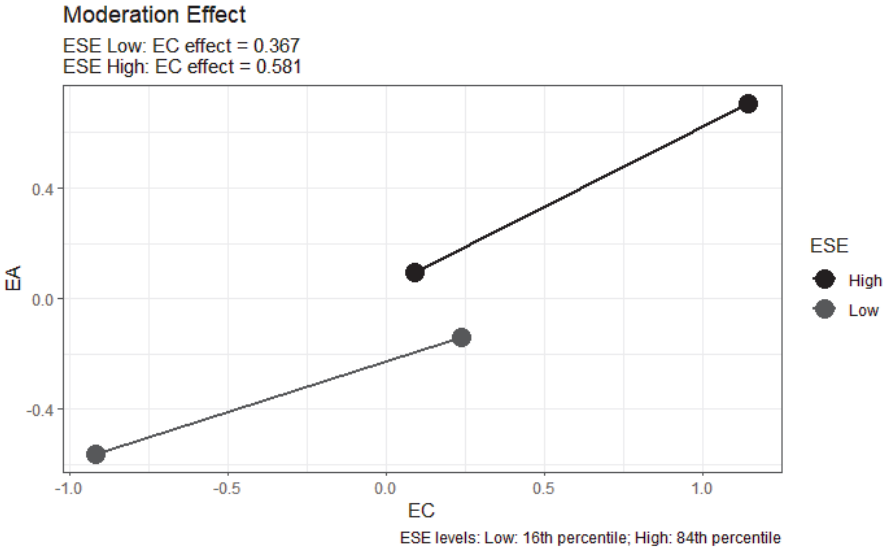
towards entrepreneurship will mediate between entrepreneurship competence and entrepreneurial intentions, can be accepted.

Finally, Hypothesis 5 anticipated a moderation effect of entrepreneurial self-efficacy on the relationship between the independent variable entrepreneurship competence and the mediator attitude towards entrepreneurship. The results yielded for the moderation effect demonstrated a positive and statistically significant moderation effect such that a unit increase in self-efficacy value can be, all else remaining the same, associated with a.345 rise in attitudes at the level of significance of p =.004, as can be seen in Figure 2. Such results allow for H5 to be accepted.

On top of that, the analysis of confidence intervals of the moderated mediation effect of the model yielded results of LO90 =.014 and HI90 =.165, and as 0 is not within the confidence interval range, the moderated mediation model can be accepted as valid.

The control variables, namely *gender* and *entrepreneurial family background*, did not play a significant role in the relationships between the antecedents of intentions and entrepreneurial intentions.

Figure 2: Moderation effect



Note: Figure 2 represents a tumble graph in which the width of each line depends on the distribution of the predictor (focal variable) at each moderator level (Bodner, 2016).

Table 1: The results of the Confirmatory factor analysis on the measurement model

Factor	Observed variables	Loadings
Entrepreneurship competence		
Spotting opportunities	*α =.89, CR =.17, AVE =.64*	*.96*
	I can find opportunities to help others.	*.73*
	I can find different examples of challenges that need solutions.	*.81*
	I can find examples of groups who have benefited from a solution to a given problem.	*.85*
	I can tell the difference between different areas where value can be created (for example, at home, in the community, in the environment, economy or society).	*.82*
Motivation and perseverance	*α =.88, CR =.03, AVE =.59*	*.99*
	I am driven by the possibility to do or contribute to something good for me or others.	*.78*
	I see tasks as challenges to do my best.	*.72*
	I can recognise different ways of motivating myself and others to create value. (Level 2)	*.81*
	I show passion and willingness to achieve my goals.	*.76*
	I do not give up and can keep going even when facing difficulties.	*.81*
Working with others	*α =.83, CR =.24, AVE =.63*	*.90*
	I can show respect for others, their background, and their situations.	*.82*
	I can recognise the role of my emotions, attitudes, and behaviours in shaping other people's attitudes and behaviours and vice versa.	*.79*
	I can discuss the benefits of listening to other people's ideas for achieving my (or my team's) goals.	*.77*
Attitude towards entrepreneurship	*α =.83, CR =.64, AVE =.59*	
	My parents have a positive attitude towards entrepreneurs.	*.85*
	I have a positive attitude towards entrepreneurs.	*.84*
	In my opinion, society respects successful entrepreneurs.	*.76*
	People who have started their businesses and have failed should be given a second chance.	*.57*
Entrepreneurial self-efficacy	*α =.83, CR =.64, AVE =.62*	
	I can identify my needs, wants, interests, and goals.	*.71*
	I can identify things I am good at and things I am not.	*.84*
	I believe in my ability to do what I am asked to do successfully.	*.81*

Note:
α = Cronbach's alpha
CR = Composite reliability
AVE = Average variance extracted

Table 2: Results for the decomposition of effects in the moderated mediation model using the bootstrap method

Regressions	Estimates	Standard Error	p-value	Standardised Estimates
EA ~ EC	*.477*	*.157*	*.002*	*.477*
EA ~ ESExEC	*.113*	*.039*	*.004*	*.345*
EA ~ ESE	*.142*	*.119*	*.234*	*.142*
EI ~ EA	*.583*	*.105*	*.000*	*.579*
EI ~ EC	*-.020*	*.084*	*.816*	*-.019*
EI ~ Gender	*.284*	*.157*	*.071*	*.141*
Indirect effect: EC – EA – EI	*.278*	*.120*	*.021*	*.276*
Indirect effect: ESExEC – EA – EI	*.066*	*.033*	*.047*	*.199*
Direct effect: EA – EI	*.583*	*.102*	*.000*	*.579*
Direct effect: ESExEC – EA	*.113*	*.049*	*.022*	*.345*
Direct effect: EC – EA	*.477*	*.195*	*.014*	*.477*
Total effect: EC – EI	*.258*	*.129*	*.045*	*.256*
Total effect: ESExEC – EI	*.066*	*.033*	*.047*	*.199*

Note:
Entrepreneurial intentions – EI
Entrepreneurship competence – EC
Entrepreneurial self-efficacy – ESE
Attitude towards entrepreneurship – EA

5. Discussion

5.1 Theoretical contributions

The present study uses the proposed theoretical model with moderated mediation based on TPB to explain the interactions between the different constructs of entrepreneurial learning outcomes in primary school. Early adolescents learn differently from older students. While their aptness to learn competence or self-efficacy lags behind older students (Sagone et al., 2020), they are not so quickly distraught by stress (Stepánková et al., 2023) and are much more closely connected with their peers and teachers, which plays a role in how they learn in teams and under teachers' tutorship (Clark-Lempers et al., 1991; Spiekerman & Rose, 2024). The research results thus contribute to research on early adolescents in the psychological processes of entrepreneurial intention formation, a field where results from research on older students cannot be freely applied to the described differences between the disparate age groups.

The results demonstrate that no single antecedent is responsible for developing entrepreneurial intentions; an intricate interplay is at work. The results show that competence, attitude, or self-efficacy alone are insufficient for developing intentions. Specifically, developed competence will only positively affect intentions if the adolescent participant of EE programs has adopted a positive

attitude towards entrepreneurship, evidencing that attitudes positively mediate the relationship between competence and intentions. Moreover, entrepreneurship competence is significantly related to entrepreneurial intentions only indirectly, mediated by attitude towards entrepreneurship and moderated by entrepreneurial self-efficacy. The study also demonstrates that competence is more positively associated with attitudes if the participant has developed self-efficacy, and the letter moderates the relationship between competence and attitude. Surprisingly, gender and entrepreneurial family background do not play a significant role in how the constructs are interrelated.

While Liñán and Chen (2009) and Liñán (2008) demonstrated a robust positive effect of entrepreneurship competence on attitude towards entrepreneurship among university students, the present study extends these findings to a younger demographic. Notably, the same significant direct impact of entrepreneurship competence on attitude towards entrepreneurship was observed in the present study, suggesting that the relationship between entrepreneurship competence and attitude towards entrepreneurship may emerge earlier in the developmental process than previously recognised. This finding implies that a high level of self-perceived entrepreneurship competence has a significant psychological effect on early adolescents' attitude towards entrepreneurship, potentially influencing their career aspirations towards self-employment at a formative age (Athayde, 2009; Liñán, 2008).

Results evidence that attitude towards entrepreneurship is related to entrepreneurial intentions and this TPB model's theoretical path has been tested and confirmed on university students (Galvao et al., 2018; Liñán & Chen, 2009). Similarly, some studies in EE programs for early adolescents show entrepreneurship competence and attitude towards entrepreneurship increasing or decreasing synchronously (Garcia-Rodriguez et al., 2019; Tsakiridou & Stergiou, 2014). The antecedent-consequent relationship can be elucidated from the Liñán -Ajzen entrepreneurial intention model (Liñán & Chen, 2009) and from TPB itself. The finding holds for early adolescents, too, possibly meaning they will pursue a potential career in entrepreneurship if they have a positive attitude towards this way of life. It also means that the intention for such a career path does not solely depend on whether an individual possesses the competence needed for such a career.

The present study predicts that the psychological effect of entrepreneurship competence on attitude towards entrepreneurship is more substantial if the value of entrepreneurial self-efficacy is significant. Consistent with TPB and Boyd and Vozikis (1994), where entrepreneurial self-efficacy closely interacts with attitude towards entrepreneurship and entrepreneurial intentions, a positive relationship is demonstrated in the present study between entrepreneurship competence and attitude towards entrepreneurship when entrepreneurial self-efficacy is well de-

veloped. Thus, the present study enhanced the theoretical framework of TPB by adding the moderating effect of entrepreneurial self-efficacy to explain the dynamics between entrepreneurship competence as the direct antecedent of attitude towards entrepreneurship. Entrepreneurial self-efficacy has already been shown to positively moderate the effect of attitude towards entrepreneurship on entrepreneurial intentions (Pham et al., 2023). The enhanced model provides further contributions by explaining the relations between the given constructs for early adolescents, in whom the development of competence and self-efficacy is less efficient than in their older counterparts (Sagone et al., 2020). However, this seeming setback might be mitigated by their closeness with teammates and not feeling stressed as quickly as their older counterparts (Spiekerman & Rose, 2024; Stepánková et al., 2023).

The indirect effect of entrepreneurship competence on entrepreneurial intentions is mediated by attitude towards entrepreneurship, and the direct effect of entrepreneurship competence on attitude towards entrepreneurship is moderated by entrepreneurial self-efficacy in this study. Studies of primary school EE programs have thus far demonstrated the contemporaneous development of the three constructs (Barba-Sánchez & Atienza-Sahuquillo, 2016; Cárcamo-Solís et al., 2017) but have never attempted to explain the interactions between the measured constructs within an entrepreneurial intentions model. The present study builds on the literature evidencing that EE programs improve entrepreneurship competence, attitude towards entrepreneurship, entrepreneurial self-efficacy, and entrepreneurial intentions (Cárcamo-Solís et al., 2017; Fayolle & Gailly, 2015) and uses an upgraded theoretical model based on TPB to explain the interactions between the given constructs.

5.2 Practical contributions

The study has practical implications for teachers and policymakers but with some caveats. Firstly, the results demonstrate that despite the brevity of the startup weekend, early adolescents still form intentions similar to those of more extended EE programs. The finding shows that even for early adolescents, startup weekends are a legitimate way of entrepreneurial learning, which informs policymakers in their decision to keep funding short EE programs like startup weekends.

While it is true that early adolescents lag behind their older counterparts in how successfully they can learn competence or self-efficacy (Sagone et al., 2020), this can be mitigated by the fact that this age group is not so quickly fazed by stressful situations (Stepánková et al., 2023), which allows the conclusion that their attitude towards entrepreneurship, which is instrumental in intention formation, will not go sour at the first sign of trouble, and entrepreneurial self-efficacy will not wane quickly. Secondly, when signs of stress do start showing, early

adolescents can mitigate them by good relationships within their teams because, to early adolescents, closeness with peers is more impactful than to their older counterparts as their support for one another plays a crucial role in the process (Clark-Lempers et al., 1991; Spiekerman & Rose, 2024). Also, early adolescents look up to their teachers more than their older counterparts. Teachers are often seen as adult role models and someone they can trust. As such, they are essential for guiding their pupils throughout the startup weekend, helping them believe in the entrepreneurship competence they have mastered, and shaping a positive attitude towards entrepreneurship. In this way, they will aid pupils in forming entrepreneurial intentions (Brüne & Lutz, 2020).

Lastly, the role of outside experts who facilitated the startup weekend programs is crucial. They work for startup incubators (SPIRIT Slovenija, 2019), so they possess competence that might make them role models for early adolescent participants (Brüne & Lutz, 2020). This fact is also vital for self-efficacy formation because a self-efficacious teacher or expert will help build pupils' self-efficacy (Bandura, 1977), which is even more true for early adolescents (Clark-Lempers et al., 1991). Teachers who organise startup weekends for early adolescents are thus advised to hire the help of outside experts to use the startup weekend program for early adolescents to its fullest.

5.3 Limitations

First, the study's authors do not have detailed information on how the EE program teachers and mentors were trained. Different levels of entrepreneurship competence or entrepreneurial self-efficacy of the teachers might yield different results in the entrepreneurial learning of EE program participants. Second, startup weekends are particular EE programs with a fast-paced tempo and high work intensity, not to mention the level of knowledge the participants are expected to learn in such a short time. Thus, the study results are hardly applicable to other EE programs that have a longer duration. Third, most participants joined the EE programs of their own free will.

Consequently, some self-selection bias might have been present, which might have also affected the results. Fourth, not all the participants answered the questionnaire at the end of the program. Some responded some days after the program had ended. This fact may have slanted the results of the survey to some extent. Fifth, the cross-sectional design, measuring constructs only at the end of the startup weekend, focused only on exploring the relationships between constructs and did not directly measure the effect of the EE program, limiting the study's ability to analyse the program's impact on the evolution of the measured constructs. Sixth, the sample consisted only of pupils of Slovenian primary schools, which meant they had a similar cultural, economic, and social background. An exclusively Slovenian sample may have affected how the pupils an-

swered the survey and narrowed the ways the pupils perceived entrepreneurship education, thus possibly slanting the results. Lastly, half the respondents came to the program with prior EE experience, which put them in a position different from their teammates without expertise. In addition, about 30 % of the participants planned to attend an entrepreneurship competition, which might have heightened their motivation. While early adolescents are more connected with each other and thus help each other learn, this fact may still have affected results.

5.4 Future research

The study identified several areas for possible future research. The study found that entrepreneurial self-efficacy moderated the direct relationship between entrepreneurship competence and attitude towards entrepreneurship, but it is not yet clear how entrepreneurial self-efficacy influences other relationships within the TPB model. Future research could examine the impact of entrepreneurial self-efficacy on the attitude towards entrepreneurship, the connection between entrepreneurial intentions, and other relationships.

The current study was conducted with a limited sample of early adolescents from a relatively homogenous educational setting. Future research could be conducted with a more extensive and diverse sample, possibly spanning multiple educational programs or geographical regions. Such a sample would help ensure that the findings are generalisable to a broader population.

Additionally, the role of contextual factors, such as family, community, culture, and other environmental influences, in forming entrepreneurial intentions has not been well-studied. Future research could examine these factors to identify new ways to improve entrepreneurial learning outcomes.

Further, to avoid doing research with pupils from only one country, researchers may, in future collaborations, make use of international networks like the Danube Cup to extend their research to other countries, thus avoiding the possible entrapments of single-country research.

Lastly, entrepreneurial intention development is a long-term process, and it is not yet clear how entrepreneurship competence, attitude towards entrepreneurship, entrepreneurial self-efficacy, and entrepreneurial intentions evolve. Future research could employ a longitudinal design, measuring the constructs at the beginning and end of the EE program and possibly at follow-up intervals post-program. Such an approach would track construct development over time, comprehensively assess the program's efficacy, and provide insights into immediate and long-term impacts. Such research would offer a more profound understanding of the impact of EE programs on early adolescents.

6. Conclusion

The present study delves into the entrepreneurial learning outcomes of primary school entrepreneurship education programs and provides a deeper insight into the logic behind the entrepreneurial intention development process. Specifically, the study investigates the interrelatedness of entrepreneurship competence, attitude towards entrepreneurship, entrepreneurial self-efficacy, and entrepreneurial intentions in early adolescents participating in EE programs by inspecting how the constructs interact and impact each other. It proposes a theoretical model based on TPB to explain why entrepreneurial intentions develop and what is necessary for this to occur.

This study contributes significantly to the ongoing conversation about how entrepreneurial intentions are formed in primary schools and how the antecedents of intentions, namely competence, attitude, and self-efficacy, are interconnected, thus contributing to the body of knowledge on TPB. Results provide valuable insights for practitioners and researchers in entrepreneurship education. By enhancing our understanding of intention formation, better EE programs can be designed and implemented, ultimately fostering the next generation of successful entrepreneurs.

Funding

This research has been supported by the Slovenian Research and Innovation Agency (Core Project Funding J5–4574 and Programme group P5–0441).

References

Aamir, S., Atsan, N. F., & Erdem, A. F. (2019). A review of entrepreneurship education research in the special issues of Education + Training journal. *Education and Training*, *61*(9), 1078-1099. https://doi.org/10.1108/ET-02-2019-0027

Ajzen, I. (1991). Theory of planned behavior. *Social psychology volume I: Social cognition and social perception*, *50*, 179–211. https://doi.org/10.1037/t15668-000

Archer, L., DeWitt, J., & Wong, B. (2014). Spheres of influence: what shapes young people's aspirations at age 12/13 and what are the implications for education policy? *Journal of Education Policy*, *29*(1), 58–85. https://doi.org/10.1080/02680939.2013.790079

Ashby, J. S., & Schoon, I. (2010). Career success: The role of teenage career aspirations, ambition value and gender in predicting adult social status and earnings. *Journal of Vocational Behavior*, *77*(3), 350–360. https://doi.org/https://doi.org/10.1016/j.jvb.2010.06.006

Athayde, R. (2009). E T & P Potential in Young People. *Entrepreneurship Theory and Practice*(44), 481–501. https://doi.org/10.1111/j.1540-6520.2009.00300.x

Baartman, L. K. J., & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, *6*(2), 125–134. https://doi.org/https://doi.org/10.1016/j.edurev.2011.03.001

Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). EntreComp: The Entrepreneurship Competence Framework. *Joint Research Centre*. https://doi.org/10.2791/593884

Bandura, A. (1977). Self-efficacy – Toward a unifying theory of behavioral change. *PSYCHOLOGICAL REVIEW*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Barba-Sánchez, V., & Atienza-Sahuquillo, C. (2016). The development of entrepreneurship at school: the Spanish experience. *Education + Training*, *58*(7/8), 783–796. https://doi.org/10.1108/ET-01-2016-0021

Bodner, T. E. (2016). Tumble Graphs: Avoiding Misleading End Point Extrapolation When Graphing Interactions From a Moderated Multiple Regression Analysis. *JOURNAL OF EDUCATIONAL AND BEHAVIORAL STATISTICS*, *41*(6), 593–604. https://doi.org/10.3102/1076998616657080

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

Boyd, N. G., & Vozikis, G. S. (1994). The Influence of Self-Efficacy on the Development of Entrepreneurial Intentions and Actions. *Entrepreneurship Theory and Practice*, *18*(4), 63–77. https://doi.org/10.1177/104225879401800404

Brislin, R. W. (1970). Back-Translation for Cross-Cultural Research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Brüne, N., & Lutz, E. (2020). The effect of entrepreneurship education in schools on entrepreneurial outcomes: a systematic review. *Management Review Quarterly*, *70*(2), 275–305. https://doi.org/10.1007/s11301-019-00168-3

Cárcamo-Solís, M. d. L., Arroyo-López, M. d. P., Alvarez-Castañón, L. d. C., & García-López, E. (2017). Developing entrepreneurship in primary schools. The Mexican experience of "My first enterprise: Entrepreneurship by playing". *Teaching and Teacher Education*, *64*, 291–304. https://doi.org/10.1016/j.tate.2017.02.013

Clark-Lempers, D. S., Lempers, J. D., & Ho, C. (1991). Early, Middle, and Late Adolescents' Perceptions of Their Relationships with Significant Others. *Journal of Adolescent Research*, *6*(3), 296–315. https://doi.org/10.1177/074355489163003

Cunha, F., & Heckman, J. J. (2008). Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. *Journal of human resources*, *43*(4), 738–782.

DeGeorge, J. M., & Fayolle, A. (2008). Is entrepreneurial intention stable through time? First insights from a sample of French students. *International Journal of Entrepreneurship Small Business*, *5*(1), 7–27.

Dyer, J. H., Gregersen, H. B., & Christensen, C. (2008). Entrepreneur behaviors, opportunity recognition, and the origins of innovative ventures [https://doi.org/10.1002/sej.59]. *Strategic Entrepreneurship Journal*, *2*(4), 317–338. https://doi.org/https://doi.org/10.1002/sej.59

Elert, N., Andersson, F. W., & Wennberg, K. (2015). The impact of entrepreneurship education in high school on long-term entrepreneurial performance. *Journal of Economic Behavior and Organization*, *111*, 209–223. https://doi.org/10.1016/j.jebo.2014.12.020

Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management*, *53*(1), 75–93. https://doi.org/10.1111/jsbm.12065

Galvao, A., Marques, C. S., & Marques, C. P. (2018). Antecedents of entrepreneurial intentions among students in vocational training programmes [Article]. *Education and Training*, *60*(7–8), 719–734. https://doi.org/10.1108/et-03-2017-0034

Garcia-Rodriguez, F. J., Gutierrez-Tano, D., & Ruiz-Rosa, I. (2019). Analysis of the Potential of Entrepreneurship Education in Young Children [Article]. *Entrepreneurship Research Journal*, *9*(1), 9, Article 20170064. https://doi.org/10.1515/erj-2017-0064

Goel, A., Vohra, N., Zhang, L., & Arora, B. (2007). Attitudes of the Youth towards Entrepreneurs and Entrepreneurship: A Cross-Cultural Comparison of India and China Attitudes of the Youth towards Entrepreneurs and Entrepreneurship : A Cross-Cultural Comparison of India and China. *Journal of Asia Entrepreneurship and Sustainability*, *3*(1), 0–35.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY, US. Guilford Press.

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

Jardim, J., Pereira, A., Bartolo, A., Pinho, A., Cardoso, M., & Catanho, P. (2023). Promoting an Entrepreneurial Culture: Development, Feasibility and Acceptability of a Primary School-Based Program Focused on Soft Skills. *Education Sciences*, *13*(11), Article 1074. https://doi.org/10.3390/educsci13111074

Krueger, N. F. (2014). Diving Deeper: Entrepreneurial Immersion building an entrepreneurial creative economy. https://doi.org/DOI: 10.13140/RG.2.2.21779.27687

Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, *15*(5), 411–432. https://doi.org/10.1016/S0883-9026(98)00033-0

Lazarides, R., Dicke, A.-L., Rubach, C., & Eccles, J. S. J. J. o. e. p. (2020). Profiles of motivational beliefs in math: Exploring their development, relations to student-perceived classroom characteristics, and impact on future career aspirations and choices. *Journal of Educational Psychology*, *112*(1), 70.

Liñán, F. (2008). Skill and value perceptions: How do they affect entrepreneurial intentions? *International Entrepreneurship and Management Journal*, *4*(3), 257–272. https://doi.org/10.1007/s11365-008-0093-0

Liñán, F., & 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

Morris, M. H., Webb, J. W., Fu, J., & Singhal, S. (2013). A Competency-Based Perspective on Entrepreneurship Education: Conceptual and Empirical Insights. *Journal of Small Business Management*, *51*(3), 352–369. https://doi.org/10.1111/jsbm.12023

Pham, M., Lam, B. L., & Tran, L. V. P. (2023). The e-entrepreneurial intention of students: The role of self-efficacy and education. *Entrepreneurial Business and Economics Review*, *11*(1), 127–143. https://doi.org/https://doi.org/10.15678/EBER.2023.110107

Ratelle, C. F., Lascano, D. I. V., Guay, F., & Duchesne, S. (2023). Need satisfaction profiles during the transition to secondary school and its implications in later education. *Learning and Individual Differences*, *107*, Article 102357. https://doi.org/10.1016/j.lindif.2023.102357

Rosário, P. J. S. L. d. F., Pereira, A., Núñez Pérez, J. C., Cunha, J., Fuentes, S., Polydoro, S.,... Fernández Alba, M. E. (2014). An explanatory model of the intention to continue studying among nontraditional university students. *Psicothema*, *26*(1), 84–90.

Rosique-Blasco, M., Madrid-Guijarro, A., & García-Pérez-de-Lema, D. (2018). The effects of personal abilities and self-efficacy on entrepreneurial intentions. *International Entrepreneurship and Management Journal*, *14*(4), 1025–1052. https://doi.org/10.1007/s11365-017-0469-0

Sagone, E., De Caroli, M. E., Falanga, R., & Indiana, M. L. (2020). Resilience and perceived self-efficacy in life skills from early to late adolescence. *International Journal of Adolescence and Youth*, *25*(1), 882–890. https://doi.org/10.1080/02673843.2020.1771599

Sergent, K., Lee, D., Stajkovic, A. D., Greenwald, J. M., Younger, S., & Raffiee, J. (2021). The Mitigating Role of Trait Core Confidence on Psychological Distress in Entrepreneurship. *APPLIED PSYCHOLOGY-AN INTERNATIONAL REVIEW-PSYCHOLOGIE APPLIQUEE-REVUE INTERNATIONALE*, *70*(3), 1128–1153. https://doi.org/10.1111/apps.12267

Spiekerman, A. M., & Rose, A. J. (2024). Associations Between Adolescent Friends' Responses During Problem Talk and Depressive Symptoms. *Developmental psychology*. https://doi.org/10.1037/dev0001685

SPIRIT Slovenija. (2017). *Usposabljanje za učitelje in profesorje: "Z ustvarjalnostjo in inovativnostjo do podjetnosti"*. [Training for Teachers and Professors: "With Creativity and Innovation to Entrepreneurship"]: Spirit Slovenija. Retrieved from https://www.podjetniski-portal.si/dogodki/usposabljanje-za-ucitelje-in-profesorje-z-ustvarjalnostjo-in-inovativnostjo-do-podjetnosti-7472

SPIRIT Slovenija. (2019). *Javni poziv osnovnim in srednjim šolam za dodelitev spodbud namenjenih izvajanju aktivnosti za spodbujanje ustvarjalnosti, podjetnosti in inovativnosti med mladimi v letih 2019/2020*. [Public Call for Tender to Primary Schools for Collaboration in Programs for Enhancing Creativity, Entrepreneurship, and Innovation for Young People in the School Year 2019/2020]: Spirit Slovenija. Retrieved from https://www.spiritslovenia.si/resources/files/doc/javni_razpisi/RAZPISI_2019/1321/Pozivna_dokumentacija_JP_MLADI_2019_2020.pdf

Stepánková, L., Fikrlová, J., Albrecht, A., Serek, J., & Brojác, J. (2023). Difficulties, uncertainty, and opportunity: The experience of the COVID-19 pandemic by early to late adolescence in the Czech Republic. *SOCIAL AND PERSONALITY PSYCHOLOGY COMPASS*, *17*(10). https://doi.org/10.1111/spc3.12844

Thompson, N. A., & Illes, E. (2021). Entrepreneurial learning as practice: a video-ethnographic analysis. *International Journal of Entrepreneurial Behavior & Research*, *27*(3), 579–599. https://doi.org/10.1108/IJEBR-10-2018-0663

Tsakiridou, H., & Stergiou, K. (2014). Entrepreneurial competences and entrepreneurial intentions of students in primary education. *International Journal of Humanities Social Sciences and Education*, *1*(9), 106–117.

Unveiling the Power of Constructivist Pedagogy in Entrepreneurship Education for Early Adolescents*

*Janez Gorenc, Alenka Slavec Gomezel, Blaž Zupan***

Abstract

The study investigates early adolescents' perceptions of entrepreneurial learning in primary school entrepreneurship education programs through a social constructivist learning theory lens. Qualitative data from semi-structured focus group interviews with 11–14-year-old pupils, teachers, and principals across 12 schools revealed that specific pedagogical methods effectively enhance competence dimensions like *working with others* or *mobilising resources*. However, *financial and economic literacy* or *valuing ideas* showed less improvement. A supportive school environment proved crucial for engagement and learning. The study provides insights into how constructivist pedagogy impacts entrepreneurial learning in early adolescents, offering valuable perspectives on effective entrepreneurship education for young learners.

Keywords: Entrepreneurship education, primary school, entrepreneurship competence, social constructivist learning theory, learning process, constructivist pedagogy.
JEL Codes: A21, L26, I21

1. Introduction

The global proliferation of entrepreneurship education (EE) programs (Brüne & Lutz, 2020) has led to the widespread endorsement of constructivist pedagogy as the most effective approach in this field (Bell & Bell, 2020; Cocieru et al., 2020). Constructivist pedagogy facilitates entrepreneurial learning through learning by doing (Oe & Tanaka, 2023). Teachers versed in constructivist pedagogy utilise various pedagogical methods like scaffolding techniques or knowledge convey while avoiding traditional instruction methods like lectures or testing (Moberg, 2014; Oe & Tanaka, 2023). Constructivist pedagogy is highly suitable for early adolescents as it positively affects motivation and learning

* Received: 31.1.24, accepted: 24.7.24, 1 revision.
This article is based on a research chapter in: Gorenc, J. (2024). *An investigation into the Factors Related to Learning Outcomes in Primary School Entrepreneurship Programs*. [Doctoral Dissertation, University of Ljubljana]. Ljubljana.

** *Janez Gorenc*, M.Sc., Assistant, School of Economics and Business, University of Ljubljana. Email: janez.gorenc@ef.uni-lj.si. Main research interest: learning outcomes of entrepreneurship education, development of entrepreneurship competence, green entrepreneurship.
Alenka Slavec Gomezel, Ph.D., Associate Professor, School of Economics and Business, University of Ljubljana. Email: alenka.slavec@ef.uni-lj.si. Main research interest: entrepreneurial personality, entrepreneurial well-being, social entrepreneurship.
Blaž Zupan (Corresponding author), Ph.D., Assistant Professor, School of Economics and Business, University of Ljubljana. Email: blaz.zupan@ef.uni-lj.si. Main research interest: entrepreneurship education, new product development, family business, design thinking.

(Moberg, 2014), allowing children to learn through experience, play, and games (Huber et al., 2014; Löbler, 2006).

Early adolescents, typically aged 10–14 (Brüne & Lutz, 2020; Jardim et al., 2023), have been identified as the group that benefits most from EE programs and frequently participates in them (Barba-Sánchez & Atienza-Sahuquillo, 2016; Garcia-Rodriguez et al., 2019; Jardim et al., 2023). Although it seems early adolescents are not as savvy at learning different types of competence as their older counterparts (Sagone et al., 2020), they benefit significantly from the fact that they do not seem to be fazed so quickly by crises as older adolescents (Stepánková et al., 2023). Crises, or discontinuous events common in EE programs and entrepreneurship in general, facilitate entrepreneurial learning (Cope, 2003; Jardim et al., 2023). Furthermore, early adolescents benefit significantly from peer interactions, particularly with friends, during teamwork activities commonly featured in EE programs (Huber et al., 2014; Yang et al., 2021). On top of that, early adolescence is a period in life when a trusting relationship with a non-parent adult is crucial for the pupils' class performance and learning (Feldlaufer et al., 1988). In EE programs, teachers fulfil the role of a trusted non-parent adult. Consequently, early adolescents tend to form stronger attachments to their teachers than their older peers, underscoring the critical importance of the pedagogical methods employed in these programs (Spiekerman & Rose, 2024).

Despite this, few studies investigate the specific pedagogical methods employed in EE programs for early adolescents and how each method correlates with perceived learning of particular dimensions of entrepreneurship competence (EC). The proliferation of primary school EE programs underscores the need for a comprehensive pedagogical framework to guide entrepreneurship teachers in their quest to mould future entrepreneurs (Bell & Bell, 2020).

The present study aims to investigate specific pedagogical methods used in EE programs for early adolescents and how these methods assist the participants in learning particular EC dimensions. Specifically, it applies social constructivist learning theory to elucidate the entrepreneurial learning process in early adolescents, as perceived by the pupils and their teachers.

2. Theoretical background and research questions

2.1 Social constructivist learning theory

Multiple learning theories can be applied to explain how participants in EE programs acquire knowledge and skills. Human capital theory, for instance, focuses on developing knowledge and skills – collectively termed human capital – which enables individuals to advance economically, socially, and in other aspects of life (Martin et al., 2013). The social learning theory, as defined

by Bandura (1977), posits that learning primarily occurs through observation, imitation, and modelling of others' behaviour. The effectiveness of the learning process is influenced by the individual's self-efficacy beliefs and behavioural responses (Bandura, 1977).

The social constructivist learning theory, proposed by Lev Vygotsky in 1968, emphasises that individuals develop their knowledge and comprehension through their prior experiences and present social interactions. The process supports cognitive and emotional growth, which are intrinsically connected to the learning process (Vygotsky, 1978). Social constructivist learning theory proposes that learners will transition back and forth between three zones. These are the zones where they learn independently or with peers, learn only in case a teacher guides them, and cannot learn despite a teacher's guidance (Vygotsky, 1978, p. 86). The second zone means that when the learner falls short on previous experience or is cognitively not yet adequately developed to conceive specific new knowledge, a knowledgeable other – in EE, this is the teacher – facilitates the acquisition of new knowledge, skills, attitude, or experience with appropriate pedagogical methods (Bauman & Lucy, 2021). Vygotsky (1978) theorised that such interaction between the learner and knowledgeable others occurs in the second zone, termed the zone of proximal development (ZPD). The social constructivist learning theory, incorporating ZDP, is particularly effective in explaining the learning process in EE programs for early adolescents. Teachers apply constructivist pedagogical methods when the pupils are within their ZDP, meaning they lack the prior experience, knowledge, skills, and attitudes necessary to resolve the problems they have encountered independently (Bell & Bell, 2020; Tenney-Soeiro & Sieplinga, 2021).

2.2 Constructivist pedagogical methods

Constructivist pedagogical methods promote learning by doing, teamwork, and peer learning (Cocieru et al., 2020). According to Chernikova et al. (2020), constructivist pedagogy uses scaffolding techniques, such as guiding with questions, coaching, or hints, instead of traditional instruction. Knowledge convey is also an essential instrument of guidance used when scaffolding techniques are insufficient. Knowledge convey can be treated as conventional guided instruction because it provides final answers to the task the pupils are trying to complete. However, knowledge is only conveyed to the pupils when they need that exact knowledge and skills, not sooner (Chernikova et al., 2020).

2.3 Early adolescents and entrepreneurship education

Early adolescence marks a critical period of an individual's life during which career aspirations begin to take shape (Lazarides et al., 2020). This age group's cognitive and emotional developmental stages differ markedly from those of

older adolescents and young adults. In addition to their sprouting career aspirations (Lazarides et al., 2020), early adolescents form powerful attachments to their closest friends and their teachers (Ratelle et al., 2023), and they are more resilient to stress than their older counterparts (Stepánková et al., 2023).

Primary schools often introduce early adolescents to EE programs, which are highly practice-based. Some focus on soft skills, such as understanding the world of work, creative thinking, problem-solving, or taking responsibility (Chojak, 2024; Jardim et al., 2023). Others are sandbox versions of real entrepreneurship and are more business-oriented, employing activities to further entrepreneurial knowledge and skills, such as product development, financial calculations, marketing, establishing and liquidating a company, or planning and management of the company (Bergman et al., 2011; Huber et al., 2014). Participants in these EE programs face a variety of tasks, decisions, and uncertainties similar to those encountered by real entrepreneurs but without the vast material risks, stress, and responsibility involved (Brüne & Lutz, 2020; Hytti & O'Gorman, 2004). All the studied EE programs utilised constructivist pedagogical methods.

For instance, Huber et al. (2014) described the learning outcomes of the Dutch 5-day BizWorld program, which led participants through establishing and running a company. Pupils wrote job applications, created company logos, manufactured, marketed, and sold products, handled the finances, and competed with other pupil firms. The EE program was practice-based, and pupils learned from experience and failure. BizWorld advanced the participants' learning of EC dimensions, such as risk-taking, creativity, self-efficacy, and persistence. (Huber et al., 2014). Similarly, Garcia-Rodriguez et al. (2019) described the Spanish *Enterprise at School* (Spanish: *Emprender en la Escuela, ELE*) EE program for early adolescents that employed constructivist pedagogical methods. The participants were tasked with forming and managing a school cooperative, designing, manufacturing, and selling different products at a fair. ELE was designed to improve soft skills, such as creativity, leadership, and a sense of achievement.

In addition to employing appropriate pedagogical methods, a supportive school environment is essential for the pupils to learn new knowledge and skills and develop positive attitudes. A supportive environment encompasses respectful relationships among pupils, teachers, and school management, a reward system for outstanding achievements, and a commitment from the school management to facilitate the teachers' participation in relevant training programs. Research indicates these factors significantly contribute to positive entrepreneurial learning (Huber & Helm, 2020; Hytti & O'Gorman, 2004).

2.4 Entrepreneurship competence and EntreComp

In primary school EE programs, EC is often the most highly sought-after learning outcome (Armuña et al., 2020; Huber et al., 2014; Hytti & O'Gorman, 2004). Competence is usually defined as a task-specific amalgam of appropriate knowledge, skills, and attitudes necessary for performing the given task successfully (Baartman & de Bruijn, 2011). Thus, EC represents the knowledge, skills, and attitudes essential for any individual to perform entrepreneurship-related tasks with a favourable outcome. In Europe, the European Commission has designed the EntreComp: the Entrepreneurship Competence Framework, a configuration of 15 dimensions distributed into three clusters (Bacigalupo et al., 2016). EntreComp encompasses the following dimensions: *creativity, spotting opportunities*, *vision*, *valuing ideas*, and *ethical and sustainable thinking* from the 'Ideas and opportunities' cluster, *motivation and perseverance*, *mobilising resources*, *mobilising others*, *self-awareness and self-efficacy* and *financial and economic literacy* from the 'Resources' cluster, and *planning and management*, *taking the initiative*, *coping with ambiguity, uncertainty & risk*, *learning through experience*, and *working with others* from the 'Into action' cluster. Each EC dimension is described on eight levels of mastery, from Level 1, 'Discover', with descriptors like "I can find opportunities to help others" or "I can assemble objects that create value for others" to Level 8, "Transform", with descriptors like "I can show different audiences the benefits of my vision during turbulent times" or "I can judge a possible opportunity as an investor." Published in 2016, EntreComp has become one of the main instruments for describing EC or measuring and understanding entrepreneurial learning at primary (Floris & Pillitu, 2019), secondary (Jardim et al., 2021; Moberg, 2021), or tertiary EE programs (Armuña et al., 2020; Czyzewska & Mroczek, 2020). The EC dimensions outlined in the EntreComp framework encompass knowledge, skills, and attitudes that can be developed through the 'learning through entrepreneurship' process, which involves learning by doing and learning from experience and failure (Bell & Bell, 2020).

2.5 Research questions

A literature review highlights the opportunity to investigate the individual pedagogical methods teachers in EE programs for early adolescents employ within the early adolescents' ZPD. Additionally, there is potential to explore the supportive measures schools can implement and the impact of these factors on the early adolescents' perceived entrepreneurial learning. Given the unique characteristics distinguishing early adolescents from their older peers, investigating the entrepreneurial learning processes within ZDP for this age group is particularly important. Thus, the study addressed three research questions:

Research question 1: *Identify which specific pedagogical methods the EEP teachers used to enhance pupils' entrepreneurial learning when the latter did not know how to proceed;*

Research question 2: *Investigate in which EC dimensions pupils exhibited positive entrepreneurial learning outcomes after teachers had employed specific pedagogical methods;*

Research question 3: *Determine how a supportive school environment enhances the pupils' entrepreneurial learning.*

3. Methods

3.1 Sample

The present study uses qualitative data to gain insight into the interactions between the perceived pupils' entrepreneurial learning process and the specific constructivist pedagogical methods that the teachers employed to assist the early adolescents' entrepreneurial learning process within their ZPD. The data were obtained through semi-structured interviews with pupils, teachers, and principals or assistant principals. Therefore, the sample comprised the teachers who had received specific training in using constructivist pedagogical methods in EE, as well as early adolescent pupils who voluntarily participated in EE programs and perceived that they had acquired specific dimensions of EC through their teachers' application of appropriate constructivist pedagogical methods (SPIRIT Slovenija, 2019). The interviewed principals endorsed and supported the EE program in their schools.

Overall, over 30 primary school teachers were emailed directly or through business incubators requesting an interview with them and the pupils participating in the teachers' EE programs. Of these, 15 teachers from 12 primary schools responded positively to the interview request. Regarding experience with teaching in EE programs, 14 teachers were women with, on average, 4.6 years of experience working as teachers of EE. The teachers who agreed to participate also asked the pupils participating in their EE programs to partake in the interviews.

Altogether, 39 pupils from all 12 schools decided to participate in the research, of whom 21 were girls and 18 were boys. The pupils were 11–14 years old. On average, they were 13.4 years old and went to 6th, 7th, 8th, and 9th class in Slovenian primary education, which lasts nine years and encompasses ages 6–15 years old. Specifically, the girls were 11 to 14 years old, with an average age of 13.2 years, and the boys were 12–14 years old, with an average age of 13.5 years. The pupils with one or two years of experience with work in EE programs counted 23 individuals or 59 % of the sample, of whom 13 were girls and 10 were boys. The experienced pupils came from 6 schools where the teacher had

more than five years of EE program teaching experience. Finally, four of the pupils' parents owned a business.

In addition to the teachers and pupils, principals of 12 schools were asked for an interview, and five principals or assistant principals from four schools responded positively to the interview request, of whom four were women and one was a man. Regarding experience, two women had more than ten years of experience with principalship and two women and one man had less than three years of experience.

3.2 Entrepreneurship education programs

All the interviewed pupils were, at the time of the interview, participating in entrepreneurship activities that were part of the afterschool *creativity, entrepreneurship, and innovation* program in the academic year 2021–2022. The EE programs lasting from October to May were designed to teach the participants the 15 dimensions of EC defined in EntreComp through a school-level business experience in which the pupils and teachers participated. Specifically, pupils achieved entrepreneurial learning by developing rudimentary business models for their business ideas and presenting them at a competition in which all but four pupils participated. In the afterschool EE activities, pupils, working in teams, first identified opportunities for business ideas, researched the market by interviewing potential customers and reliable informants, outlined the existing competition, prototyped a sustainable solution and tested it with prospective customers. The development of business models also involved running and managing the entrepreneurial activities within the team, learning from experience and failures, recognising possible risks, calculating the finances, identifying appropriate sales and marketing channels, and projecting a vision for future development (SPIRIT Slovenija, 2019).

Teachers leading EE programs had to attend a hands-on 16-hour training course or a three-day startup weekend where teachers would develop their EC (SPIRIT Slovenija, 2016). The training was also designed to equip the EE teachers with appropriate constructivist pedagogical methods they could later employ in their EE programs.

3.3 Interviews

Pupils were interviewed alone or in a focus group, and the teachers were interviewed alone in all but one instance. Altogether, 13 interviews were conducted with the pupils; on average, the number of pupils in the focus group interview groups was 3. The interviews lasted anywhere from 20 to 60 minutes. The interviews with pupils and teachers centred around topics such as the routine

and activities in the EE program, the teaching methods utilised, and the interviewees' perception of the pupils' entrepreneurial learning.

Pupils were interviewed explicitly about their perception of how they acquired EC and the pedagogical methods employed by their teachers. The teachers were interviewed regarding their perceptions of the pupils' work and achievements, the observations of the pupils' learning of EC, and their pedagogical methods. When discussing the pedagogical methods employed and the EC the pupils had learned, interviewees were prompted with questions like "What did you learn most?" or "What did that look like?" This approach aligns with recommendations in the literature (Oe & Tanaka, 2023; Sommarström et al., 2020). In specific cases, when the pupils discussed challenges with particular entrepreneurial knowledge that they had encountered, they were asked more detailed questions, for instance, "How did you calculate the finances?" or "How did the teacher help with the finances?"

Similarly, the teachers were asked specific questions, such as "How did you help the pupils with finances?" if the occasion arose. However, pupils and teachers were mostly encouraged to formulate responses themselves and describe the specific EC dimensions they believed the pupils had developed. Overall, interview questions were carefully crafted to avoid leading the interviewees towards a particular answer. For instance, the teachers were never prompted to describe predefined methods employed in their EE programs. Also, answers from pupils were never elicited with questions like "How much financial literacy did you learn?" or "How well did you learn to value ideas?" This approach effectively minimised the potential for interviewees, whether teachers or pupils, to feel pressured into giving answers that aligned with the interviewer's expectations (Fylan, 2005; Wengraf, 2001, p. 126).

Furthermore, to prevent any bias in responses, teachers were never present in the same room during pupil interviews, and vice-versa, as recommended (Paul-Binyamin & Potchter, 2020), except in one instance involving two pupils. Interviews with principals primarily focused on the school environment and their perspectives on EE programs in their schools and the participating teachers and pupils. Questions posed to them included, "Can you describe what it was like when your teams participated in competitions?" or "How extensively did you discuss the EE program with the teacher in charge?" As recommended in the literature, the principals were never present during interviews with teachers or pupils, or vice-versa, to maintain impartiality and minimise any potential pressure on interviewees (Paul-Binyamin & Potchter, 2020).

3.4 Data Analysis

The interviews were recorded and transcribed verbatim. Data coding was conducted using a blended approach, combining theory-driven deductive methods

and data-driven inductive approaches (Flick, 2018, p. 258). Data were initially uploaded into the MAXQDA 2022 statistical software and organised into three categories: *pupils*, *teachers*, and *principals*. Deductive coding followed, which involved creating codes for distinct dimensions of EC and pedagogical methods teachers used. Examples of predefined codes for pedagogical methods included *guiding with questions*, *whiteboard*, or *knowledge convey* (Chernikova et al., 2020; Cocieru et al., 2020). Codes describing EC that the pupils could learn with teacher guidance included *spotting opportunities*, *creativity*, *motivation and perseverance*, and *financial and economic literacy* (Armuña et al., 2020; Bacigalupo et al., 2016). The pupil and teacher interviews were equipped with deductive codes to compare responses and identify similarities. Following deductive coding, an inductive coding phase was conducted to identify emerging themes in the data. Examples of codes generated through inductive coding included *peer feedback*, *little support from parents*, or *teachers lack skills and experience*. Throughout this process, all the codes were continuously refined and iterated upon, with frequent reference to relevant literature (Blenker et al., 2014).

Code co-occurrence analysis was conducted to explore relationships between different themes and to assess connections between pedagogical methods and entrepreneurial learning outcomes. For instance, the study inspected how frequently codes indicating pupils' gaps in the required entrepreneurial knowledge co-occurred with codes representing the distinct pedagogical methods employed by teachers. Additionally, co-occurrences between codes indicating pedagogical methods and perceptions of entrepreneurial learning were analysed to determine potential correlations. The code co-occurrence analysis followed the methodology outlined by Oe and Tanaka (2023), where all code co-occurrences were examined within the context of two consecutive paragraphs in the interviews. Interviews with principals were analysed separately, following established procedures (Flick, 2018; Yin, 2018) to assess the impact of the school environment on entrepreneurial learning outcomes.

Data triangulation across multiple sources was utilised to enhance the validity of the findings. Information gathered from pupils' interviews was triangulated with teacher interviews to verify consistency and alignment between what pupils reported about their learning experiences and the teachers' perspectives. Similarly, the teachers' accounts of their pedagogical methods were cross-referenced with pupils' descriptions to ensure mutual agreement on the methods used. Furthermore, teachers' perspectives were compared with the principals' statements regarding a supportive school environment to validate the aspects of the school environment that are advantageous for fostering entrepreneurial learning. This triangulation approach helped ensure the study findings' reliability and credibility.

4. Results

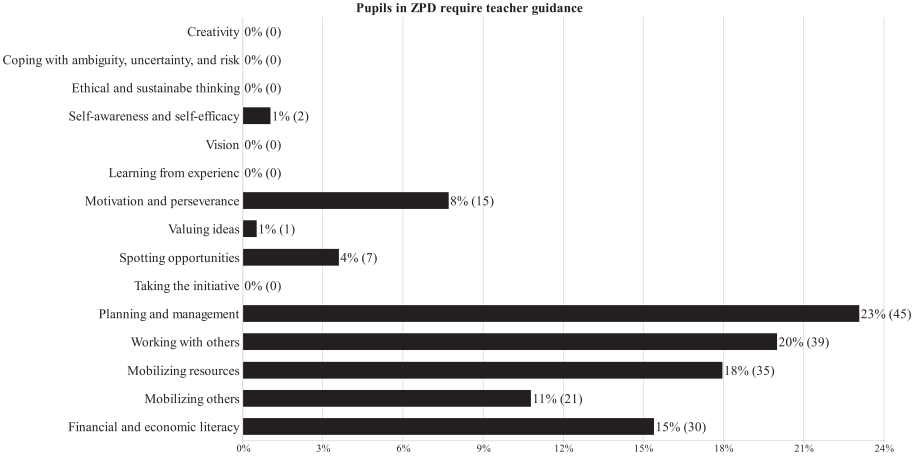
Overall, 107 codes were created, of which eight were thematic top-level codes encompassing several codes. Examples of thematic top-level codes were *pupils exhibit learning* or *teachers' pedagogical methods*. The thematic top-level codes are depicted in Table 1.

Table 1: Thematic top-level codes

Top-level Code System
Coping with difficulties – exogenous factors
Describing pupils' work on the entrepreneurship project
Pupils describe reasons for joining
Pupils in ZPD require teacher guidance for specific EC dimensions
Pupils attended event for promotion of entrepreneurship
Pupils exhibit learning of entrepreneurship competence
Teacher pedagogical methods

The pupils often encountered challenges they did not possess the necessary EC to resolve and required assistance from the teacher. The challenges the pupils could not settle without the teachers' aid were, for instance, *planning and management* or *working with others*. The frequency of occasions when the pupils lacked knowledge of specific EC dimensions and required the teachers' interventions is depicted in Figure 1.

Figure 1: Pupils are in ZPD and require teacher guidance for specific EC dimensions



All the challenges the pupils encountered in ZPD provided opportunities for the teacher to facilitate the pupils' learning through constructivist pedagogical methods. The findings indicate that teachers predominantly employed scaffold-

ing techniques to support the pupils' learning process. Specifically, the teachers most frequently used *coaching and hints* to facilitate pupils' learning without telling them the solution. Besides *coaching and hints*, the teacher used words of *encouragement* or *guidance with questions*. However, even more frequently than scaffolding techniques, the teacher employed *knowledge convey* and *direct involvement*, taking on one of the jobs in the team. The most commonly used pedagogical methods can be seen in Figure 2.

Following the teachers' implementation of constructivist pedagogical methods, the pupils frequently demonstrated or reported enhanced mastery of specific dimensions of EC. For instance, improvements in *working with others* are often noted. Additionally, there were observable advancements in the pupils' capacity in *learning through experience* and *mobilising others*, as well as in *mobilising resources* or *taking the initiative*. Figure 3 illustrates the frequency with which the pupils' perceived improvements in these dimensions of EC were reported.

Code co-occurrence analysis was conducted following the sequence outlined in the social constructivist learning theory. Initially, codes denoting entrepreneurial activities were matched with codes indicating gaps in the knowledge of EC. This analysis helped identify the specific activities during which the indicated knowledge gaps emerged most frequently. Next, codes denoting knowledge gaps and codes representing teachers' pedagogical methods were examined. This analysis aimed to determine which pedagogical methods teachers employed to address and support the pupils' learning needs in EC. Finally, code co-occurrences were explored between pedagogical methods and pupils' perceptions of their entrepreneurial learning outcomes.

Figure 2: Teacher pedagogical methods used in EE programs

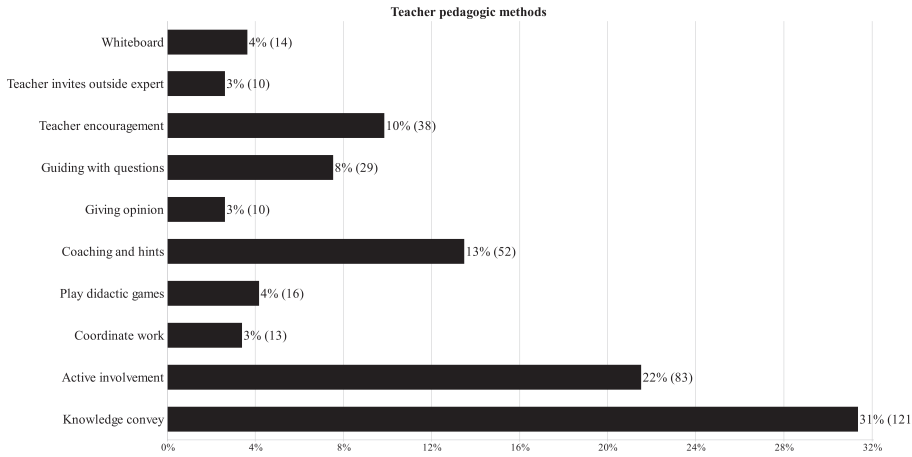


Table 2: Code co-occurrences for encountered knowledge gaps and activity when knowledge gaps occurred

Activity Knowledge gaps	Pupils follow teacher's guidance	Pupils do independent work	Pupils making a mistake	Development of business model	Pupils' idea for solution	Iteration of business model	SUM
Motivation and perseverance	0	4	3	2	2	0	11
Spotting opportunities	2	4	0	2	0	0	8
Planning and management	4	6	0	10	6	0	26
Working with others	4	4	0	12	0	0	20
Mobilising resources	4	4	0	4	10	4	26
Mobilising others	4	4	0	8	0	0	16
Financial and economic literacy	3	4	2	13	0	0	22
SUM	21	30	5	51	18	4	129

Table 3: Which pedagogical methods did teachers employ to support pupils in alleviating knowledge gaps within their ZPD

Pedagogical method Knowledge gaps	White-board	Design thinking	Teacher encouragement	Guiding with questions	Giving opinion	Coaching and hints	Coordinate work	Active involvement	Knowledge convey	Outside expert helps with instruction	SUM
Self-awareness and self-efficacy	0	0	2	0	0	0	0	2	0	0	4
Motivation and perseverance	0	0	0	0	2	2	0	0	6	0	10
Spotting opportunities	0	2	3	0	0	2	2	3	2	0	14
Planning and management	2	2	4	2	2	2	0	3	23	2	42
Working with others	0	4	4	0	0	7	0	4	17	8	44
Mobilising resources	5	5	4	0	5	7	2	6	9	3	46
Mobilising others	0	6	5	2	0	0	2	9	16	0	40
Financial and economic literacy	0	2	0	6	0	2	0	9	5	5	29
SUM	7	21	22	10	9	22	6	36	78	18	229

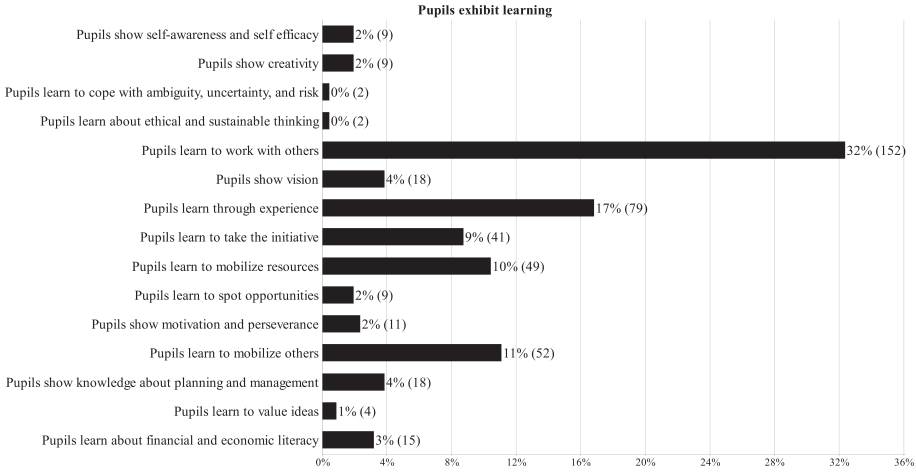
Table 4: What knowledge did pupils demonstrate after the teachers intervened with pedagogical methods

Pedagogical method Demonstrated knowledge	White-board	Design thinking	Teacher encour-agement	Guiding with ques-tions	Giving opinion	Coach-ing and hints	Play di-dactic games	Coordi-nate work	Active involve-ment	Knowl-edge convey	Outside expert helps with in-struction	SUM
Self-awareness and self-efficacy	3	0	2	0	0	0	0	0	0	0	0	5
Creativity	2	2	0	0	0	2	0	0	0	0	0	6
Ethical thinking and sustainability	2	0	0	0	0	2	0	0	0	0	0	4
Working with others	7	11	9	8	7	10	2	2	27	53	2	138
Vision	0	2	0	0	0	0	0	0	0	4	0	6
Learning through ex-perience	4	6	6	2	0	5	2	2	8	12	13	60
Taking the initiative	0	2	4	4	2	6	0	0	7	4	9	38
Mobilising resources	3	7	0	0	0	6	0	5	5	10	7	43
Motivation and per-severance	2	0	2	2	0	2	0	0	0	2	0	10
Mobilising others	0	9	4	0	0	4	0	0	11	20	11	59
Planning and man-agement	0	0	0	0	0	0	0	0	2	2	0	4
Financial and econo-mic literacy	0	0	0	2	0	0	0	2	4	0	0	8
SUM	23	39	27	18	9	37	4	11	64	107	42	381

Note: Tables 2, 3, and 4 only feature the EC the pupils mentioned as having problems understanding or having mastered. The tables do not feature the EC that the pupils never once mentioned.

Therefore, across two consecutive paragraphs, the pupils frequently mentioned gaps in their understanding of EC, particularly in *financial and economic literacy* and *working with others*. These gaps were notably recognised when pupils were tasked with developing business models without direct teacher guidance. Table 2 illustrates the code co-occurrences representing knowledge gaps and the specific entrepreneurial activities during which the gaps emerged. The table details the number of interviews where each co-occurrence was observed.

Figure 3: Pupils exhibit learning of entrepreneurship competence



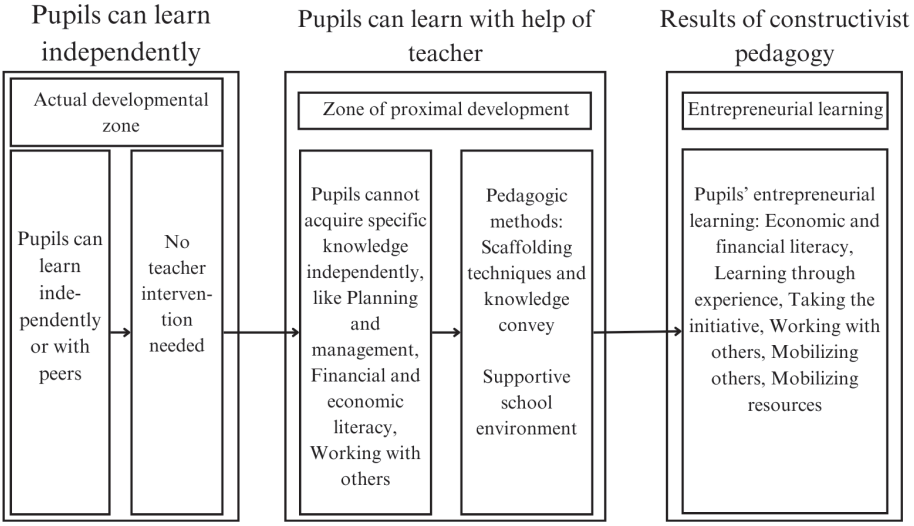
To facilitate learning within ZPD, teachers frequently utilised scaffolding techniques, knowledge convey, and active involvement. Among these methods, *knowledge convey* was the most extensively employed, significantly bolstering pupils' understanding of *planning and management*, *working with others*, or *mobilising others*. Table 3 illustrates the frequency of interviews where these co-occurrences were observed, highlighting the effectiveness of knowledge convey in supporting pupils' development in these dimensions of EC.

Research question 2 examines which dimensions of EC were reported to have developed for the pupils following the teachers' application of various constructivist pedagogical methods. Pupils demonstrated varying levels of entrepreneurial knowledge. Methods such as *knowledge convey*, *active involvement* or *coordination of work* appeared particularly effective, as they provided direct answers to pupils' questions rather than just hints or more questions. *Knowledge convey* proved most effective in enabling the pupils to learn the dimensions of EC, like *working with others*, *mobilising others*, and *learning from experience*. The teachers' *active involvement* was most frequently associated with developing the dimensions of *working with others* and *mobilising others*. Scaffolding techniques like *coaching and hints* or *guiding with questions* were also mentioned

in connection with entrepreneurial learning, particularly with the dimensions of *working with others*, *learning through experience*, or *taking the initiative*. Table 4 illustrates these relationships with the frequency of interviews where these co-occurrences were identified.

Based on the code analysis findings, the present study proposes a teaching and learning framework presented in Figure 4. The framework illustrates the relationships between dimensions of EC where pupils can independently acquire knowledge, the dimensions where teacher assistance is necessary due to knowledge gaps, the pedagogical methods teachers employ to enhance pupils' learning, and the resultant entrepreneurial learning. Initially, pupils operate in their actual developmental zone (Vygotsky, 1978), where they can acquire learning independently. However, teacher guidance becomes essential when the pupils encounter knowledge gaps that exceed their current capabilities. When these gaps fall within the pupils' ZPD, the teachers can effectively support the pupils' learning through the appropriate pedagogical methods. (Cocieru et al., 2020; Vygotsky, 1978).

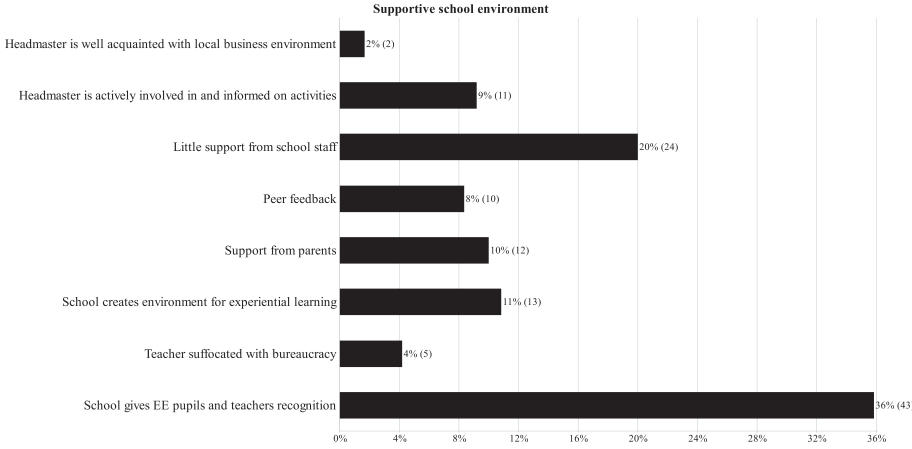
Figure 4: Teaching and learning framework based on social constructivist learning theory (Vygotsky, 1978)



Research question 3 explores how a supportive school environment sustains entrepreneurial learning. Codes representing a supportive school environment were benchmarked against codes related to entrepreneurial learning, revealing two significant factors that were particularly conducive to learning: *school gives EE pupils and teachers recognition* and *support from parents*. The pupils frequently reported improvements in the dimensions of *working with others* and *learning*

through experience when they felt supported by the school. However, not all the pupils experienced consistent support within their school environment. For instance, some pupils or teachers mentioned *little support from school staff*, while *peer feedback* was often described as hostile and derisive. Although parents mainly provided support, there were instances where they expressed concerns that the pupils should prioritise traditional academic subjects over entrepreneurship. The perceived elements of a supportive school environment and instances of insufficient support are depicted in Figure 5.

Figure 5: Supportive school environment



5. Discussion

This research enhances the understanding of social constructivist learning theory by elucidating the dynamics of EC development in early adolescents participating in EE programs. Moreover, it identifies the pedagogical approaches that appear most effective in fostering the participants' learning.

5.1 Theoretical implications

The study illuminates the entrepreneurial learning process among early adolescents in EE programs, focusing on applying the ZDP concept. The results demonstrate that when early adolescents encounter challenges beyond their current knowledge base, such as applying *financial and economic literacy* to define their prospective businesses' costs and revenue streams, they fall within their ZDP. In these instances, the teacher's intervention becomes crucial in acquiring the necessary knowledge and skills. The dynamic illustrates the practical application of social constructivist learning theory in EE for this age group. Rather than delivering traditional lectures on accounting and business finances, teachers

guide students through targeted questions to provide just-in-time information, aligning with pedagogical methods, like scaffolding techniques or knowledge convey within the pupils' ZDP.

On the other hand, the findings also imply developmental limitations in the early adolescents' ability to fully grasp concepts like uncertainty, ambiguity, and risk or idea valuation, for instance, due to their lack of life experience. This insight contributes to a nuanced understanding of the role of scaffolding techniques and knowledge convey within the pupils' ZPD and the boundaries thereof. The study extends social constructivist learning theory principles to EE programs, reaffirming that early adolescents acquire new knowledge, skills, and attitudes most effectively when guided by the appropriate pedagogical methods within their ZDP. The study further highlights the crucial role of constructivist pedagogical methods like scaffolding techniques and the more traditional knowledge convey and active participation, accompanied by classroom setting and teamwork, in facilitating entrepreneurial learning at this developmental stage. Thus, the study enhances the understanding of the entrepreneurial learning process for early adolescents through the lens of the social constructivist learning theory. Significantly, it extends the framework by highlighting the critical role of a supportive school environment. This insight underscores the holistic nature of EE, where pedagogical approaches, developmental considerations, and environmental factors need to converge to facilitate entrepreneurial learning.

Moreover, the study proposes a teaching and learning framework for primary school EE rooted in the social constructivist learning theory (Bell & Bell, 2020; Cocieru et al., 2020). Derived from rigorous qualitative data analysis (Flick, 2018, p. 7), this framework is specifically tailored to the early adolescent population. The study thus advances the discourse on EC development in primary school EE by holistically addressing contributing factors, including pedagogical methods and institutional support structures. Furthermore, the research also enriches the broader understanding of learning processes through the lens of social constructivist learning theory, offering insights extending beyond EE's realm.

5.2 Practical implications

Beyond theoretical implications, the study also offers practical implications for EE teachers and principals. Research suggests that constructivist pedagogy holds much promise for EE programs and has demonstrated positive outcomes. Specifically, in primary school, early adolescents exhibit enthusiasm for collaborative teamwork and do not hesitate to seek assistance from individuals outside their immediate environment to help with their work. They also enjoy tackling challenges and exploring new materials and digital applications to build prototypes. However, successful implementation relies on skilled teachers who can guide the pupils using appropriate pedagogical methods. Despite potential

variations in outcomes, teachers are encouraged to engage early adolescents in constructivist pedagogical approaches whenever possible. Such an approach might sometimes involve active intervention by teachers in the pupils' work to facilitate the learning process, even if the final results may differ from expectations.

Also, in EE programs, the emphasis is frequently on developing all dimensions of EC equally. In this context, teachers should pay particular attention to EC dimensions such as *financial and economic literacy*, *coping with ambiguity, uncertainty, and risk*, or *valuing ideas*. These dimensions might not immediately appeal to the participating pupils. However, the present study demonstrated that while the pupils did recognise the importance of the mentioned topics, especially when preparing for entrepreneurship competitions, they did not prominently discuss the given dimensions when reflecting on their learning experiences. This finding did not diverge from expectations based on previous research (Czyzewska & Mroczek, 2020; Huber et al., 2014). The identified gap could be successfully addressed by introducing simplified and gamified versions of the economic themes that the pupils did not grasp as thoroughly. The dimensions that pupils did not learn well align with EC dimensions that have posed challenges to pupils and students in other comparable EE programs (Huber et al., 2014; Oosterbeek et al., 2010). Consequently, policymakers should prioritise teacher EE training in constructivist pedagogy, which has positively affected the learning process in EE programs for early adolescents.

Finally, school environments have a discernible impact on the success of learning EC and achieving entrepreneurial learning outcomes among the participating pupils. The support provided by the school leadership, staff, and parents significantly contributes to this success. Negative feedback from peers does not play a pivotal role in the pupils' learning process. Even when faced with such feedback, participants remain motivated and resilient, motivated by the EE program. The pupils' enthusiasm for collaborative teamwork outweighs any deterrent effect of negative and derisive peer comments from non-participating pupils. While peers do influence initial application decisions and are essential for the learning environment, the present study suggests that the derisive remarks about the participating pupils' work do not overwhelmingly hinder or demotivate the participants (Barba-Sánchez & Atienza-Sahuquillo, 2016; Cocieru et al., 2020; Huber & Helm, 2020).

5.3 Limitations and future research

Certain limitations have been identified in this study. First, the authors possess no knowledge of the actual level of training and experience each of the teachers participating in the study possessed. Different levels of training could lead to teachers using different pedagogical methods and, consequently, varying levels

of success in the pupils' learning. Future researchers are advised to measure the teachers' training, experience, and background before the interviews commence. Second, while the teachers and pupils did describe the pedagogical methods used and the perceived learning that took place, there is a high probability of self-perception, and, likely, the descriptions are not an unbiased reflection of what indeed transpired in the EE programs. Also, the interviewer encouraged pupils to choose their most important perceived learning outcomes for themselves, which might have led the pupils and teachers to avoid talking about EC dimensions that have been learned but were not found to be highly important and were thus omitted from the discourse. Such an interviewing strategy might have led to important information being neglected. Future researchers could spend more time within the classroom spaces where the EE programs were being held or accompany the pupils on their excursions outside of the classroom and take notes of the occurrences rather than rely on the testimonies of the participants. Apart from direct and long-term observations, future researchers should use a mixed methods approach with a PRE and POST quantitative exploration of the learned EC dimensions measured with Likert-scale questionnaires.

Such an approach would enable the researcher to triangulate the outcomes of the qualitative and quantitative findings and render the study outcomes more reliable. Third, the pupils who participated in the EE programs did so of their own volition, which means there could have been some self-selection bias present. Future researchers could use an experimental design, picking the participants randomly and measuring the EC development of the participating and control groups to see if there is a difference in the level of EC improvement between the two groups. Fourth, the pupils, teachers, and principals partaking in the research were all from Slovenia, which can be perceived as a weakness for their similar cultural, social, and educational backgrounds, thus limiting the possibility of different background-based outcomes. Future researchers could utilise international networks like the Danube Cup as an opportunity to extend their research to other countries in future collaborations. Lastly, the teachers in the EE programs used only constructivist pedagogical methods, with teamwork being prevalent, but they employed no frontal teaching of specific EC dimensions like financial and economic literacy and deployed no traditional in-class testing. Such an approach might have led participants overwhelmingly to demonstrate the development of some non-economic dimensions, like *working with others,* but not of the more economic ones, like *financial and economic literacy*. Future researchers should create a control group where the participants would be taught only with traditional instruction. Then, the researchers might survey both groups using mixed methods to determine which pedagogical methods were more successful at achieving successful entrepreneurial learning outcomes.

6. Conclusion

The present study's findings underscore the significant potential of constructivist pedagogical methods in enhancing EC among early adolescents. Educators can better equip young learners with essential entrepreneurial skills by fostering an environment where students actively engage in hands-on learning through experience and failure. The role of the teacher emerged as pivotal in guiding pupils through complex concepts within their ZPD. This finding highlights the importance of targeted teacher training programs emphasising constructivist approaches, ensuring educators are well-prepared to facilitate effective entrepreneurial learning.

Moreover, the study revealed a distinct preference among pupils for collaborative activities and resource mobilisation, suggesting that these areas may be particularly fruitful for further pedagogical development. Conversely, the relatively lower emphasis on financial literacy and idea valuation indicates a need for more engaging and accessible methods to teach these critical economic concepts. Future researchers are recommended to explore innovative ways to integrate these dimensions into EE programs, potentially through gamification or other interactive approaches.

The implications of this research extend beyond the classroom, providing valuable insights for policymakers and educational program developers. By adopting constructivist methods and focusing on comprehensive teacher training, educational institutions can create a more supportive and effective learning environment that nurtures the entrepreneurial capabilities of young learners. Such an approach can, in turn, contribute to a more entrepreneurial society equipped to meet future challenges with creativity and resilience.

Funding

This research has been supported by the Slovenian Research and Innovation Agency (Core Project Funding J5–4574 and Programme group P5–0441).

References

Armuña, C., Ramos, S., Juan, J., Feijóo, C., & Arenal, A. (2020). From stand-up to start-up: exploring entrepreneurship competences and STEM women's intention. *International Entrepreneurship and Management Journal*, *16*(1), 69-92. https://doi.org/10.1007/s11365-019-00627-z

Baartman, L. K. J., & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, *6*(2), 125–134. https://doi.org/https://doi.org/10.1016/j.edurev.2011.03.001

Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). EntreComp: The Entrepreneurship Competence Framework. *Joint Research Centre*. https://doi.org/10.2791/593884

Bandura, A. (1977). Self-efficacy – Toward a unifying theory of behavioral change. *PSYCHOLOGICAL REVIEW*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Barba-Sánchez, V., & Atienza-Sahuquillo, C. (2016). The development of entrepreneurship at school: the Spanish experience. *Education + Training*, *58*(7/8), 783–796. https://doi.org/10.1108/ET-01-2016-0021

Bauman, A., & Lucy, C. (2021). Enhancing entrepreneurial education: Developing competencies for success. *The International Journal of Management Education*, *19*(1), 100293. https://doi.org/https://doi.org/10.1016/j.ijme.2019.03.005

Bell, R., & Bell, H. (2020). Applying educational theory to develop a framework to support the delivery of experiential entrepreneurship education. *Journal of Small Business and Enterprise Development*, *27*(6), 987–1004. https://doi.org/10.1108/JSBED-01-2020-0012

Bergman, N., Rosenblatt, Z., Erez, M., & De-Haan, U. (2011). Gender and the effects of an entrepreneurship training programme on entrepreneurial self-efficacy and entrepreneurial knowledge gain. *International Journal of Entrepreneurship and Small Business*, *13*(1), 38–54. https://doi.org/10.1504/IJESB.2011.040415

Blenker, P., Elmholdt, S. T., Frederiksen, S. H., Korsgaard, S., & Wagner, K. (2014). Methods in entrepreneurship education research: A review and integrative framework. *Education and Training*, *56*(8/9), 697–715. https://doi.org/10.1108/ET-06-2014-0066

Brüne, N., & Lutz, E. (2020). The effect of entrepreneurship education in schools on entrepreneurial outcomes: a systematic review. *Management Review Quarterly*, *70*(2), 275–305. https://doi.org/10.1007/s11301-019-00168-3

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020). Simulation-Based Learning in Higher Education: A Meta-Analysis. *Review of Educational Research*, *90*(4), 499–541. https://doi.org/10.3102/0034654320933544

Chojak, M. (2024). Shaping Entrepreneurial Attitudes among Young Children on the Basis of the "Entrepreneurial Kids" International Project. *Education Sciences*, *14*(1), Article 74. https://doi.org/10.3390/educsci14010074

Cocieru, O. C., Katz, M., & McDonald, M. A. (2020). A social network comparison between a Classroom-as-Organization and traditional management classes. *Journal of Education for Business*, *95*(8), 541–547. https://doi.org/10.1080/08832323.2020.1729684

Cope, J. (2003). Entrepreneurial Learning and Critical Reflection. *Management Learning*, *34*(4), 429–450. https://doi.org/10.1177/1350507603039067

Czyzewska, M., & Mroczek, T. (2020). Data Mining in Entrepreneurial Competencies Diagnosis. *Education Sciences*, *10(8)*(196), 1–17. https://doi.org/https://doi.org/10.3390/educsci10080196.

Feldlaufer, H., Midgley, C., & Eccles, J. S. (1988). Student, teacher, and observer perceptions of the classroom environment before and after the transition to junior high school. *The Journal of Early Adolescence*, *8*(2), 133–156.

Flick, U. (2018). *The SAGE Handbook of Qualitative Data Collection*. London. SAGE Publications Inc. https://doi.org/10.4135/9781526416070

Floris, M., & Pillitu, D. (2019). Improving entrepreneurship education in primary schools: a pioneer project. *International Journal of Educational Management*, *33*(6), 1148–1169. https://doi.org/10.1108/IJEM-09-2018-0283

Fylan, F. (2005). Semi-structured interviewing. In J. Miles & P. Gilbert (Eds.), *A Handbook of Research Methods for Clinical and Health Psychology* (pp. 16). Oxford University Press. https://doi.org/10.1093/med:psych/9780198527565.003.0006

Garcia-Rodriguez, F. J., Gutierrez-Tano, D., & Ruiz-Rosa, I. (2019). Analysis of the Potential of Entrepreneurship Education in Young Children [Article]. *Entrepreneurship Research Journal*, *9*(1), 9, Article 20170064. https://doi.org/10.1515/erj-2017-0064

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

Huber, S. G., & Helm, C. (2020). COVID-19 and schooling: evaluation, assessment and accountability in times of crises—reacting quickly to explore key issues for policy, practice and research with the school barometer. *Educational Assessment, Evaluation and Accountability*, *32*(2), 237–270. https://doi.org/10.1007/s11092-020-09322-y

Hytti, U., & O'Gorman, C. (2004). What is "enterprise education"? An analysis of the objectives and methods of enterprise education programmes in four European countries. *Education + Training*, *46*(1), 11–23. https://doi.org/10.1108/00400910410518188

Jardim, J., Bartolo, A., & Pinho, A. (2021). Towards a Global Entrepreneurial Culture: A Systematic Review of the Effectiveness of Entrepreneurship Education Programs [Review]. *Education Sciences*, *11*(8), 18, Article 398. https://doi.org/10.3390/educsci11080398

Jardim, J., Pereira, A., Bartolo, A., Pinho, A., Cardoso, M., & Catanho, P. (2023). Promoting an Entrepreneurial Culture: Development, Feasibility and Acceptability of a Primary School-Based Program Focused on Soft Skills. *Education Sciences*, *13*(11), Article 1074. https://doi.org/10.3390/educsci13111074

Lazarides, R., Dicke, A.-L., Rubach, C., & Eccles, J. S. J. J. o. e. p. (2020). Profiles of motivational beliefs in math: Exploring their development, relations to student-perceived classroom characteristics, and impact on future career aspirations and choices. *Journal of Educational Psychology*, *112*(1), 70.

Löbler, H. (2006). Learning entrepreneurship from a constructivist perspective. *Technology Analysis & Strategic Management*, *18*(1), 19–38. https://doi.org/10.1080/09537320500520460

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*(2), 211–224. https://doi.org/10.1016/j.jbusvent.2012.03.002

Moberg, K. (2014). Two approaches to entrepreneurship education: The different effects of education for and through entrepreneurship at the lower secondary level. *The International Journal of Management Education*, *12*(3), 512–528. https://doi.org/https://doi.org/10.1016/j.ijme.2014.05.002

Moberg, S. K. (2021). Online-based entrepreneurship education-its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education*, *24*(2), 1–27.

Oe, H., & Tanaka, C. (2023). Qualitative Evaluation of Scaffolded Teaching Materials in Business Analysis Classes: How to Support the Learning Process of Young Entrepreneurs. *Education Sciences*, *13*(3), 1–15.

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

Paul-Binyamin, I., & Potchter, O. (2020). Religious students in a public-secular college: feeling unique in a milieu of diversity. *BRITISH JOURNAL OF RELIGIOUS EDUCATION*, *42*(3), 350–363. https://doi.org/10.1080/01416200.2019.1644487

Ratelle, C. F., Lascano, D. I. V., Guay, F., & Duchesne, S. (2023). Need satisfaction profiles during the transition to secondary school and its implications in later education. *Learning and Individual Differences*, *107*, Article 102357. https://doi.org/10.1016/j.lindif.2023.102357

Sagone, E., De Caroli, M. E., Falanga, R., & Indiana, M. L. (2020). Resilience and perceived self-efficacy in life skills from early to late adolescence. *International Journal of Adolescence and Youth*, *25*(1), 882–890. https://doi.org/10.1080/02673843.2020.1771599

Sommarström, K., Oikkonen, E., & Pihkala, T. (2020). Entrepreneurship education – paradoxes in school–company interaction. *Education and Training*(2002). https://doi.org/10.1108/ET-08-2019-0171

Spiekerman, A. M., & Rose, A. J. (2024). Associations Between Adolescent Friends' Responses During Problem Talk and Depressive Symptoms. *Developmental psychology*. https://doi.org/10.1037/dev0001685

SPIRIT Slovenija. (2016). *Vikend podjetnosti za učitelje, profesorje in vodstva šol*. [Startup Weekend for Teachers, Professors, and School Management]: Spirit Slovenija. Retrieved from https://www.podjetniski-portal.si/novice/vikend-podjetnosti-za-ucitelje-profesorje-in-vodstva-sol-2016-10-04

SPIRIT Slovenija. (2019). *Javni poziv osnovnim in srednjim šolam za dodelitev spodbud namenjenih izvajanju aktivnosti za spodbujanje ustvarjalnosti, podjetnosti in inovativnosti med mladimi v letih 2019/2020*. [Public Call for Tender to Primary Schools for Collaboration in Programs for Enhancing Creativity, Entrepreneurship, and Innovation for Young People in the School Year 2019/2020]: Spirit Slovenija. Retrieved from https://www.spiritslovenia.si/resources/files/doc/javni_razpisi/RAZPISI_2019/1321/Pozivna_dokumentacija_JP_MLADI_2019_2020.pdf

Stepánková, L., Fikrlová, J., Albrecht, A., Serek, J., & Brojác, J. (2023). Difficulties, uncertainty, and opportunity: The experience of the COVID-19 pandemic by early to late adolescence in the Czech Republic. *SOCIAL AND PERSONALITY PSYCHOLOGY COMPASS*, *17*(10). https://doi.org/10.1111/spc3.12844

Tenney-Soeiro, R., & Sieplinga, K. (2021). Teaching about children with medical complexity: A blueprint for curriculum design. *CURRENT PROBLEMS IN PEDIATRIC AND ADOLESCENT HEALTH CARE*, *51*(12), Article 101129. https://doi.org/10.1016/j.cppeds.2021.101129

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes* (2 ed.). Cambridge. Harvard University Press.

Wengraf, T. (2001). *Qualitative Research Interviewing: Biographic Narrative and Semi-Structured Methods*. London. Sage. http://digital.casalini.it/9781446205846 http://digital.casalini.it/4913045

Yang, Q. X., Chen, J. C., Yang, L. J., & Liu, Z. H. (2021). How to Develop Entrepreneurial Talent More Effectively? A Comparison of Different Entrepreneurship Educational Methods [Article]. *Frontiers in Psychology*, *12*, 14, Article 644113. https://doi.org/10.3389/fpsyg.2021.644113

Yin, R. K. (2018). *Case study research: Design and methods* (6 ed., Vol. 5). Los Angeles. SAGE.

Entrepreneurship Education Differences between the Generations of Socialism and Post-Socialism*

*Judit Csákné Filep, Áron Szennay***

Abstract

The study investigates the generational differences in entrepreneurship education between socialist and post-socialist eras in Hungary, addressing an often-overlooked aspect of entrepreneurial studies. We analysed data from a Hungary-specific question block in the 2022 Global Entrepreneurship Monitor (GEM) dataset to examine disparities in access to entrepreneurial knowledge. Our findings reveal significant generational differences influenced by the natural evolution of education and historical events. A positive correlation was found between participation in entrepreneurship education and entrepreneurial activity. These findings highlight the need for tailored training programs that consider generational nuances. The study advocates for integrating entrepreneurship education at all levels to promote entrepreneurial ventures effectively.

Keywords: entrepreneurship education, Central and Eastern Europe, CEE, Hungary
JEL Codes: A20, L26, P29

1. Introduction

Entrepreneurship catalyses employment, economic growth, and regional progress (Galvão et al., 2017; Urbano et al., 2019). It is significantly fostered by dedicated entrepreneurship education and training initiatives (Martínez-Gregorio et al., 2021). Consequently, entrepreneurship education has garnered prominence on political agendas, exemplified by the European Commission's launch of the Entrepreneurship 2020 Action Plan (European Commission, 2013). This strategic initiative underscores the societal and economic significance of fostering entrepreneurial skills and knowledge in the educational landscape.

Although entrepreneurship education is often regarded as a homogeneous entity, a critical oversight neglects the variances in entrepreneurship education across different generations, especially in the post-socialist countries of Central and Eastern Europe (CEE) (Banha et al., 2022; Ensari, 2017). Here, disparities transcend the natural evolution of entrepreneurship education, extending into historical events that have shaped diverse generations' access to distinct forms of entrepreneurial knowledge (Festeu et al., 2020; Potter, 2008).

* Received: 26.1.24, accepted: 18.10.24, 2 revisions.

** *Judit Csákné Filep*, Ph.D., Senior Research Fellow, Budapest Business University, Budapest LAB Office for Entrepreneurship Development; Associate Professor, University of Nyíregyháza, Institute of Business and Management Sciences. Email: csaknefilep.judit@uni-bge.hu. Main research interests: entrepreneurship, family businesses, entrepreneurship education.
Áron Szennay, Ph.D., Senior Research Fellow, Budapest Business University, Budapest LAB Office for Entrepreneurship Development. Email: szennay.aron@uni-bge.hu, Main research interest: entrepreneurship, social and environmental responsibility in business.

Within this context, our study addresses the following research questions:

– How did participation patterns in entrepreneurship education evolve before and after the regime change in a post-socialist country?
– What were the primary sources for acquiring entrepreneurial skills and knowledge across different generations?
– How does educational attainment influence participation in entrepreneurship education among various generations?

Thus, we suggest that ignoring the influence of generational dynamics in entrepreneurship education hinders a comprehensive understanding, particularly in transformational economies within the European Union. General generational theories provide a valuable framework for examining participation in entrepreneurship education, especially relevant to CEE countries (Róbert & Valuch, 2013).

Intergenerational differentiation can affect the content and methodology of entrepreneurship education. Varied generational needs for knowledge and distinct preferences in teaching methods necessitate tailored approaches. Classical methods may prove effective for the older generation, while digitialised learning materials become imperative for the younger cohort (Kauppinen & Iftikhar Choudhary, 2021).

Our work contributes to the knowledge of entrepreneurship education in CEE, which is underrepresented in the literature. The uniqueness of our work lies in the intergenerational approach to entrepreneurship education in a post-socialist country.

The ensuing chapter explores the literature on entrepreneurship education, with a particular emphasis on findings relevant to CEE, and presents the hypotheses. Subsequent sections outline the dataset underpinning our analysis, detail the variables considered, and discuss our research findings. Ultimately, the paper concludes by delineating potential avenues for future research.

2. Literature review and hypothesis development

Entrepreneurship is pivotal in generating value, employment, and overall economic advancement. In CEE countries, entrepreneurship is pivotal in socio-economic development, as entrepreneurs are seen as key drivers of progress (Festeu et al., 2020). Entrepreneurship education cultivates entrepreneurial intentions and equips individuals with essential entrepreneurial competencies vital for entrepreneurs and employees. The European Commission's Entrepreneurship Competence Framework offers a standardised definition of entrepreneurship as a competence and serves as a foundational tool for the development of entrepreneurship curricula (Bacigalupo et al., 2016). Recognising their role in stimulating entrepreneurial activity, higher education institutions in the region

have integrated entrepreneurship into their curricula (Varblane & Mets, 2010). Consequently, the emphasis is on producing a growing cohort of graduates equipped with diverse enterprising competencies and the skills and aspirations requisite for entrepreneurial pursuits (Blenker et al., 2014).

The distinctive evolution of entrepreneurship in transition economies, like those in CEE, underscores the need for a deeper understanding of societal and economic progress.

Scholars employ a range of terminologies to describe the regimes of the former Soviet bloc. Some scholars prefer the term "communist," while others opt for "socialist," and some use these terms interchangeably. Socialism and communism are economic ideologies that advocate for public rather than private ownership of resources (Çam & Kayaoğlu, 2015; Roberts, 2004). Regime change refers to the transition from Soviet-imposed one-party dictatorships to parliamentary democracies with multi-party systems in Eastern Europe and the shift from centrally planned economies based on state ownership to market economies based on private ownership (Romsics, 2014, p.1).

Entrepreneurs are the architects of new business ventures, which persisted in CEE despite challenging political conditions (Kuczi & Lengyel, 2001). Before the significant transitions at the end of the 1980 s, the private sector in these countries operated within various categorisations, such as (1) the grey (optimise tax payments to the minimum (Papp, 2008), (2) second (invisible income, economic production carried out outside the main working place (Andorka, 1990) and (3) underground (illegal economic transactions not meeting government reporting requirements) economy. This sector was typically characterised by its small-scale, labour-intensive nature and informal structure. Initial reforms in the 1980 s marked a shift as socialist governments began easing restrictions on the private sector, resulting in an initial surge of entrepreneurship. Without clear legal frameworks for private property, entrepreneurship flourished in this ambiguous environment, mainly where government restrictions on the private sector were relatively few (Kuczi & Lengyel, 2001; Sereghyová, 1993).

The 1990 s witnessed a substantial surge in private entrepreneurship, driven by the dismantling of communism and the ongoing decline of the state sector (Peng & Shekshnia, 1993). Although Lelkes (2006) found that entrepreneurs were considered major winners of the political transition, the transition itself resulted in a transformational recession (Kornai, 1994) as large masses became unemployed after former state-owned companies went bankrupt (Csizmadia et al., 2016). These times were described with gates “thrown wide open, resulting in some cases [in] rampant capitalism and illicit profiteering” (Mosolygó-Kiss et al., 2019, p. 4). Capitalism, however, became an attractive prospect, acting as a pull factor, while the failures of state-owned enterprises acted as a push factor. These

dynamics led to the dismantling of restrictions on private firms, paving the way for the rapid growth of entrepreneurship (Peng & Shekshnia, 1993).

The socialist regime diminished the entrepreneurial spirit due to a lack of self-reliance fostered by decades of socialist education and socialisation, particularly evident in East Germans compared to their West German counterparts (Bauernschuster et al., 2012). However, entrepreneurship education can develop the essential traits, abilities, and skills needed for entrepreneurship for example Kuratko (2016) or Liu et al. (2019).

Entrepreneurship education, the development of skills and knowledge for entrepreneurship, affects the intention to start a business based on the theory of planned behaviour, which is a prerequisite for starting an enterprise (Ajzen, 1991). In post-socialist countries, where there has been no opportunity to start a business for decades, the role of entrepreneurship education in stimulating entrepreneurial propensity is vital. Evidence shows that entrepreneurship education has a positive impact on students' entrepreneurial intention in high-income (e. g., Hungary see Szerb & Lukovszki, 2013; Gubik & Farkas, 2019 or Trinidad and Tobago see Mack et al., 2021), emerging (e. g., India see Jena, 2020), and developing countries (e. g. Nigeria see Ediagbonya, 2013). (The World Bank categorises countries according to gross national income.)

Nowiński et al. (2019), in a study examining the impact of entrepreneurship education on entrepreneurial intentions among university students in the Visegrad countries (Czech Republic, Hungary, Poland, Slovakia), found that entrepreneurship education exerts a notable influence on entrepreneurial intentions, primarily mediated by the enhancement of entrepreneurial self-efficacy. This underscores the positive effect of structured entrepreneurship education programmes on shaping the mindset and intentions of aspiring entrepreneurs.

Empirical evidence shows that a myriad of factors influences entrepreneurial intention, for example, (1) age as a moderating factor on the influence of work experience (Miralles et al., 2017), (2) gender and university education (Maslakcı & Sürücü, 2021), (3) entrepreneurship education (Putri & Widiyanti, 2022), or even (4) parents and friends, government support, and university support (Yu & Ma, 2022). Conversely, attributes like narcissism, psychopathy, and Machiavellianism, representing the opposite of proactive personality, also exert a substantial effect on entrepreneurial intention (Gubik & Vörös, 2023; Wu et al., 2019).

The growing importance of entrepreneurship education fostered related research (Huszák & Jáki, 2022). However, the research landscape in entrepreneurship education exhibits conceptual and methodological fragmentation. Existing findings indicate that research methodologies in entrepreneurship education tend to coalesce into two predominant groups: first, quantitative studies focusing on

the scope and impact of entrepreneurship education, and second, qualitative single-case studies delving into various courses and programmes (Blenker et al., 2014).

Professional education, work experience, and previous management roles can positively influence entrepreneurship and business formation. In transition economies, education and professional experience gain additional significance, especially since many entrepreneurs initially lack private business experience. Entrepreneurship became more appealing to educated individuals once the transition commenced, surpassing the attractiveness of entrepreneurial activities tolerated under communism (Smallbone & Welter, 2009).

Doan (2022) asserts that countries aspiring to foster entrepreneurship and enterprise development should prioritise entrepreneurship education.

As the literature suggests, entrepreneurship education, like several other factors, significantly affects entrepreneurial activity. However, generations have had different access to entrepreneurship education in transitional economies like Hungary. Thus, we formed the first hypothesis:

H1: The participation rates in entrepreneurship education before and after the regime change are equal in Hungary.

The generation socialised during the decades of socialism due to the lack of entrepreneurship curriculum in formal education (secondary school, university); if they wanted to improve their entrepreneurial knowledge, they did so outside the school system through courses, training or other courses. Furthermore, it is assumed that the opening up opportunities for business start-ups and the availability of non-formal forms of entrepreneurship education after the regime change will equalise the proportion of participants in entrepreneurship education across the generations. The generational difference was analysed using the following hypothesis.

H2: In Hungary, the older generation (generations of socialism) tended to acquire their knowledge of entrepreneurship outside formal education.

Higher education is generally correlated with the years spent in formal education. As a result, individuals with higher education are more likely to have received training during their studies to prepare them for entrepreneurial activities than those who completed their education earlier. However, during the socialist era in Hungary, entrepreneurship was not allowed, and education was not available in this area. Once private business ownership became possible, individuals who recognised the need to develop their entrepreneurial skills would likely pursue such opportunities regardless of their educational background. Assuming that the older generation has received entrepreneurship education outside the formal school system and that the younger generation has sufficient

opportunities to learn entrepreneurship at all levels of the education system, we believe that participation in entrepreneurship education is not dependent on educational attainment. The relationship between entrepreneurship education and educational attainment was analysed to better understand the phenomena using two sub-hypotheses reflecting the two generations.

H3 a: Participation in entrepreneurship education is independent of educational attainment in the case of the generation of socialism in Hungary.

H3 b: Participation in entrepreneurship education is independent of educational attainment in the case of the generation of transformational crisis and post-socialism in Hungary.

Accepting the positive effect of entrepreneurship education on becoming an entrepreneur highlighted in the literature (Martínez-Gregorio et al., 2021) and assuming that entrepreneurs with no prior knowledge of entrepreneurship attend entrepreneurship courses as practising entrepreneurs to increase their knowledge, we expect the data to confirm the positive relationship between entrepreneurship education and becoming an entrepreneur. Based on this, the following hypothesis was formulated.

H4: For both Hungarian generations studied, there is a positive relationship between participation in entrepreneurship education and becoming an entrepreneur.

3. Methodology

We aim to contribute to the topic of entrepreneurship education in Central and Eastern Europe by analysing data from the Hungarian Global Entrepreneurship Monitor (GEM) Adult Population Survey (APS) 2022. GEM conducts survey-based research on entrepreneurship and entrepreneurship ecosystems worldwide by collecting data on entrepreneurship directly from individual entrepreneurs. The APS examines the role of the individual in the life cycle of the entrepreneurial process. The APS is administered to a nationally representative sample of active-aged adults in each economy. Data collection for the APS is coordinated centrally; thus, all surveys are subject to several quality assurance checks before data collection begins. The resulting data are repeatedly checked before publication (GEM (Global Entrepreneurship Monitor), 2024).

Data from the 2022 GEM Hungary APS were used during our work. The initial dataset comprises 2014 respondents representing the 18–64 year old population. However, the subsample of entrepreneurs contains 336 elements. The standard GEM questionnaire was complemented with questions on entrepreneurship education. For variables measured on a scale, GEM employs a 5-point Likert scale. For the analysis, the following variables were used:

Table 1. Description of variables (own compilation)

Variable	Description	Values
UNEDUC	Educational attainment using harmonised categories of the United Nations (updated in 2018)	Pre-primary education Primary education, or first stage of basic education Lower secondary or second stage of basic education (Upper) secondary education Post-secondary non-tertiary education Short-cycle tertiary education Bachelor or equivalent Master or equivalent Doctor or equivalent
huaentredu	Participation in education aiming to prepare for becoming an entrepreneur or motivating to become one?	Yes No
huaentreduwhe	Source of entrepreneurship education	Elementary school High school University Other (training, other course)
ANYBUSOW	The respondent is an entrepreneur (nascent, new or established)	Yes No
GENERATIONS	Generations	Generations of socialism Generations of transformational crisis and post-socialism

For the analysis, a dummy variable was created based on the generations identified by Róbert and Valuch (2013) (see Table 2) in Hungary. In their detailed generational map, the authors identified eight generations and then, by combining them, created a categorisation with six generations. In our work, we further narrowed the categories and distinguished two generations: (1) generations of socialism and (2) generations of transformational crisis and post-socialism. Our sample reasoned this reduction as the survey was conducted among the 18–64-year-old adult population. For this reason, the first generation involved in the study is the generation socialised during the times of economic growth called Goulash Communism, which provided some legitimisation for the system (Beichelt, 2015). With this categorisation, we divided the population involved in the data collection into the generation of socialism and post-socialism using 1990, the first national election after the regime change, as a cut-off point. As with every generational categorisation, ours has its flaws, but as the age cohorts with the highest entrepreneurial activity 35–54 years (see Csákné Filep et al., 2023) are technically split, this approach can be a satisfactory solution for classification.

Table 2. Generational map (Róbert & Valuch, 2013, p. 112)

Detailed generation map	Merged generational map	Reduced generational map
before 1945: generation socialised during the Horthy era	before 1949: presocialist generation socialised before 1949	Population at or close to the age of retirement
1939–1945: generation socialised during the war period		
1945–1948: generation of bright-winds		
1949–1962: generation socialised in the long 50 s	1949–1962: generation socialised in the long 50 s	1949–1989: generations of socialism
1963–1979: generation socialised during the Kádár consolidation (including the "big generation" and the technocrat generation)	1963–1979: generation socialised during the Kádár consolidation (including the "big generation" and the technocrat generation)	
1980–1989: generation of Kádár-crisis	1980–1989: generation of Kádár-crisis	
1990–1995: generation of transformational crisis	1990–1995: generation of transformational crisis	1990-present: generations of transformational crisis and post-socialism
1996-present: generation of post-socialism	1996-present: generation of post-socialism	

Data from a representative survey of the Hungarian adult population were analysed using a quantitative methodology. Given the categorical nature of the variables involved in the analysis, chi-square tests were conducted.

4. Results & Discussion

The sample analysed is representative of the Hungarian active-aged population. Accordingly, the distribution of gender and age in the dataset corresponds to the population distribution, but educational attainment was also considered. It is important to highlight that if a respondent refuses to give his/her year of birth exactly, it is feasible to give an age category instead. Thus, in some cases, the generations could not be computed (see missing values in the case of the Generations variable in Table 3). The majority of the sample is considered to be older, as 71.5 % of them belong to the generation of communism, i. e., born before 1990. Almost one-fifth (18.1 %) of the sample reported ever participating in entrepreneurship education, slightly higher than the similar figure in the GEM Hungary National Report of 2023/2024 (see Csákné Filep et al., 2024). The majority of them (52.3 %), however, received it outside of the formal education.

Table 3. Distribution of demographic variables of the sample and the variables analysed (own compilation)

Gender		**Education**	
Male	49.5 %	Pre-primary education	0.2 %
Female	50.5 %	Primary education, or first stage of basic education	8.7 %
Total	**100.0 %**	Lower secondary or second stage of basic education	21.0 %
Age		(Upper) secondary education	33,4 %
18–24	13.1 %	Short-cycle tertiary education	8.7 %
25–34	19.8 %	Bachelor or equivalent	14.4 %
35–44	25.0 %	Master or equivalent	13.0 %
45–54	20.0 %	Doctor or equivalent	0.7 %
55–64	22.1 %	**Total**	**100.0 %**
Total	**100.0 %**	**Have you ever participated in education to prepare you to become an entrepreneur or to motivate you to become one?**	
Generations		Yes	18,1 %
generations of socialism	71.5 %	No	81.6 %
generations of transformational crisis and post-socialism	28.3 %	missing	0.2 %
missing	0.2 %	**Total**	**100.0 %**
Total	**100.0 %**	**Where did you receive entrepreneurship education?**	
Any Business Owner: Nascent New Established		High school	19,4 %
Yes	16.8 %	University	28.3 %
No	83.2 %	Other (training, other course)	52.3 %
Total	**100.0 %**	**Total**	**100.0 %**

Table 4. Entrepreneurship education of generations crosstabulation (own compilation)

		Have you ever participated in education to prepare you to become an entrepreneur or to motivate you to become one?					
		Yes		No		Total	
		N	%	N	%	N	%
Generations	generations of socialism	237	64.9 %	1202	73.2 %	1439	71,7 %
	generations of transformational crisis and post-socialism	128	35.1 %	439	26.8 %	567	28,3 %
Total		365	100,0 %	1641	100.0 %	2006	100.0 %

The Pearson Chi-square test shows a significant relationship (p=0.001) between the generations and their participation in entrepreneurship education. Our findings show that the generation of transformational crisis and post-socialism are more likely to participate in entrepreneurship education than the generations of socialism. The odds ratio also confirms it, as the older generations are 0.676 times (CI: 0.531 – 0.861) more likely to participate in entrepreneurship education than younger ones. However, this relationship is rather weak as the Cramer's V value is 0.071. This finding suggests that in addition to genera-

tional affiliation, many other factors influence an individual's participation in entrepreneurship education, so further in-depth analysis and verification of the results obtained are desirable.

Based on the results, hypothesis H1 is rejected. Generations did not have the same access to entrepreneurship education. For those born after the regime change, entrepreneurship education is more accessible than for those born during the decades of socialism, most of whom did not even have the opportunity to start a business during their active years.

For the two generations concerned, there are differences in participation in entrepreneurship education and the source from which entrepreneurial knowledge is acquired. The Pearson Chi-square test yielded a significant relationship between the generations and the source of entrepreneurship education ($p< 0.001$). The strength of the correlation is weak ($V=0.276$). For the generations of socialism, entrepreneurship education was less available in formal education, and they tended to learn about entrepreneurship outside the formal education system (training and other courses). This may also indicate that entrepreneurship knowledge was a priority for them and that they were willing to mobilise financial resources and time to acquire it. The result may also be influenced by the fact that the older generations were more likely to have had opportunities to expand their knowledge of entrepreneurship outside the school system during their lifetime. Most of the younger generations of transformational crisis and post-socialism had received entrepreneurship education during their university studies or in secondary school, and they were less likely to have taken advantage of non-formal entrepreneurship education (Table 5). The older generation may have acquired knowledge outside the formal framework through experience and learning by doing (Woods & Burley, 2021). The learning-by-doing approach, the practical experience of the older generation, equipped them with a holistic understanding of market conditions after the regime change.

The analysis confirmed hypothesis H2, that the different generations acquired entrepreneurial knowledge from different sources. The results highlight the importance of entrepreneurship education, suggesting that members of the older generation who did not have access to entrepreneurship education in formal schooling were later willing to invest their resources and time to develop their knowledge of entrepreneurship outside the school system to acquire the necessary skills. In post-socialist countries, it is possible to examine the attitudes towards entrepreneurship education of two generations socialised in very different circumstances. The results suggest that entrepreneurial knowledge is so essential that people are willing to mobilise their resources to acquire it. This confirms the importance of including the development of entrepreneurial knowledge and skills in the curriculum at all levels of public education.

Table 5. Source of entrepreneurship education crosstabulation (own compilation)

		Generations				Total	
		generations of socialism		generations of transformational crisis and post-socialism			
		N	%	N	%	N	%
Where did you receive entrepreneurship education?	Refused	2	0.8 %	0	0.0 %	2	0.5 %
	Don't Know	5	2.1 %	1	0.8 %	6	1.6 %
	High school	36	15.3 %	32	25.0 %	68	18.7 %
	University	50	21.2 %	51	39.8 %	101	27.7 %
	Other (training, other course)	143	60.6 %	44	34.4 %	187	51.4 %
Total		236	100.0 %	128	100.0 %	364	100.0 %

Since becoming an entrepreneur is not linked to participation in any prior compulsory education, ideally, educational attainment and participation in entrepreneurship education should be independent. This means that access to entrepreneurship education should be available at all levels of the education system. However, our findings show a significant relationship ($p<0.001$) between educational attainment and entrepreneurship education participation in both generations analysed. These relationships are weak, as the Cramer's V values are 0.196 and 0.206 for the older and younger generations, respectively. Accordingly, hypotheses H3 a and H3 b must be rejected. Our figures suggest that people with tertiary education participate in a higher proportion of entrepreneurship training in both generations (Table 6).

Table 6. Educational attainment and entrepreneurship education crosstabulation (own compilation)

		Have you ever participated in education to prepare you to become an entrepreneur or to motivate you to become one?				Total	
		Yes		No			
		N	%	N	%	N	%
UNEDUC. UN harmonised educational attainment (Categories updated in 2018)	Pre-primary education	0	0,0 %	3	0,2 %	3	0,1 %
	Primary education, or first stage of basic education	9	2,5 %	165	10,0 %	174	8,7 %
	Lower secondary or second stage of basic education	49	13,4 %	370	22,5 %	419	20,9 %
	(Upper) secondary education	115	31,5 %	559	34,0 %	674	33,5 %
	Short-cycle tertiary education	45	12,3 %	129	7,8 %	174	8,7 %
	Bachelor or equivalent	64	17,5 %	226	13,7 %	290	14,4 %
	Master or equivalent	76	20,8 %	184	11,2 %	260	12,9 %
	Doctor or equivalent	7	1,9 %	8	0,5 %	15	0,7 %
Total		365	100,0 %	1644	100,0 %	2009	100,0 %

If a respondent has participated ever in entrepreneurship education, another question was related to the source of that education. Accordingly, this is a subsample because answers from those not participating in entrepreneurship education are excluded. There is a relationship between educational attainment and participation in entrepreneurship education, with those with higher educational attainment more likely to receive entrepreneurship education. It is plausible that entrepreneurship education is mainly concentrated in higher education. However, more than half of the respondents participated in entrepreneurship education outside the formal education system, and only one in four reported that the university was the source of this knowledge. Not only do those with tertiary education have a higher proportion of entrepreneurship education, but they also tend to have acquired entrepreneurial skills through university education. Based on the analysis, the effect size is moderate ($p<0.001$, $V=0.358$). Among the respondents without tertiary education, we also found respondents who said that they had acquired entrepreneurial skills and knowledge in higher education. This may be because there are Hungarian universities that organise free or market-oriented training courses and conferences where a university degree is not a requirement for participation (Table 7).

Table 7. Educational attainment and source of entrepreneurship education crosstabulation (own compilation)

		Where did you receive entrepreneurship education?						Total	
		High school		University		Other (training, other course)			
		N	%	N	%	N	%	N	%
UNEDUC. UN harmonised educational attainment (Categories updated in 2018)	Primary education, or first stage of basic education	5	7,1 %	1	1,0 %	3	1,6 %	9	2,5 %
	Lower secondary or second stage of basic education	11	15,7 %	1	1,0 %	36	19,1 %	48	13,4 %
	(Upper) secondary education	24	34,3 %	16	15,8 %	71	37,8 %	111	30,9 %
	Short-cycle tertiary education	14	20,0 %	5	5,0 %	26	13,8 %	45	12,5 %
	Bachelor or equivalent	10	14,3 %	30	29,7 %	23	12,2 %	63	17,5 %
	Master or equivalent	6	8,6 %	44	43,6 %	26	13,8 %	76	21,2 %
	Doctor or equivalent	0	0,0 %	4	4,0 %	3	1,6 %	7	1,9 %
Total		70	100,0 %	101	100,0 %	188	100,0 %	359	100,0 %

For a deeper look at the impact of entrepreneurship education, we split the generations by whether or not they had received entrepreneurship education.

Based on this breakdown, we grouped the respondents into four categories: (1) generations of socialism with entrepreneurship education (N=237), generations of socialism without entrepreneurship education (N=1202), generations of transformational crisis and post-socialism with entrepreneurship education (N=128), generations of transformational crisis and post-socialism without entrepreneurship education (N=439).

There is a relatively large literature on the relationship between participation in entrepreneurship education and entrepreneurship. However, the primary source of knowledge on the subject is the Global University Entrepreneurial Spirit Students' Survey (GUESSS), which provides comprehensive, internationally comparable data on the entrepreneurial propensity of students in higher education, but data on the adult population are not available with a similar regularity and structure (Sieger et al., 2021).

Our findings suggest that people who participate in entrepreneurship education are more likely to be entrepreneurs (Table 8). The odds ratio is 2.21 for the total population, while it is 1.79 for the older and 4.14 for the younger generations. However, this result does not determine the direction of the relationship. Chi-Square tests confirm a significant relationship between participating in entrepreneurship education and becoming an entrepreneur for both generations analysed ($p<0.001$). The relationship is, however, rather weak, $V=0.092$ and $V=0.250$ for the older and the younger generations, respectively. The higher V-value for the younger generation and the strikingly low V-value for the older generation may indicate that the older generation acquired entrepreneurial knowledge mainly by learning by doing.

Table 8. Entrepreneurship education and entrepreneurship crosstabulation (own compilation)

Generation	Participation in education aiming to prepare for becoming an entrepreneur or motivating to become one?	Owns or manages a business				Total	
		No		Yes			
		N	%	N	%	N	%
Generations of socialism	Yes	176	14.9 %	61	23.8 %	237	16.5 %
	No	1007	85.1 %	195	76.2 %	1202	83.5 %
	Total	1183	100.0 %	256	100.0 %	1439	100.0 %
Generations of transformational crisis and post-socialism	Yes	89	18.3 %	39	48.1 %	128	22.6 %
	No	397	81.7 %	42	51.9 %	439	77.4 %
	Total	486	100.0 %	81	100.0 %	567	100.0 %
Total	Yes	266	15.9 %	99	29.5 %	365	18.2 %
	No	1408	84.1 %	237	70.5 %	1645	81.8 %
	Total	1674	100.0 %	336	100.0 %	2010	100.0 %

However, the motivation and purpose of participation in entrepreneurship education are likely to differ between the older and younger generations. Many

members of the older generation became entrepreneurs after the regime change out of necessity to secure the standard of living they had been used to. It is likely that many of them, already active entrepreneurs, were faced with a lack of entrepreneurial skills to run their businesses successfully and efficiently and developed their skills outside the formal education system or learning by doing. For the younger generation, the aim of entrepreneurship education is quite different, as an essential element of formal education is the inclusion of educational modules that motivate them to become entrepreneurs. In their case, entrepreneurship education aims to stimulate interest in becoming an entrepreneur and to develop the necessary skills and basic knowledge.

Table 9. Summary of hypotheses analysed (own compilation)

Hypothesis	Variables	Result
H1: Generations' participation rates in entrepreneurship education do not differ.	Generations × HUAENTREDU	rejected (p=0.001)
H2: The older generation (generations of socialism) tended to acquire their knowledge of entrepreneurship outside formal education	Generations × HUAENTREDUWHE	confirmed (p< 0.001)
H3a: Participation in entrepreneurship education is independent of educational attainment in the case of the generation of socialism.	UNEDUC × HUAENTREDU	rejected (p<0.001)
H3b: Participation in entrepreneurship education is independent of educational attainment in the case of the generation of transformational crisis and post-socialism.	UNEDUC × HUAENTREDU	rejected (p<0.001)
H4: There is a positive relationship between participation in entrepreneurship education and becoming an entrepreneur for both generations studied	GENERATIONS × HUAENTREDU × ANYBUSOW	confirmed (p<0.001)

5. Conclusion & Future Research Directions

Our work plays a pioneering role in mapping the impact of the post-socialist era on entrepreneurship education and, in addition to other aspects of a specific historical past already studied (Csákné Filep, Martyniuk et al., 2023; Gittins et al., 2022), draws attention to the differential access to entrepreneurship education across generations. The findings of this study underscore a pronounced variance in the accessibility of entrepreneurship education between cohorts belonging to the generation of socialism and the generation of transformational crisis and post-socialism in Hungary. The older generation, primarily shaped during the socialist era, faced limited access to entrepreneurship education during their formal educational years. Regrettably, this educational deficit persisted into their later stages of life, as evident in the efforts undertaken by this cohort to bridge the knowledge gap through extracurricular means.

Contrastingly, the younger generation benefits from integrating entrepreneurship education within formal educational frameworks. This inclusion suggests a potential explanation for the proclivity of the older generation to seek supple-

mentary entrepreneurial knowledge outside the formal education spectrum. Consequently, our study advocates for a nuanced approach when crafting training programmes geared towards cultivating entrepreneurial skills, underscoring the importance of tailoring such initiatives to the unique needs of each generation. Entrepreneurship education in Central and Eastern Europe requires a unique approach, evidenced by publishing a book dedicated to the subject (Żyminkowska & Ożańska-Ponikwia, 2023).

Notably, our results elucidate a disparity in the availability of entrepreneurship education across different echelons of the education system. While higher education institutions, particularly universities, play a pivotal role in offering such programs, a more inclusive approach warrants consideration, as Festeu et al. highlighted (2020). Introducing entrepreneurship education into the curricula of primary and secondary schools as recommended by the Eurydice report (Education, Audiovisual and Culture Executive Agency. Eurydice (Brussels, Belgium). et al., 2016) holds promise for equalising access to foundational skills, competencies, and knowledge crucial for embarking on successful entrepreneurial ventures.

This research confirms the critical role that entrepreneurship education has already been shown to play in fostering entrepreneurial aspirations (Ediagbonya, 2013; Gubik & Farkas, 2019; Jena, 2020; Mack et al., 2021; Szerb & Lukovszki, 2013). A positive correlation between participation in entrepreneurship education and entrepreneurial pursuits emerges prominently within both the socialist and post-socialist generations. These findings are relevant for policymakers and practitioners in entrepreneurship education, providing valuable insights into formulating practical strategies and raising awareness of the need to adapt curricula to generational needs.

Despite these contributions, it is imperative to acknowledge the study's limitations. The exclusive focus on a single country precludes international comparisons that could corroborate or challenge the observed trends within a broader context. Additionally, the inherent complexities in demarcating generational cohorts present potential points of contention in the methodology. Notwithstanding these constraints, our results represent a substantial addition to the knowledge of entrepreneurship education in the CEE region.

This research suggests several avenues for future exploration. The hypotheses warrant validation through comparable studies in other Eastern and Central European countries employing similar methodological frameworks. An interesting complement to these results could be to repeat and compare a study by Varblane and Mets (2010) to map the entrepreneurship education practices available in higher education institutions in the region with the previous results and the conclusions drawn from the GEM data. Delving into diverse generations' nuanced needs, expectations, and experiences regarding entrepreneurship educa-

tion through qualitative research methodologies presents an enticing prospect for future investigations. The role and importance of learning by doing in the acquisition of entrepreneurial skills and knowledge among the older generation and as highlighted by Ratten and Usmanij (2021) longitudinal approach, the examination of macro-effects of entrepreneurship education and the role of female teachers play in entrepreneurship education opens up new avenues for research.

Acknowledgements

Project no. TKP2021-NKTA-44 has been implemented with the support provided by the Ministry of Innovation and Technology of Hungary from the National Research, Development and Innovation Fund, financed under the TKP2021-NKTA funding scheme.

References

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

Andorka, R. (1990). A második gazdaság szerepe és társadalmi hatása. *Aula*, *12*(4), 16–37.

Bacigalupo, M., Kampylis, P., Punie, Y., & Van, D. B. L. (2016). *EntreComp: The Entrepreneurship Competence Framework.* https://doi.org/10.2791/160811

Banha, F., Coelho, L. S., & Flores, A. (2022). Entrepreneurship Education: A Systematic Literature Review and Identification of an Existing Gap in the Field. *Education Sciences*, *12*(5), Article 5. https://doi.org/10.3390/educsci12050336

Bauernschuster, S., Falck, O., Gold, R., & Heblich, S. (2012). The shadows of the socialist past: Lack of self-reliance hinders entrepreneurship. *European Journal of Political Economy*, *28*(4), 485–497. https://doi.org/10.1016/j.ejpoleco.2012.05.008

Beichelt, T. (2015). Revolutions of 1989–90 in Eastern Central Europe. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)* (pp. 633–636). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.62074-3

Blenker, P., Trolle Elmholdt, S., Hedeboe Frederiksen, S., Korsgaard, S., & Wagner, K. (2014). Methods in entrepreneurship education research: A review and integrative framework. *Education + Training*, *56*(8/9), 697–715. https://doi.org/10.1108/ET-06-2014-0066

Çam, T., & Kayaoğlu, M. (2015). Marx's distinction between socialism and communism. *Journal of Human Sciences*, *12*(1), 385–391.

Csákné Filep, J., Martyniuk, O. A., & Wojtyra-Perlejewska, M. (2023). The state of family business research in the Visegrád countries. *Journal of Family Business Management*, *14*(3), 562–602. https://doi.org/10.1108/JFBM-04-2023-0057

Csákné Filep J., Radácsi L., Szennay Á., & Timár G. (2023). *Taking initiative and earning a living – Entrepreneurial motivations and opportunity perception in Hungary*. Budapesti Gazdasági Egyetem. https://budapestlab.hu/wp-content/uploads/2023/08/GEM-BGE_beliv_2023_angol_webre.pdf

Csákné Filep, J., Szennay, Á., & Timár, G. (2024). *Entrepreneurial environment, opportunities and motivations*. Budapest Business University.

Csizmadia, P., Makó, C., & Heidrich, B. (2016). Managing Succession and Knowledge Transfer in Family Businesses: Lessons from a Comparative Research. *Vezetéstudomány / Budapest Management Review*, *47*(11), 59–69. https://doi.org/10.14267/VEZTUD.2016.11.07

Doan, K. H. (2022). The differences in the impact of entrepreneurship education on entrepreneurial knowledge: A cross-country analysis. *Management & Marketing*, *17*(1), 73–97. https://doi.org/10.2478/mmcks-2022-0005

Ediagbonya, K. (2013). The Roles of Entrepreneurship Education in Ensuring Economic. *Journal of Business Administration and Education*, *4*(1), 35–46.

Education, Audiovisual and Culture Executive Agency. Eurydice (Brussels, Belgium)., Bourgeois, A., Balcon, M.-P., Riiheläinen, J. M., Antoine, A., & Noorani, S. (2016). *Entrepreneurship education at school in Europe: Eurydice report.* Publications Office. https://data.europa.eu/doi/10.2797/301610

Ensari, M. S. (2017). A study on the differences of entrepreneurship potential among generations. *Pressacademia*, *4*(1), 52–62. https://doi.org/10.17261/Pressacademia.2017.370

Estrin, S., Meyer, K. E., & Bytchkova, M. (2006). Entrepreneurship in Transition Economies. In *The Oxford Handbook of Entrepreneurship* (pp. 693–725). Oxford University Press. https://research.cbs.dk/en/publications/entrepreneurship-in-transition-economies

European Commission. (2013). *ENTREPRENEURSHIP 2020 ACTION PLAN Reigniting the entrepreneurial spirit in Europe* (COM(2012) 795 final). https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0795:FIN:en:PDF

Festeu, D., Turlakova, N., & Crudu, R. (2020). Entrepreneurship education programme tailored to Eastern European neighbouring countries. *Eastern Journal of European Studies*, *11(2)*, 266–287.

Galvão, A., Ferreira, J. J., & Marques, C. (2017). Entrepreneurship education and training as facilitators of regional development: A systematic literature review. *Journal of Small Business and Enterprise Development*, *25*(1), 17–40. https://doi.org/10.1108/JSBED-05-2017-0178

GEM (Global Entrepreneurship Monitor). (2024). *Global Entrepreneurship Monitor 2023/2024 Global Report: 25 Years and Growing*. https://www.gemconsortium.org/report/global-entrepreneurship-monitor-gem-20232024-global-report-25-years-and-growing

Gittins, T., Freész, G., & Huszák, L. (2022). The response of Hungarian SMEs to the Covid-19 pandemic: A Resilience Adaption Model. In *Challenges of Management in the COVID-19 Reality* (pp. 49–69). Nomos Verlagsgesellschaft mbH & Co. KG. https://doi.org/10.5771/9783957103987-49

Gubik, A. S., & Farkas, S. (2019). Entrepreneurial Intention in the Visegrad Countries. *DANUBE*, *10*(4), 347–368. https://doi.org/10.2478/danb-2019-0018

Gubik, A. S., & Vörös, Z. (2023). Why narcissists may be successful entrepreneurs: The role of entrepreneurial social identity and overwork. *Journal of Business Venturing Insights*, *19*, e00364. https://doi.org/10.1016/j.jbvi.2022.e00364

Huszák, L., & Jáki, E. (2022). Perspectives of Entrepreneurship Education in the Danube Region. *Köz-Gazdaság – Review of Economic Theory and Policy*, *17*(3), 3–11.

Jena, R. K. (2020). Measuring the impact of business management Student's attitude towards entrepreneurship education on entrepreneurial intention: A case study. *Computers in Human Behavior*, *107*, 106275. https://doi.org/10.1016/j.chb.2020.106275

Kauppinen, A., & Iftikhar Choudhary, A. (2021). Gamification in entrepreneurship education: A concrete application of Kahoot! *The International Journal of Management Education*, *19*(3), 100563. https://doi.org/10.1016/j.ijme.2021.100563

Kornai, J. (1994). Transformational Recession: The Main Causes. *Journal of Comparative Economics*, *19*(1), 39–63. https://doi.org/10.1006/jcec.1994.1062

Kuczi, T., & Lengyel, G. (2001). The Spread of Entrepreneurship in Eastern Europe. In P. Meusburger & H. Jöns (Eds.), *Transformations in Hungary: Essays in Economy and Society* (pp. 157–172). Physica-Verlag HD. https://doi.org/10.1007/978-3-642-57584-6_5

Kuratko, D. (2016). *Entrepreneurship: Theory, Process, and Practice* (10th edition). Cengage Learning.

Lelkes, O. (2006). Tasting freedom: Happiness, religion and economic transition. *Journal of Economic Behavior & Organization*, *59*(2), 173–194. https://doi.org/10.1016/j.jebo.2004.03.016

Liu, X., Lin, C., Zhao, G., & Zhao, D. (2019). Research on the Effects of Entrepreneurial Education and Entrepreneurial Self-Efficacy on College Students' Entrepreneurial Intention. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00869

Mack, A. J., White, D., & Senghor, O. (2021). The benefits of exposing post-secondary students to entrepreneurship training in Trinidad and Tobago. *Humanities and Social Sciences Communications*, *8*(1), Article 1. https://doi.org/10.1057/s41599-021-00905-8

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. *The International Journal of Management Education*, *19*(3), 100545. https://doi.org/10.1016/j.ijme.2021.100545

Maslakcı, A., & Sürücü, L. (2021). ASSESSMENT OF ENTREPRENEURIAL INTENTIONS OF UNIVERSITY STUDENTS ACCORDING TO DEMOGRAPHIC FACTORS. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, *31*, Article 31. https://doi.org/10.18092/ulikidince.837747

McMillan, J., & Woodruff, C. (2002). The Central Role of Entrepreneurs in Transition Economies. *Journal of Economic Perspectives*, *16*(3), 153–170. https://doi.org/10.1257/089533002760278767

Miralles, F., Giones, F., & Gozun, B. (2017). Does direct experience matter? Examining the consequences of current entrepreneurial behavior on entrepreneurial intention. *International Entrepreneurship and Management Journal*, *13*(3), 881–903. https://doi.org/10.1007/s11365-016-0430-7

Mosolygó-Kiss, Á., Heidrich, B., & Chandler, N. (2019). *Ready or not, here I come! A study of human capital in the family business to gauge successors' readiness for intra-family takeover*. https://www.researchgate.net/publication/332556057_Ready_or_not_here_I_come_A_study_of_human_capital_in_family_business_to_guage_successors%27_readiness_for_intra-family_takeover

Nowiński, W., Haddoud, M. Y., Lančarič, D., Egerová, D., & Czeglédi, C. (2019). The impact of entrepreneurship education, entrepreneurial self-efficacy and gender on entrepreneurial intentions of university students in the Visegrad countries. *Studies in Higher Education*, *44*(2), 361–379. https://doi.org/10.1080/03075079.2017.1365359

Papp, J. (2008). A gúzsba kötött gazdaság kiszabadítása. *Pénzügyi Szemle = Public Finance Quarterly*, *53*(4), 663–693.

Peng, M. W., & Shekshnia, S. V. (1993). How Entrepreneurs Create Wealth in Transition Economies [and Executive Commentary]. *The Academy of Management Executive (1993)*, *15*(1), 95–110.

Potter, J. (2008). *Entrepreneurship and Higher Education* (Local Economic and Employment Development (LEED)). OECD Publishing. https://doi.org/10.1787/9789264044104-en

Putri, M. K., & Widiyanti, A. E. (2022). *Impact of Entrepreneurship Education on Entrepreneurial Intention in Self-Efficacy Mediation*. *12*(3). https://doi.org/10.46254/EU05.20220333

Ratten, V., & Usmanij, P. (2021). Entrepreneurship education: Time for a change in research direction? *The International Journal of Management Education*, *19*(1), 100367. https://doi.org/10.1016/j.ijme.2020.100367

Róbert P., & Valuch T. (2013). Generációk a történelemben és a társadalomban. Generációs politikai attitűdök és részvételi minták történeti-szociológiai megközelítésben. *Politikatudományi Szemle*, *22*(4), 116–139.

Roberts, A. (2004). The State of Socialism: A Note on Terminology. *Slavic Review*, *63*(2), 349–366. https://doi.org/10.2307/3185732

Romsics, I. (2014). Regime Change in Hungary. *ENRS*. https://enrs.eu/article/regime-change-in-hungary

Sereghyová, J. (1993). *Entrepreneurship in CentralEast Europe*. Physica-Verlag HD. https://doi.org/10.1007/978-3-642-95908-0

Sieger, P., Raemy, L., Zelweger, T., Fueglistaller, U., & Hatak, I. (2021). *Global Student Entrepreneurship 2021: Insights From 58 Countries*. https://www.guesssurvey.org/resources/PDF_InterReports/GUESSS_2021_Global_Report.pdf

Smallbone, D., & Welter, F. (2009). *Entrepreneurship and Small Business Development in Post-Socialist Economies*. Routledge. https://www.routledge.com/Entrepreneurship-and-Small-Business-Development-in-Post-Socialist-Economies/Smallbone-Welter/p/book/9780415542746

Szerb L., & Lukovszki L. (2013). Magyar egyetemi hallgatók vállalkozási attitűdjei és az attitűdöket befolyásoló tényezők elemzése a GUESSS-felmérés adatai alapján – Kik is akarnak ténylegesen vállalkozni? (Entrepreneurial attitudes of the Hungarian students and the analysis of the factors influencing attitudes based on the datas of GUESSS survey – Who want to undertake really?). *Vezetéstudomány – Budapest Management Review*, *44*(7–8), Article 7–8. https://doi.org/10.14267/VEZTUD.2013.07.03

Urbano, D., Aparicio, S., & Audretsch, D. (2019). Twenty-five years of research on institutions, entrepreneurship, and economic growth: What has been learned? *Small Business Economics*, *53*(1), 21–49. https://doi.org/10.1007/s11187-018-0038-0

Varblane, U., & Mets, T. (2010). Entrepreneurship education in the higher education institutions (HEIs) of post-communist European countries. *Journal of Enterprising Communities: People and Places in the Global Economy*, *4*(3), 204–219.

Woods, J., & Burley, P. M. W. (2021). *Chapter 14 A learning-by-doing approach to entrepreneurship education, student job creation and new venture incubation*. https://china.elgaronline.com/edcollchap/edcoll/9781789904451/9781789904451.00022.xml

Wu, Z., Jiang, M., Cai, Y., Wang, H., & Li, S. (2019). What Hinders the Development of Green Building? An Investigation of China. *International Journal of Environmental Research and Public Health*, *16*(17), Article 17. https://doi.org/10.3390/ijerph16173140

Yu, J., & Ma, X. (2022). *Data Analysis on the Factors Affecting the Entrepreneurial Intentions of English Majors in Local Universities*. 1058–1065. https://doi.org/10.2991/978-94-6463-058-9_166

Żyminkowska, K., & Ożańska-Ponikwia, K. (Eds.). (2023). *Entrepreneurship Education and Pedagogy in Central and Eastern European Countries: Critical and Pragmatic Perspectives*. Routledge. https://doi.org/10.4324/9781003453352

Entrepreneurship Education Approaches: Hackathon and Project-Based Learning

Ana Miličević, Milica Simić, Zorica Bogdanović, Marijana Despotović-Zrakić, Marko Suvajdžić[**]

Abstract

This study compares the impact of informal education (hackathons) and formal education (project-based learning) on entrepreneurial education. Analysing data on both approaches, gathered through practical experience at the University of Belgrade, the research reveals positive effects on entrepreneurial behaviour and mindset. The study tracks various learning indicators by examining strengths, challenges, and differences in students' intentions, attitudes, and teachers' perspectives. Results show hackathons foster creativity and entrepreneurial skills, while project-based learning excels in subject mastery and soft skill development. Both approaches enhance networking and innovation, but students prioritise hackathons for personal promotion, resulting in varying levels of commitment.

Keywords: Entrepreneurial learning model, Entrepreneurial education, Hackathon, Project-based learning, Sustainable entrepreneurship
JEL Codes: I23 Higher education, L26 Entrepreneurship

1. Introduction

The problem addressed in this article is bridging the gap between academic studies and practical entrepreneurship during studies and offering a unique opportunity for students to gain both formal degrees and experience with real-world challenges, potentially leading to their entrepreneurial careers.

Entrepreneurship education is a complex and fragmented field that is undergoing continuous evolution. Despite the growth of research, consolidation is needed,

** *Ana Miličević*, Senior Associate, Ph.D. Student, Department of Research and Development Center, Faculty of Organizational Sciences, University of Belgrade. E-mail: ana.milicevic@fon.bg.ac.rs. Main research interests: Entrepreneurship, Project-Based Learning, Hackathons, E-Business
Milica Simić, Teaching Assistant, Ph.D. Student, Department for E-Business, Faculty of Organizational Sciences, University of Belgrade. E-mail: milica.simic@fon.bg.ac.rs. Main research interests: E-Business, Blockchain, Artificial Intelligence, Internet technologies, Technology in Education.
Zorica Bogdanović, Full Professor, Ph.D., Department for E-Business, Faculty of Organizational Sciences, University of Belgrade. E-mail: zorica.bogdanovic@fon.bg.ac.rs. Main research interests: E-Business, Internet Technologies, DevOps, Blockchain, Artificial Intelligence
Marijana Despotović-Zrakić, Full Professor, Ph.D., Department for E-Business, Faculty of Organizational Sciences, University of Belgrade. E-mail: marijana.despotovic-zrakic@fon.bg.ac.rs. Main research interests: E-Business, Internet Technologies, Blockchain, Artificial Intelligence
Marko Suvajdžić, Associate Professor, University of Florida. E-mail: marko@digitalworlds.ufl.edu. Main research interests: Digital Art, Blockchain, Game Design, Virtual Reality

especially in pedagogy and curriculum integration. Studies highlight the positive impact of entrepreneurship education on skill development, emphasising pedagogical models of collaboration in technology-rich environments. Common approaches include experiential, problem-based, and project-based learning (PBL), along with methods such as peer assessment, design thinking, formative feedback, and service learning. This diversity emphasises the interdisciplinary nature of entrepreneurship education. While existing research focuses on the outcomes of entrepreneurship education, there is still a lack of emphasis on "education" itself, and its pedagogy is still a black box. Therefore, it is necessary to reconsider the goals, content, teaching and learning methods as assessment strategies (Rodrigues, 2023).

Previous studies have demonstrated the effectiveness of experiential programs in university extracurricular settings. However, there has been inconsistent implementation of Entrepreneurship Education in educational institutions, both within curricula and real-world contexts. Additionally, there has been a lack of promotion for necessary pedagogical innovations in this field (Rodriguez, 2023). European articles dedicated to Entrepreneurship Education exclusively interpret learning outcomes, neglecting the discussion of pedagogical aspects related to the teaching and learning of entrepreneurship (Tiberius & Weyland, 2023).

Entrepreneurial education is a common practice in formal and informal settings, with various models and formats to encourage entrepreneurial thinking and behaviour among students. Its significance is reflected in fostering the idea of entrepreneurship as a career choice and in empowering students to implement entrepreneurial ideas. However, it is still questionable how to ensure a closer engagement between educational theory and pedagogical practice and how educators can manage some educational theories and philosophies to consolidate the adequate provision of quality experiential entrepreneurship education (Bell & Bell, 2020).

One of the ways of bringing formal education closer to the needs of entrepreneurial learning is related to innovations in pedagogical approaches. This includes combining methods, such as PBL and various active learning methods, with traditional assessment approaches. The goal is to overcome the limitations of a standardised educational process and provide flexibility that supports the development of entrepreneurial skills. These innovations allow students to actively participate in learning, apply knowledge to real problems and develop creativity, which is critical to preparing future entrepreneurs.

An alternative approach to making formal education more relevant to entrepreneurial learning is derived from the philosophy of open innovation developed in industry. In this approach, the academic community is included as one of the spirals in the triple, quadruple, or quintuple helix models. (Carayannis & Campbell, 2010). Student competitions and hackathons are used to implement

open innovation in non-formal education, with companies recognising their value in generating ideas and prototypes. However, the limitation of this model is that it exclusively focuses on the innovation capacity of educational institutions or technology transfer and ignores educational goals and learning outcomes. While PBL is a recognised method for fostering innovative competencies, its shortcoming for open innovation lies in translating classroom results to potential investors, consumers or markets (Stojanović et al., 2023).

The research gap is observed in the concrete educational environment at the University of the Belgrade – Faculty of Organizational Sciences (FON), where two different approaches to learning are implemented and practised: PBL in the formal and hackathon in the informal education process. The aim is to examine the contribution of two learning approaches to entrepreneurship education. The analysis of motivational factors refers to the views of PBL and hackathon participants on the contribution of motivational factors to entrepreneurial intention, with the final goal of preparing students to take entrepreneurial action.

The paper is structured as follows: Section 2 reviews the literature on hackathons and PBL in entrepreneurial learning. Section 3 outlines the methodology applied in this research. Section 4 analyses the results, while Section 5 provides discussion and concluding remarks.

2. Literature Overview

In the Literature Review section, we explore the different theories that form the foundation of our research. We also introduce carefully formulated research questions designed to build upon and support the existing theoretical framework. By outlining our research questions here, we aim to emphasise the close connection between our study and the current body of knowledge.

2.1. Bridging the gap to entrepreneurial education through innovative pedagogical approaches

According to the European Entrepreneurship Competence Framework, "EntreComp", developing an entrepreneurial mindset requires skills to generate ideas and recognise opportunities, resources, and actions (García-Castanedo & Corrales-Garay, 2024). Entrepreneurial behaviour refers to the mindset and actions of individuals aimed at creating a positive impact in the workplace. This includes taking the initiative, being innovative and taking calculated risks for success, identifying opportunities and developing creative solutions (Toding et al., 2023). Strategies such as interdisciplinary problem-based learning courses, internships, and teamwork assignments are needed to achieve this. However, entrepreneurship learning strategies in colleges usually apply to a certain level of entrepreneurship training adapted to the early stages, focusing mainly on de-

veloping business ideas or prototypes. While there is no agreement on whether entrepreneurship can be stimulated through education, it is acknowledged that entrepreneurship education positively impacts the development of knowledge and skills and improves entrepreneurial attitudes and intentions (Lina et al., 2019; Muthumeena & Yogeswaran, 2022). An entrepreneurial and innovative Higher Education Institution (HEI) should provide diverse learning opportunities to facilitate innovative teaching and learning across all faculties. Such an institution must encourage innovation and diversity in its approach to teaching and learning across all faculties and departments. Moreover, it should develop entrepreneurial mindsets and skills across all academic programs. Several practices can be implemented to promote the development of an entrepreneurial mindset across the student and teaching staff, including internships, business competitions, case studies, hackathons, games, and simulations. Additionally, teaching staff can receive training to acquire interdisciplinary teaching and research methods that support the development of an entrepreneurial mindset (Marin et al., 2018).

Universities have made significant efforts to incorporate entrepreneurship education into their academic programs. These measures include introducing theoretical courses on entrepreneurship and organising events that promote entrepreneurship (Lina et al., 2019). Despite the large number of existing models of entrepreneurial education, there is currently a lack of adequate models that are applied in higher education institutions and are tailored to help in the establishment of startups (Santoso et al., 2023). There is no coherent framework for entrepreneurship education, although there are frameworks in individual HEIs (Marin et al., 2018). However, the Entrepreneurship 2020 Action Plan proposed by the European Union suggests introducing entrepreneurship education in schools, colleges, and universities, aiming to promote students' entrepreneurship as a driving force for overall social welfare (Simović & Ilić, n.d.). Still, entrepreneurship education faces the challenge of determining the content and methodology (Organ et al., 2022). Another critical factor that can impact the effectiveness of entrepreneurship education is the "fear of failure".

Fear of failure is a psychological phenomenon defined by concern or anxiety over not reaching desired results or goals. Entrepreneurship might show concern about the potential negative repercussions of business failure, such as financial loss, reputational damage, or personal disappointment. Recognising and addressing this challenge within educational frameworks can help institutions better prepare students for the uncertainties of the entrepreneurial environment. (Cacciotti et al., 2016).

In further analysis, we focus on two different pedagogical approaches for improving entrepreneurial education, namely, hackathon-based and project-based

learning approaches, and the outcomes related to students' readiness for an entrepreneurial environment.

2.1.1. Hackathons in Entrepreneurial Education

Hackathons bring together people with diverse skills to solve real-world challenges through collaboration and problem-solving. These events promote cross-disciplinary teamwork, rapid prototyping, practical problem-solving, and effective networking. Hackathons are also great experiential learning opportunities that prioritise user-centric solutions and open collaboration to fuel unexpected innovation. They validate ideas, cultivate an innovation-driven culture, leverage open-source contributions from technical challenges to benefit the wider community, and provide recognition for winning solutions that enhance visibility and attract potential investments. Ultimately, hackathons accelerate open innovation and yield concrete outcomes (Cobham et al., 2017).

A hackathon is a gathering where individuals collaborate to create inventive technological solutions addressing diverse challenges in various industries. This event encourages creativity, problem-solving, and the incorporation of cutting-edge technologies while showcasing a feasible business concept as the proposed solution. Although hackathons were initially centred around programming and exclusively for hackers, they have now transformed into a distinct innovation model with a broader scope, such as finance, food, climate, healthcare, space exploration, music, sports, fashion, and tourism (Lionaite, 2020). Private companies host 48.5 % of hackathons globally, with the academic sector responsible for 30.3 % of these events (HackerEarth, 2017).

Hackathons can enhance performance, drive innovation, and foster intrapreneurship by encouraging creative thinking and risk-taking, promoting cross-functional collaboration, and empowering participants to take ownership of their ideas. They facilitate rapid prototyping and iteration, boost engagement and motivation, and serve as a talent identification and development tool. Ultimately, hackathons create a culture of innovation, foster collaboration, encourage intrapreneurial behaviour, enable quick learning and adaptation, and help identify and nurture potential talent within organisations (Szymanska et al., 2020; Wallwey et al., 2022). Hackathons contribute to entrepreneurial skills and self-efficacy. Effective entrepreneurial learning also significantly improves the ability to identify viable entrepreneurial concepts and launch new ventures (Szymanska et al., 2020).

Communication and collaboration are essential in hackathons. Participants form teams, brainstorm ideas, divide tasks, share knowledge, receive feedback, iterate on their work, and present their projects. Hackathons foster a collaborative environment where effective communication and collaboration are crucial for successful project development, problem-solving, and innovation (Szymanska et

al., 2020). The educational hackathon is an interactive and collaborative learning method that involves students, educational organisations, industry, and society. It fosters multidisciplinary learning and networking (Jussila et al., 2020).

Examples of hackathon usage in academic environments for entrepreneurial learning are numerous, focusing on different aspects, such as training programs and Minimum Viable product generation (Avila-Merino, 2019; Feder, 2021; Temiz, 2021). Minimum Viable Product **(**MVP) is the most basic product version that can be released with the minimum features necessary to satisfy early adopters. The concept is rooted in the lean startup methodology, which aims to validate a business idea by building and launching a simplified product version. By releasing an MVP, startups can gather valuable customer feedback, test hypotheses, and iterate on the product, reducing the risk of investing significant resources into developing features that may not meet market demands (Blank & Bob Dorf, n.d.; Hart, 2012).

The hackathon events held at FON gained much attention from sponsors, partners, companies, and governmental and non-governmental entities over time. By 2010, the hackathon had become a university-wide event. In the following years, hackathons became accessible to all students across Serbia, extending their reach beyond the initial faculty (Naumović et al., 2022). FON student organisation "FONIS" extended hackathons to high school students in 2018. The international hackathon W3 Algorand Hackathon 2023 was hosted at the FON in April 2023, welcoming students at every academic level from the USA and Serbia (Bogdanović et al., 2023; Miličević et al., 2024).

2.1.2. Project-based learning in entrepreneurial education

PBL is an approach to teaching that emphasises active, context-specific learning to equip students with competencies to solve real-world problems. It is widely recognised as an effective method for developing innovation competencies in engineers (Charosky Larrieu-Let, 2021; Cortés et al., 2022; Isomöttönen & Kärkkäinen, 2016). Under the PBL model, students can generate a range of products, from prototypes to commercially viable products, thereby fostering the success of startups (Santoso et al., 2023). The PBL approach emphasises collaborative learning, where teachers and students work together to solve problems and develop projects. It involves students working in groups to share knowledge and skills and encourages effective communication through interactions with peers and teachers. The PBL approach has been found to enhance student engagement, improve learning outcomes, and develop essential skills such as collaboration and communication (Almulla, 2020).

Examples of PBL usage in academic environments for entrepreneurial learning are various. For example, PBL can deliver an entrepreneurial curriculum to software development students (Organ et al., 2022) or for creating startups at

higher education institutions (Santoso et al., 2023). The Department of E-Business at FON has used the PBL approach for a few years. This approach involves students working in multidisciplinary teams to develop business models, digital products and intelligent environments. The teams consist of members with various roles, such as Scrum Masters, Product Development Team, Software Developers, and Testers. DevOps tools are used to facilitate communication and collaboration among the teams. Students actively engage in classes and practical exercises and work on concrete projects for final exams (Bogdanović et al., 2023).

2.1.3. Entrepreneurial readiness in local startup ecosystem: navigating preparedness for professional environments

Specific traits of the local startup ecosystem identified during the previous year indicate that almost 80 % (Ivanovic et al., 2023) of startup founders have a higher education degree. This shows that academia has the potential to contribute to the growth of an entrepreneurial mindset and support entrepreneurial activities. However, *Startup Skener* (Ivanovic et al., 2023; Tomić-Brkušanin, 2022) concluded that the educational system does not motivate and prepare students for future entrepreneurial endeavours and that it does not educate future professionals in areas needed for the development of the digital economy. Lack of relevant knowledge and skills from formal education directly influences the number of startup teams and hinders the employment of new team members in many areas crucial for their growth. Analysis of local support organisations indicates these programs are insufficiently aligned with startup needs.

Entrepreneurship education has a significant positive impact on the performance of established businesses by helping entrepreneurs improve their perceived capabilities and opportunities. These findings extend the current research on the effects of entrepreneurship education on entrepreneurial activities at different stages of development for entrepreneurial businesses (He et al., 2024). On the other hand, it examines design thinking as a method of project-based education used in university-level ideation (García-Castanedo & Corrales-Garay, 2024).

In addition to the above initiatives, many Erasmus, EIT, EIC and HEI projects deal with similar challenges in an international context, e.g., UPM, ELTE, and Universite de Rennes, which provide extensive programs for students with an entrepreneurial orientation. These opportunities involved FON staff and student teams participating in workshops, mentoring programs, and panel discussions. One example of good international practice is the Danube Cup, an international network of universities along the Danube that enhances entrepreneurship education and supports student startups. It brings together student startups with educators, startup ecosystems, and one another to help them succeed in international markets.

Based on the previous analysis and comparison of the hackathon and PBL learning approaches, and having in mind the analysed aspects of the startup environment given in sections 2.1.1, 2.1.2 and 2.1.3, we have formulated three research questions:

RQ1: Does implementing hackathon and PBL approaches enhance students' technological and business knowledge and skills?

RQ2: How do students' perceptions of the impact of hackathons and PBL on their entrepreneurial behaviour reflect the influence of these approaches on their attitudes and actions towards entrepreneurship?

RQ3: Which factors drive students' motivation and active engagement in proposed learning approaches?

2.2. The role of teachers in cultivating stimulating learning environments

Supporting the development of students' entrepreneurial skills requires the special participation and efforts of the teaching staff. The attitude of teaching staff towards entrepreneurship education refers to the way of thinking and behaviour of teachers to create a climate, adopt, apply, and monitor the effects of different approaches (in this case, PBL and Hackathon) for focused learning and supporting entrepreneurial attitudes and behaviours of students. As coaching and mentoring are used to develop students' startup talents, the ability to teach students becomes an enabling factor for action-based learning methods in entrepreneurship education (Somià et al., 2023). Still, the relationship between teacher thinking and creating a student-centred learning environment is underresearched in entrepreneurship education (Santoso et al., 2023; Toding et al., 2023). This study aims to shed light on two different approaches of formal and informal training, the possibility of combining them to achieve influence and encourage entrepreneurial thinking and behaviours of students during their studies at the level of the early phases of development of ideas and solutions. Based on this analysis, the fourth research question was formulated:

RQ4: How do student engagement, learning outcomes, and instructional ease of implementation influence teachers' evaluations of the effectiveness and preferences for different learning methods?

3. Methodology

3.1. Research context

Both approaches (PBL and Hackathon) were considered and implemented within the educational process of the Department of e-business at FON.

Project-based learning occurred in subjects such as the Internet of Things, Digital Marketing, and E-business Risk Management. Students proposed solutions as exam projects without special prizes. The data presented in this article were gathered during the school year 2022–23 (Bogdanović et al., 2023).

The hackathon approach was implemented within the same context but as an informal activity. The Algorand Hackathon 2023, hosted in April 2023, aimed to foster innovation in Web3 projects based on blockchain technologies. Participants proposed e-business solutions across various sectors, guided by a structured program encompassing a blockchain boot camp, design thinking workshops, and a WEB3 hackathon. The hackathon allowed students to apply their knowledge and present their creations to an international jury, earning recognition and prizes from sponsors.

3.2. Assessing the impact of hackathons and project-based learning initiatives: A comparative analysis

To compare PBL, which is incorporated in the classroom, with hackathons, which are typically extracurricular, and to assess their contributions to entrepreneurial learning, the effects of both approaches on students were reviewed using identified indicators and literature reviews.

It is important to emphasise that these two approaches are not directly comparable in an educational context. However, they were evaluated from the point of view of indicators related to learning, project value, career development, professional networks, after-work experiences, and perceived shortcomings, considering factors such as the number of participants, motivation, management model, incentives, collaboration methods, learning outcomes, quality and applicability of solutions. (Avila-Merino, 2019; Bogdanović et al., 2023; Byrne et al., 2018; Garcia, 2023; Miličević et al., 2023).

When assessing the impact of hackathons or PBL initiatives, several critical indicators are considered (Bogdanovic et al., 2023; Butt et al., 2021; Miličević et al., 2024; Nolte et al., 2018; Pe-Than et al., 2018). One of the most important is skills development, which refers to how these initiatives enhance participants' technological skills, soft skills, and problem-solving abilities. Another crucial factor is project value, which includes participants' satisfaction with the challenges and solutions, their overall perception of the experience, and their commitment to advancing the project during hackathons or PBL initiatives.

Additionally, career development plays a crucial role, as participants often view hackathons or PBL initiatives as opportunities to open doors for future jobs or internships. Participants also see these initiatives as a platform for nurturing business ideas with the potential to lead to startup ventures. Networking oppor-

tunities are another critical consideration, as these events allow participants to connect with professionals and like-minded individuals.

Finally, the impact of engagement in post-event activities is considered, along with any perceived drawbacks. These drawbacks may include challenges from the fast-paced environment, issues within team dynamics, or unmet expectations related to mentoring or the event's structure.

3.3. Data collection and Instruments

This study utilised data from surveys conducted after PBL courses and during and after the hackathon. The research and data collection occurred while implementing PBL during the 2022–2023 school year. A survey, titled "Survey Sheet for the Evaluation of Work on the Project," was distributed to gather pertinent information from all students who participated in classes from the e-business department using this learning approach during this period. The survey included six demographic questions, 61 questions about perceived benefits and sacrifices for participation in PBL, and two open-ended questions. Only the questions related to indicators presented in the previous subsection were considered for analysis.

The hackathon data collection was conducted in two stages. The first stage involved initial data collection immediately after the hackathon, focusing on participants' experiences and feedback. Four months later, a follow-up data collection took place, including input from participants and organisers, specifically the teaching staff. To facilitate this research process, three distinct questionnaires were developed: the Participants Survey Hackathon (Survey 1), the Participants Survey Post-Hackathon (Survey 2), and the Teaching Staff Survey (Survey 3).

Survey 1 was conducted immediately after the hackathon, while Survey 2 and Survey 3 were conducted separately for participants and teachers four months later. The research questions focused on the readiness of the participants for new technical knowledge, the initiation of the development of business ideas, and the effects after the hackathon on learning and professional development, while the teachers pointed out which model they see as more suitable in acquiring knowledge, skills and motivation of entrepreneurial thinking and behaviour among students. Survey 2 was designed for participants, aligning with the principles of the initial questionnaire. Specifically, it aimed to capture the perspectives and insights of participants four months after the hackathon's conclusion. Survey 3, designed for the hackathon and PBL teachers, investigated the impact of these methods on pre-entrepreneurial learning aspects, including fostering creativity, enhancing specific knowledge, refining soft skills, promoting an entrepreneurial mindset, and elevating solution quality. Additionally, the survey explored

teachers' openness to adopting hackathons in education and their inclination to enhance formal pedagogical approaches and methodologies.

3.4. Survey participants

In April 2023, Hackathon Survey 1 targeted 34 students from Serbia, representing diverse faculties, primarily with backgrounds in IT. The cohort comprised 16 females and 18 males, including 9 with bachelor's degrees, 13 undergraduates, 9 master's students, and 3 high school students. During Survey 2, which took place four months after the final hackathon, 30 participants from Serbia completed the questionnaire. Survey 3 was conducted exclusively for the hackathon and PBL teaching staff of the FON, and six teachers filled it.

Conversely, the PBL survey involved 111 students from FON, consisting of 44 males and 67 females. These participants actively participated in the PBL learning process and contributed to developing a mandatory project.

4. Results And Discussion

4.1. RQ1: Empowering students with new tech and business knowledge and skills

In analysing *Learning and skill acquisition* indicator based on feedback from PBL and Hackathon participants, students emphasise that both approaches foster knowledge and skill development. PBL notably impacts mastering specific subjects and curriculum knowledge (rated 4.41). Hackathons, scoring an average of 3.87, are highly effective in students' acquisition of technical expertise. PBL significantly contributes to soft skills development alongside subject knowledge acquisition (rated 4.30). According to student perspectives, the implementation of PBL in teaching subjects has a very positive influence on accepting and mastering specific subject knowledge during lessons (see Figure 1). The differences between the two approaches are statistically significant for the tech knowledge aspect: $t(40) = 3.38$, $p = 0.0008$, but not statistically significant for the soft skills aspect.

Furthermore, participants in the hackathon assessed the speed at which they could apply the acquired technical knowledge post-event, giving it an average score of 3.13, indicating a moderate pace with noticeable progress. The level of comprehension of working with technologies after the hackathon was rated at 3.68, representing a satisfactory understanding of how technology operates.

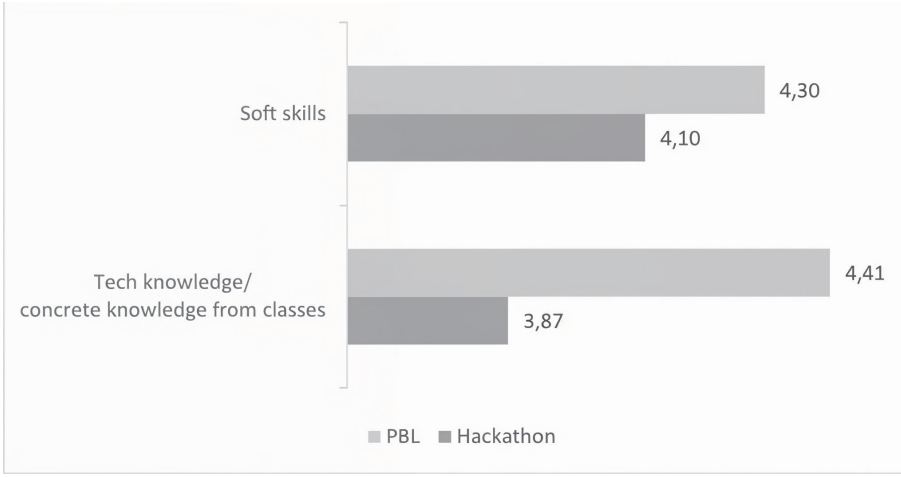


Figure 1. Comparison of average impact approaches of learning and skill acquisition.

4.2. RQ2: Students' perception of the impact of hackathons and PBL on their entrepreneurial behaviour

To perceive and analyse both approaches as forms of entrepreneurial learning, their influence on altering students' thinking and entrepreneurial behaviour was examined. This evaluation encompassed various indicators, including Learning and skill acquisition as problem-solving ability, Project Value in terms of participant satisfaction with the solutions created by the perception of the hackathon or PBL as an opportunity to initiate and inspire business ideas and launch startups, and the assessment of Networking with professionals to expand professional connections and mentorships. Post-project engagement was also considered (see Figure 2). For all three compared aspects, the differences between the intention to continue, start a business idea, and ability to cope with real problems when applying PBL and hackathon approaches are statistically significant, respectively: $t(50) = -2.61$, $p = 0.006$, $t(70) = -3.16$, $p = 0.001$, $t(43) = -7.32$, $p < 0.001$.

How effectively can hackathon participants address actual problems and challenges faced by companies? Students evaluated this capability with a score of 3.83, emphasising that participation in hackathons significantly enhances their readiness to tackle real-world issues and propose solutions. Conversely, PBL participants rated this ability at 2.50, particularly noting challenges in formulating proposed solutions. Hackathon participants, with an average score of 4.60, believed that the hackathon effectively enables students to develop their business ideas. They also noted its role in mastering the fundamentals of entrepreneurship and cultivating a startup mindset. PBL students gave this opportunity a score of 4.26, which is very good. In addition, PBL students

pointed out that they can develop their ideas more easily and quickly by participating in group innovation development projects and acquiring the basics of entrepreneurship and start-ups.

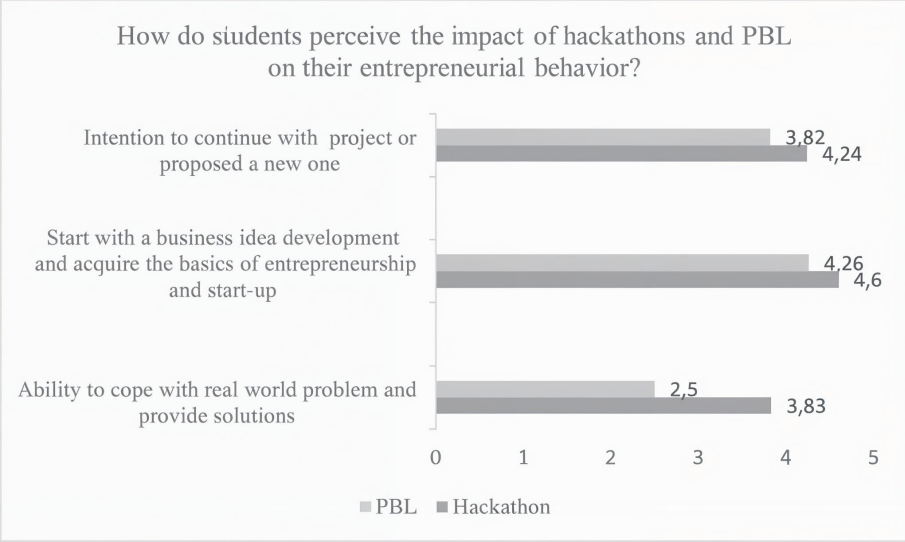


Figure 2. Comparison of the average impact of both approaches on students' entrepreneurial behaviour.

Examining the Post-project engagement indicator, hackathon participants were surveyed on their likelihood of continuing to work on the project. The results showed a grade of 4.24 for hackathon students and 3.82 for PBL students, indicating a positive attitude toward continuing to work on the project.

Additionally, participants were asked to rate the importance of hackathon organisers offering events after the hackathon to support project continuation. Participants expressed strong enthusiasm for this idea, deeming it very important and assigning it a score of 3.97.

A vital benefit of those two learning approaches as entrepreneurial education is transforming entrepreneurial intention into entrepreneurial behaviour. Entrepreneurial intention is essential in entrepreneurship, as it influences actual behaviour. Nevertheless, there are concerns that it may not translate to behaviour. Commitment and internal locus of control provide favourable boundary conditions for an individual to transition from entrepreneurial intention to actual behaviour (Neneh & Dzomonda, 2024).

The mechanism for transitioning from entrepreneurial intention to actual behaviour involves understanding how different learning experiences, such as hackathons and PBL, contribute to this process, especially in fostering partici-

pant commitment and internal locus of control. According to the study results (Kong et al., 2020), the connection of Entrepreneurial intention is positively correlated with entrepreneurial behaviour, while the fear of failure acts as a barrier among students. Having business role models improves entrepreneurial intentions. The study recommends implementing measures to address students' fear of failure and enhance entrepreneurship education to nurture creative talent.

Hackathons offer intensive, hands-on environments where participants face real-world challenges under tight deadlines. They connect intention with action through design, prototyping, and competitive solution presentation. Participants rate the experience highly, attributing it to initial entrepreneurial knowledge that encourages them to participate again. This environment reduces the fear of failure and guides participants with the support of mentors.

PBL involves students in long-term, collaborative projects that delve deeply into complex challenges, where the participants rate the ability to solve real problems with an average score of 2.5. They positively evaluate acquiring basic entrepreneurial knowledge and creating business ideas through their project tasks, which encourages the intention to continue with the baiting project. Long-term engagement with the project enables longer mentoring and guidance through learning and creating solutions, facilitating the fundamental transition from intention to behaviour.

4.3. RQ3: Students' motivation and drivers of active engagement

Both entrepreneurial learning approaches (hackathon and PBL) motivate participants through Project Value, which generates positive emotions, sparks activity, and instils a sense of usefulness by creating innovative solutions. Hackathon students also perceive it positively, grading it by 4.25. The highly positive evaluations for hackathon students 4.12. and PBL students 4.48. indicate that students are motivated by the project's value as they find it gratifying to contribute to developing new innovative services and fulfilling project expectations. Students engaged in PBL conveyed that their curiosity, coupled with addressing real-world problems in PBL projects, motivated them to propose and develop new solutions. They assigned an average score of 4.30 to this mindset, underscoring the significance of curiosity as a motivating factor during project work, an integral component of their educational and examination experience. Enthusiasm and curiosity form essential aspects of the Project Value indicator, reflecting the value students derive from engaging with PBL. Developing innovative solutions is deemed worthwhile and offers a pleasant experience; for the hackathon, students were graded 4.64, and PBL students were evaluated by 4.40 (see Figure 3). There is no statistically significant difference regarding the aspect of curiosity. However, for both feeling useful and enjoyment aspects, there are statistically

significant differences between PBL and hackathon, respectively: t(61) = -2.14, p = 0.02, t(48) = 2.25, p = 0.03.

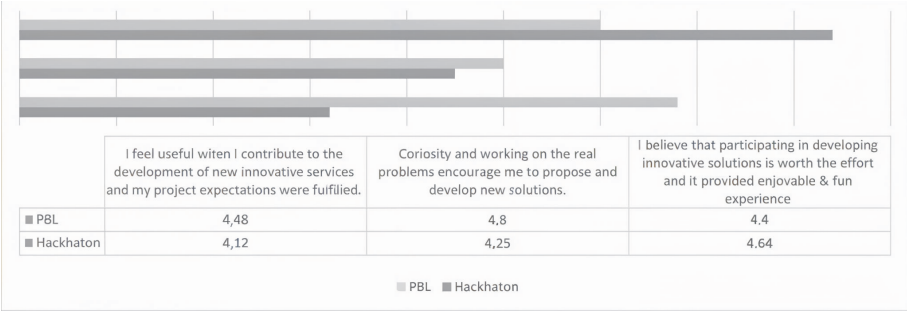


Figure 3. Project Value indicator and impact on Hackathon and PBL students' motivation

Although PBL is a compulsory learning approach integrated into the formal educational process, encompassing task preparation and exam completion, students' attitudes and additional motivations for participation were explored. Students in PBL highly appreciate the experience, viewing it as a valuable addition to their resumes and a beneficial aspect for their future careers. They are motivated by the opportunity to work on real corporate challenges, which enhances their societal recognition and reflects positively on their efforts to contribute to the local community, see Table 1.

Table 1. Motivational Factors for Increasing Student Engagement in PBL

Motivational factors description	AVG	STDEV
Better preparation for the final exam in the course	4.41	0.71
Benefit for further development and career	4.39	0.75
Participation in projects assigned by companies.	4.13	0.91
Contribution to the local community.	4.11	0.94
Individual reputation in society.	3.98	1.01
CV enrichment	3.89	1.21

Table 2 presents the average ratings of various motivational factors influencing participants' decisions to engage in hackathons. Participants were asked to rate the importance of these factors, and the values ranged from the highest-rated factor, having an enjoyable experience, to the least-rated factor, funding a hackathon project (solution), but still highly evaluated, see Table 2.

Table 2. Motivational Factors for Increasing Student Engagement in hackathon.

Motivational Factors for Increasing Student Engagement in hackathon	AVG	STDEV
Have enjoyable experience	4.64	0.49
Improve tech knowledge	4.59	0.5
Connect with professionals	4.57	0.69
Network with like-minded individuals	4.46	0.74
Learn new soft skills	4.27	0.83
Work on real-world problems	4.25	1.11
Employment	4.07	1.11
Internships	4.04	1.19
Validate ideas (business or tech)	3.95	1.05
Win prizes	3.85	1.23
Funding hackathon project (solution)	3.75	1.21
Prizes	3.17	0.49

The average rating for the importance of prizes was 3.17. The score indicates the collective perception among participants regarding the role of rewards, where cash and merchandise prizes, while important, are not central. Additionally, comparing participants' assessments before and after the hackathon, the influence of prizes (both material and monetary) on their decision to participate ranged from 3.85 to 3.23. This suggests that while prizes hold a moderate significance, they are not the primary motivation for students.

Based on the Career Development indicator, students rated the impact of participating in the hackathon as 3.89, indicating that it significantly enhances their chances of securing internships and professional offers. The PBL influence was even higher at 4.33. The Network with Professionals indicator provides insight into the opportunities for students to connect with industry professionals and work on projects assigned by companies. The hackathon received a high average score of 4.57 in this category (see Figure 4). However, only the difference regarding the opportunity to connect is statistically significant: $t(53) = -2.85$, $p = 0.003$.

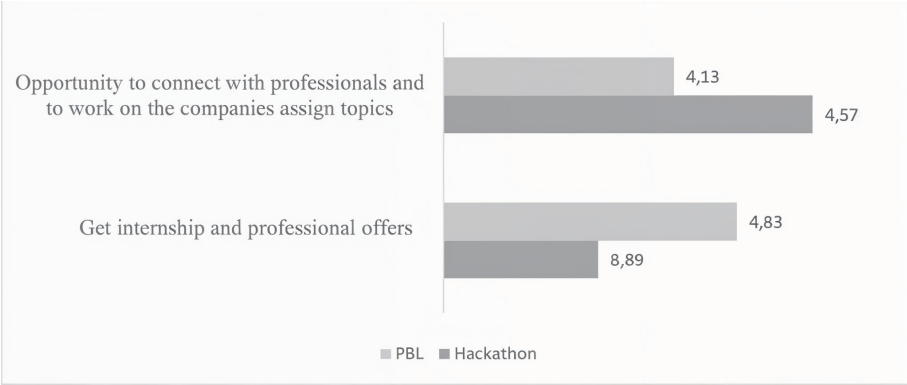


Figure 4. Impact of Hackathons and PBL on Career Development and Network with Professionals.

Additionally, regarding drawbacks such as evaluated attitudes about sharing ideas and opportunities to validate ideas, among the potential disadvantages, hackathon participants reported experiencing a sense of loss and mistrust arising from exchanging ideas. Hackathon students are rated 3.95, meaning they feel that they are not open to sharing ideas, while PBL students showed a neutral attitude about it and evaluated it by 2.66.

4.4. RQ4: Teachers' evaluation

Teachers observed indicators Exploring New pedagogical approaches and Experiential learning outcomes. They emphasised the high importance of innovativeness in student solutions from both approaches, giving it a rating of 5.00. When evaluating Perceived drawbacks and the practicality of learning outcomes, teachers rated the applicability of hackathon solutions to real-world problems higher at 4.00. Teachers who actively engage in hackathons within PBL consider this participation highly significant. It motivates them to enhance teaching methods and experiential learning (see Figure 5). Considering the small sample, we did not examine if there was a statistically significant difference between the samples.

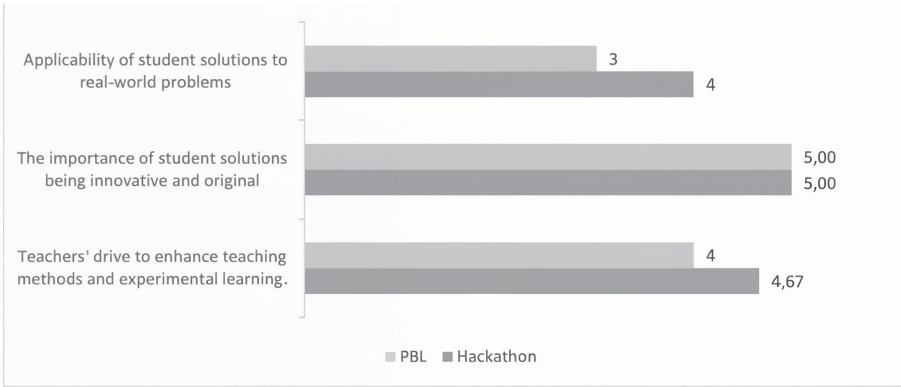


Figure 5. How teachers view the influence of hackathons and PBL as methods for entrepreneurial education on students and enhance teaching methods and experimental learning.

How do teachers compare and evaluate the effectiveness and preference of hackathons and PBL as learning methods? Experienced teachers in both approaches have found that hackathons promote creativity, problem-solving, and an entrepreneurial spirit. On the other hand, PBL focuses on developing concrete knowledge and soft skills. In the case of the hackathon, the development and improvement of the entrepreneurial spirit and behaviour of the students were rated with 100 % preference, with which all participating teachers unanimously agreed. Both learning approaches equip students with the capacity to produce high-quality solutions.

The teachers underscore that the fundamental distinction between these two formats lies in their operational dynamics. PBL is an essential and obligatory element of the formal academic process, requiring mandatory participation throughout study and course completion. On the other hand, the hackathon is an extra, non-compulsory, and informal activity that appeals to participants.

In the realm of higher education, significant transformations in university frameworks and educational settings are essential for fostering critically reflective, inter/transdisciplinary, experiential, and place-based learning. This necessitates a pivotal focus on interdisciplinarity and transdisciplinary within sustainability education, calling for proactive engagement with diverse stakeholders and providing students with opportunities beyond traditional classroom experiences. (Fernando, 2020).

While the teachability of entrepreneurship is debated, schools embrace diverse pedagogical approaches. Contrasting "traditional" and "entrepreneurial" methods reveals a shift from standardized, passive models to active, experiential, and collaborative approaches. This aligns with progressive education and connects entrepreneurship education to various learning concepts, including experiential,

situational, service, problem/project-based, cognitive, and social constructivist learning. The global trend of incorporating entrepreneurship as a distinct course in college and university curricula underscores the evolution of educational strategies (Rodrigues, 2023).

5. Discussion And Conclusion

5.1. Learning and skill acquisitions derived from hackathon and PBL

Analysing students' feedback related to RQ1, it can be concluded that both methods foster knowledge and skill development. Students assert that implementing PBL in teaching subjects positively influences accepting and mastering specific subject knowledge during lessons. Hackathon participants assessed their ability to apply acquired technical knowledge post-event as progressing at a moderate pace. Their understanding of how technology works was deemed satisfactory according to their post-hackathon evaluation.

5.2. Learning outcomes of hackathon and PBL approaches for entrepreneurial behaviour

Examining both approaches concerning RQ2, we can conclude that students' perceptions of the impact of hackathons and PBL were generally positive. The evaluation revealed that hackathon students experienced enhanced readiness, while PBL participants faced challenges in proposing solutions. Hackathon involvement proved highly effective for developing business ideas and mastering entrepreneurship basics. PBL students found value in this approach during group projects. Participants also expressed appreciation for post-project engagement, highlighting the importance of organizers' support in creating opportunities to continue working on their projects.

The study shows that hackathons can be valuable for incubating startups and teaching practical entrepreneurship, provided they are well-designed with clear themes, challenges, and stakeholder goals. Hackathons foster an entrepreneurial mindset and can confirm assumptions about the viability of solutions in pre-incubation stages, encouraging participants to learn startup principles. However, while hackathons are crucial for developing business ideas and fostering entrepreneurial thinking, they may require additional programs and mentoring for more profound, market-tested startup development. Despite market insight and user testing limitations, hackathons still provide valuable learning environments, facilitating the understanding of product/service creation based on specific technologies.

Both hackathons and PBL are vital in translating entrepreneurial intent into action by providing hands-on learning, skill development, and exposure to real-world problems. They complement each other by offering short bursts of

creativity (hackathons) and sustained project engagement (PBL), preparing individuals to pursue entrepreneurial goals effectively.

Hackathons and PBL serve as valuable mechanisms for transitioning from entrepreneurial intention to actual behaviour by providing experiential learning opportunities, fostering skill development, and exposing participants to real-world challenges. They complement each other by offering intensive, short-term bursts of creativity and problem-solving (hackathons) and sustained, in-depth project work (PBL), collectively preparing individuals to act on their entrepreneurial ambitions effectively.

These platforms facilitate dynamic idea exchange, encouraging teams to experiment, iterate, and develop creative solutions collaboratively. Hackathons and PBL foster an entrepreneurial mindset within organisations by emphasising teamwork and open communication, empowering participants to drive innovation forward.

Hackathons are a more effective and efficient model for developing entrepreneurial skills and confidence than traditional semester-long courses. They boost entrepreneurial self-efficacy more rapidly and with fewer resources. Hackathons are a powerful tool for improving entrepreneurial self-efficiency and developing students' skills (Szymanska et al., 2020).

In conclusion, from a collaborative learning and communication point of view learning through PBL and hackathons significantly impacts better performance in innovative environments and being intrapreneurs by enhancing critical thinking skills, fostering creativity, promoting cross-functional collaboration, building intrapreneurial skills, increasing engagement, and enabling rapid prototyping and practical application. These benefits collectively prepare individuals to thrive and drive innovation within organizations.

These collaborative learning methods foster multidisciplinary learning, bridge academia and industry, and prepare students for entrepreneurship by allowing them to apply and enhance their skills in real-life situations. It could be summarized that hackathons and PBL benefit all participants. For participants and team members, it refers to team engagement and teamwork, working together on a project, playing specific roles in a team and a creative way of approaching problem-solving, learning technology together, but also business and management skills. On the other hand, organisers and sponsors realise benefits such as recognition and visibility, a source of innovation, community building and engagement, corporate branding, recruitment, and even IP development (Calco & Veeck, 2015; Pe-Than et al., 2022).

5.3. Motivational forces of student engagement in hackathons and PBL

Regarding the motivational drivers considered in RQ3, both approaches to entrepreneurial learning motivate participants through the value of the project, which is assessed in terms of generating positive emotions, encouraging activity, and instilling a sense of usefulness through the creation of innovative solutions. Although PBL is a compulsory learning approach integrated into the formal educational process, it has been observed that, in addition to gaining practical knowledge and exam requirements, students in PBL highly value the experience itself, viewing it as a valuable addition to their resumes and a useful aspect for their future careers.

Key motivational factors highly esteemed in hackathons include having enjoyable experiences, enhancing tech knowledge, and connecting with professionals and like-minded individuals. Participants collectively perceive rewards, such as cash and merchandise prizes, as important but not central in influencing their decision to engage in hackathons.

Students observed a notable increase in opportunities for internships, professional offers, and connections with industry professionals through both PBL and hackathons. Additionally, they acknowledged the potential to work on projects assigned by companies.

Potential drawbacks of engaging in hackathons encompass the fast-paced and dynamic work environment, challenges arising from hackathon regulations, difficulties in team dynamics, and the absence of teaching or mentoring that may impede team progress. Hackathon participants also voiced concerns about idea loss or imitation during collaborative efforts with team members and other participants.

5.4. Teachers' perspectives

Regarding the teachers' perspectives considered in RQ4, we can conclude that teachers observe that hackathons foster creativity, problem-solving, and an entrepreneurial spirit. At the same time, PBL emphasises concrete knowledge and soft skills development. Hackathons, unanimously rated with 100 % preference by teachers, significantly enhance students' entrepreneurial spirit and behaviour. Both approaches empower students to generate high-quality solutions, motivating teachers engaged in hackathons within PBL to improve teaching methods and experiential learning.

Teachers note that students see the hackathon as an optional chance for personal advancement, motivating them to invest more effort in finding solutions. Conversely, students participate in PBL primarily because it is mandatory, leading to less effort and minimal exam preparation. The key distinction lies in the operational dynamics, with PBL being an essential and obligatory academic

element, while the hackathon is an extra, non-compulsory, and informal activity appealing to participants.

5.5. Future work and challenges

Solving the identified challenges and future work will involve additional efforts in research and establishing an environment for the practical application of realistic entrepreneurial approaches to sustainable learning. To thoroughly understand the lasting impact and value of the ideas and solutions in both approaches, in-depth longitudinal studies are necessary. A research methodology that supports monitoring both approaches while enabling adequate comparisons must be developed for these. Practical evidence is crucial for identifying optimal practices in using formal and informal learning methods in entrepreneurship education. In addition, there is a need to address additional issues related to aspects of intellectual property.

5.6. Implications

The main implications of the research results are directed to teachers and educational institutions that want to improve entrepreneurial education. The research findings could potentially contribute to developing effective pedagogical strategies and educational policies to drive student engagement in these initiatives, thereby enhancing their learning experience. The findings of this study emphasise that if educators want to improve the effectiveness of education focused on developing entrepreneurial skills, it should be implemented in formal education and include blended formal and informal processes based on different entrepreneurial learning formats.

Both hackathons and PBL were highly regarded by students for enhancing their knowledge and skills. Hackathons were preferred for their hands-on, entrepreneurial, and employability experiences. At the same time, PBL students prioritised building team trust and did not express concerns about idea loss or imitation, unlike hackathon participants. Lecturers noted that hackathons foster creativity, problem-solving, and entrepreneurship, while PBL emphasises the development of concrete knowledge and soft skills. The research also delved into students' motivations for participating in hackathons and found that pleasant experiences, technological knowledge, and networking were the top drivers. However, the rewards were significant but not as expected.

In formal education, it is indicated that if teachers want to improve the effectiveness of education aimed at developing entrepreneurial skills, postgraduate programs should be adjusted to students in business and students who are not; accordingly, their basic foundations are entirely different. These approaches to learning affect these two groups differently (Muthumeena & Yogeswaran, 2022).

The findings highlight the significant advantages of hackathon-based learning, showcasing its capacity to enhance educational experiences, stimulate innovation, and motivate students and educators to excel in their roles within academia. These insights contribute to a comprehensive understanding of the benefits and potential of hackathon-based learning in educational settings. The research affirms that hackathons effectively introduce new technologies and IT knowledge, as evidenced by positive feedback from participants without prior experience in technology.

The integration of hackathons into curricula will be explored in future studies, with the expectation that they will become a standard part of the university experience in the "next normal." While there is no universal approach to designing impactful hackathon events, educators are encouraged to experiment with this emerging pedagogy. Following the hackathon concept, there is an opportunity to revolutionise the traditional higher education model, fostering creativity, entrepreneurial thinking, and the development of graduates prepared for the evolving demands of the future workforce.

Assessment is a critical factor in shaping student learning, guiding their approach to a course and supporting the achievement of learning objectives. Evaluation provides essential feedback, helping students close the gap between their current performance and learning goals (Gratchev, 2023). Replacing traditional exams with project-based assessments centred on real-life site investigations leads to higher average grades and enhanced learning experience (Gratchev, 2023). The Faculty of Organizational Sciences has a long-standing tradition of working with students through hackathons, PBL, and solving case studies. It is common for these formats to be used in teaching, and teachers and students are used to their application. However, learning and taking exams through these work formats has not yet become common and widely accepted in the European academic space as a model of knowledge transfer, practical learning and comprehensive assessment of student engagement. FON's experience working with students through hackathon formats and PBL methods is available as a recommendation for considering the introduction of this way of working and testing students at other faculties and institutions of higher education.

Standards-based grading effectively evaluates and conveys student progress, facilitating transparent communication between educators, students, and parents regarding learning objectives and achievements. However, it often leads to a compartmentalised approach to instruction, focusing solely on individual content standards to ensure comprehensive coverage. This isolated teaching and assessment neglects opportunities for interdisciplinary learning and limits student engagement, resulting in passive participation in knowledge-building. Educators need to integrate interdisciplinary, project-based learning into standards-based grading frameworks (Yokom, 2020). This requires the agility and readiness of

academic institutions to improve the standardisation of the educational system, overcome traditional methods of student evaluation, and move to learning and evaluation models based on practical work and delivery of project results. Changing the grading system is crucial to adapt the educational process to the real needs of entrepreneurship, enabling students to acquire the necessary competencies.

In summary, this paper presents results from practical experiences in applying hackathons and PBL, leading to several key conclusions. First, the research highlights that integrating pedagogical strategies such as PBL and hackathons can significantly enhance students' entrepreneurial attitudes and intentions by improving their knowledge and skills while fostering creativity and problem-solving abilities.

Additionally, educational institutions and policymakers are encouraged to adopt blended formal and informal processes in entrepreneurial education, as this integration can effectively engage students and enrich their learning experiences, thus preparing them for both traditional career paths and entrepreneurial ventures. Although this approach is based on one country (Serbia), it can be generalised and implemented in other countries with similar educational systems. Notably, educational systems in many countries in the region, such as Croatia, Montenegro, Bosnia and Herzegovina, and North Macedonia, share a common conceptual foundation. These systems have evolved from similar frameworks, maintaining many of the same practices. This compatibility and minimal language barriers facilitate greater collaboration among students across these nations (Pantić et al., 2011). As a result, regional startup competitions frequently feature teams comprising students from various countries in the region, fostering a collaborative entrepreneurial spirit. Moreover, there is a notable number of competitions and projects within the Danube region, including initiatives like Danube Cap and various Erasmus projects. These programs focus on entrepreneurship and aim to enhance compatibility among educational institutions across borders. Therefore, the results of this research can potentially be applied, with minimal modifications, to other countries in the region. However, it is essential to recognise that the implementation of PBL may vary due to differing educational regulations across countries. While some nations allow for more flexible inclusion of PBL in assessment, the European Union, mainly through programs like Erasmus, provides frameworks supporting such projects' realisation. These frameworks ensure that innovative pedagogical strategies can be effectively integrated into regional educational practices.

Furthermore, hackathons are identified as particularly effective in providing hands-on experiences that enhance students' entrepreneurial skills and employability while also contributing to team trust and fostering creativity and critical thinking. The paper also notes the differential impact of various learning

formats, as PBL tends to emphasise the development of concrete knowledge and soft skills. In contrast, hackathons excel in stimulating innovation and entrepreneurship. This suggests that tailoring educational programs to meet diverse student needs and interests is essential for maximising learning outcomes.

Finally, the study underscores the importance of fostering a genuine interest in entrepreneurship among students; programs designed to enhance entrepreneurial skills should focus on skill development and aim to cultivate students' passion and engagement with entrepreneurship as a viable career path.

The research highlights the transformative potential of integrating innovative pedagogies into entrepreneurial education, emphasising their role in preparing students for dynamic career paths and fostering a culture of innovation within educational institutions.

Acknowledgement

The PBL part of this work was partly supported by the Erasmus+ project

D-PBL: Advancing project-based learning into the Digital Era 2021-1-PT01-KA220-HED-000032011, financed by EU

References

Almulla, M. A. (2020). The Effectiveness of the Project-Based Learning (PBL) Approach as a Way to Engage Students in Learning. *SAGE Open*, *10*(3). https://doi.org/10.1177/2158244020938702

Avila-Merino, A. (2019). Learning by doing in business education. Using hackathons to improve the teaching and learning of entrepreneurial skills. *Journal of Entrepreneurship Education, 22 (1).*, *22*(1).

Bell, R., & Bell, H. (2020). Applying educational theory to develop a framework to support the delivery of experiential entrepreneurship education. *Journal of Small Business and Enterprise Development*, *27*(6), 987–1004. https://doi.org/10.1108/JSBED-01-2020-0012

Blank, S., & Bob Dorf. (n. d.). *The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company by Steve Blank | Goodreads*. Retrieved October 14, 2024, from https://www.goodreads.com/book/show/13557008-the-startup-owner-s-manual

Bogdanovic, Z., Milicevic, A., Stojanovic, D., Labus, A., Despotovic-Zrakic, M., & Radenkovic, B. (2023). Open Innovation Strategies in Engineering Education. In *2023 IEEE 33rd International Conference on Microelectronics, MIEL 2023* (pp. 1–8). IEEE. https://doi.org/10.1109/MIEL58498.2023.10315923

Butt, W. A., Shariff, A., Khan, S., & Mian, A. I. (2021). Global Surgery Hackathons: A Case Study From Pakistan. *Surgical Innovation*, *28*(4), 496–501. https://doi.org/10.1177/1553350621101861 9

Byrne, J. R., Sullivan, K., & O'Sullivan, K. (2018). Active Learning of Computer Science Using a Hackathon-like Pedagogical Model. *2018 Constructionism; Vilnius, Lithuania; Research Council of Lithuania, 138–150.*, *September*. https://www.researchgate.net/publication/327395075

Cacciotti, G., Hayton, J. C., Mitchell, J. R., & Giazitzoglu, A. (2016). A reconceptualisation of fear of failure in entrepreneurship. *Journal of Business Venturing*, *31*(3), 302–325. https://doi.org/10.1016/J.JBUSVENT.2016.02.002

Calco, M., & Veeck, A. (2015). The Markathon: Adapting the Hackathon Model for an Introductory Marketing Class Project. *Marketing Education Review*, *25*(1), 33–38. https://doi.org/10.1080/10528008.2015.999600

Carayannis, E. G., & Campbell, D. F. J. (2010). Triple helix, Quadruple helix and Quintuple helix and how do Knowledge, Innovation and the Environment relate to Each other? a proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development*, *1*(1), 41–69. https://doi.org/10.4018/jsesd.2010010105

Charosky Larrieu-Let, G. (2021). Developing innovation competences in engineering education through project-based and challenge-based learning. *TDX (Tesis Doctorals En Xarxa)*. https://upcommons.upc.edu/handle/2117/362127

Cobham, D., Gowen, C., Jacques, K., Laurel, J., & Ringham, S. (2017). From appfest to entrepreneurs: using a hackathon event to seed a university student led entreprise: academic member of staff: doi: 10.21125/inted.2017.0265 undergraduate student. *International Technology, Education and Development Conference INTED2017 Proceedings*, 522–529.

Cortés, D., Ramírez, J., & Molina, A. (2022). *Open Innovation Laboratory to Foster Skills and Competencies in Higher Education*. 281–291. https://doi.org/10.1007/978-981-19-3383-7_22

Feder, T. (2021). Hackathons catch on for creativity, education, and networking. *Physics Today*, *74*(5), 23–25. https://doi.org/10.1063/PT.3.4746

Fernando, F. (2020). Experiential learning in sustainability: Opportunities, building partnerships, and student engagement. *Diverse Pedagogical Approaches to Experiential Learning: Multidisciplinary Case Studies, Reflections, and Strategies*, 93–109. https://doi.org/10.1007/978-3-030-42691-0_7

García-castanedo, J., & Corrales-garay, D. (2024). *The International Journal of Management Education The ideathon as an instrument for entrepreneurial education in university contexts*. *22*(March 2023). https://doi.org/10.1016/j.ijme.2023.100926

Garcia, M. B. (2023). Fostering an Innovation Culture in the Education Sector: A Scoping Review and Bibliometric Analysis of Hackathon Research. *Innovative Higher Education*, *48(4)*, 739–762. https://doi.org/10.1007/s10755-023-09651-y

Gratchev, I. (2023). Replacing Exams with Project-Based Assessment: Analysis of Students' Performance and Experience. *Education Sciences*, *13*(4). https://doi.org/10.3390/educsci13040408

HackerEarth. (2017). *Global Hackathon Report – Trends and insights, HackerEarth*. https://www.hackerearth.com/community-hackathons/resources/whitepapers/global-hackathon-report-trends-insights/

Hart, M. A. (2012). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful BusinessesEric Ries. New York: Crown Business, 2011. 320 pages. US$26.00. *Journal of Product Innovation Management*, *29*(3), 508–509. https://doi.org/10.1111/J.1540-5885.2012.00920_2.X

He, L., Zheng, L. J., Sharma, P., & Leung, T. Y. (2024). The International Journal of Management Education Entrepreneurship education and established business activities : An international perspective. *The International Journal of Management Education*, *22*(1), 100922. https://doi.org/10.1016/j.ijme.2023.100922

Isomöttönen, V., & Kärkkäinen, T. (2016). Project-based learning emphasising open resources and student ideation: How to raise student awareness of IPR? *Communications in Computer and Information Science*, *583*, 293–312. https://doi.org/10.1007/978-3-319-29585-5_17/COVER

Ivanovic, L., Kurepa, T., & Srbija, I. D. (2023). *Startap skener 2023*. https://www.preduzmi.rs/startap-skener-2023/

Jussila, J., Suominen, A. H., & Rainio, T. (2020). Entrepreneurship Competence Using Educational Hackathons in Finland. *Journal of Finnish Studies*, *23*(2), 32–73. https://doi.org/10.5406/28315081.23.2.05

Kong, F., Zhao, L., & Tsai, C. H. (2020). The Relationship Between Entrepreneurial Intention and Action: The Effects of Fear of Failure and Role Model. *Frontiers in Psychology*, *11*(March), 1–9. https://doi.org/10.3389/fpsyg.2020.00229

Lina, D. M., Ionescu, A. M., & Bedrule-Grigoruta, M. V. (2019). Entrepreneurial Orientation in Romanian Higher Education. *EDULEARN19 Proceedings*, *1*(July 2019), 9864–9872. https://doi.org/10.21125/edulearn.2019.2458

Lionaite, M. (2020). *Hackathons as a tool for learning in the framework of UNESCO learning cities* (Issue June).

Marin, A., Boanță, L. F., Țelinoiu, A., Darie, G., & Din, M. A. (2018). Supporting Entrepreneurship and Innovation in Higher Education in Romania. *ICERI2018 Proceedings*, *1*, 9938–9947. https://doi.org/10.21125/iceri.2018.0844

Miličević, A., Despotović-Zrakić, M., Naumović, T., Suvajdžić, M., & Radenković, B. (2023). Measuring the performance of the innovative potential of the academy on the example of Algorand WEB 3.0 hackathon. *In E-Business Technologies Conference Proceedings (Vol. 3, No. 1, Pp. 217–223)*., 217–223. https://www.ebt.rs/journals/index.php/conf-proc/article/view/195

Miličević, A., Despotović-Zrakić, M., Stojanović, D., Suvajžić, M., & Labus, A. (2024). Academic performance indicators for the hackathon learning approach – The case of the blockchain hackathon. *Journal of Innovation & Knowledge*, *9*(3), 100501. https://doi.org/10.1016/J.JIK.2024.100501

Muthumeena, M. P., & Yogeswaran, D. G. (2022). Entrepreneurship Education Through Successful Entrepreneurial Models in Educational Institutions. *Journal of Development Economics and Management Research Studies*, *09*(14), 13–19. https://doi.org/10.53422/jdms.2022.91402

Naumović, T., Vajagić, B., Cvetković, L., & Proročić, M. (2022). Open innovations and the role of hackathons. *E-Business Technologies Conference Proceedings*, *2*(1), 42–45. https://ebt.rs/journals/index.php/conf-proc/article/view/111

Neneh, B. N., & Dzomonda, O. (2024). Transitioning from entrepreneurial intention to actual behaviour: The role of commitment and locus of control. *International Journal of Management Education*, *22*(2), 100964. https://doi.org/10.1016/j.ijme.2024.100964

Nolte, A., Pa, E., Pe-Than, P., Filippova, A., Bird, C., Scallen, S., & Herbsleb, J. D. (2018). *You Hacked and Now What? – Exploring Outcomes of a Corporate Hackathon. Proceedings of the ACM on Human-Computer Interaction, 2(CSCW), 1–23.*

Organ, J., O'Neill, S., & Shanahan, B. W. (2022). Development of Social Technology Entrepreneurial Ventures: A challenge project-based learning approach. *IFAC-PapersOnLine*, *55*(39), 181–186. https://doi.org/10.1016/j.ifacol.2022.12.050

Pantić, N., Wubbels, T., & Mainhard, T. (2011). Teacher competence as a basis for teacher education: Comparing views of teachers and teacher educators in Five Western Balkan countries. *Comparative Education Review*, *55*(2), 165–188. https://doi.org/10.1086/657154

Pe-Than, E. P. P., Nolte, A., Filippova, A., Bird, C., Scallen, S., & Herbsleb, J. (2018). *Designing Corporate Hackathons With a Purpose. The future of software development. Ieee Software, 36(1), 15–22.*

Pe-Than, E. P. P., Nolte, A., Filippova, A., Bird, C., Scallen, S., & Herbsleb, J. (2022). Corporate hackathons, how and why? A multiple case study of motivation, projects proposal and selection, goal setting, coordination, and outcomes. *Human-Computer Interaction*, *37*(4), 281–313. https://doi.org/10.1080/07370024.2020.1760869

Rodrigues, A. L. (2023). Entrepreneurship Education Pedagogical Approaches in Higher Education. *Education Sciences*, *13*(9). https://doi.org/10.3390/educsci13090940

Santoso, R. T. P. B., Priyanto, S. H., Junaedi, I. W. R., Santoso, D. S. S., & Sunaryanto, L. T. (2023). Project-based entrepreneurial learning (PBEL): a blended model for startup creations at higher education institutions. *Journal of Innovation and Entrepreneurship*, *12*(1). https://doi.org/10.1186/s13731-023-00276-1

Simović, V. I. ekonomskih nauka, & Ilić, M. I. ekonomskih nauka. (n. d.). *Digitalno preduzetnistvo*. https://www.library.ien.bg.ac.rs/index.php/monog/article/download/1416/1156/

Somià, T., Lechner, C., & Pittaway, L. (2023). Assessment and development of coachability in entrepreneurship education. *The International Journal of Management Education*, *UR*(Last round). https://doi.org/10.1016/j.ijme.2023.100921

Stojanović, D., Radenković, B., Bogdanović, Z., Miličević, A., & Barać, D. (2023). Crowed-based open innovation: model, challenges, and trends. *6th International Scientific Conference on Digital Economy DIEC 2023*, 45–71. https://ipi-akademija.ba/file/diec-6-online/189

Szymanska, I., Sesti, T., Motley, H., & Puia, G. (2020). The effects of hackathons on the entrepreneurial skillset and perceived self-efficacy as factors shaping entrepreneurial intentions. *Administrative Sciences*, *10*(3), 1–15. https://doi.org/10.3390/admsci10030073

Temiz, S. (2021). Open innovation via crowdsourcing: A digital only hackathon case study from Sweden. *Journal of Open Innovation: Technology, Market, and Complexity, 7(1), 39.*, *7*(1), 39. https://doi.org/10.3390/joitmc7010039

Tiberius, V., & Weyland, M. (2023). Entrepreneurship education or entrepreneurship education? A bibliometric analysis. *Journal of Further and Higher Education*, *47*(1), 134–149. https://doi.org/10.1080/0309877X.2022.2100692

Toding, M., Mädamürk, K., Venesaar, U., & Malleus, E. (2023). Teachers' mindset and attitudes towards learners and learning environment to support students' entrepreneurial attitudes in universities. In *International Journal of Management Education* (Vol. 21, Issue 1). https://doi.org/10.1016/j.ijme.2023.100769

Tomić-Brkušanin, B. (2022). *Startap skener 2022*. https://www.preduzmi.rs/startap-skener/

Wallwey, C., Longmeier, M. M., Hayde, D., Armstrong, J., Kajfez, R., & Pelan, R. (2022). Consider "HACKS" when designing hackathon challenges: Hook, action, collaborative knowledge sharing. *In Frontiers in Education (Vol. 7, p. 954044). Frontiers Media SA.*, *September*. https://doi.org/10.3389/feduc.2022.954044

Yokom, H. B. (2020). *IMPLEMENTING PROJECT-BASED LEARNING WITHIN A STANDARDS-BASED GRADING SYSTEM*. https://digitalcommons.hamline.edu/hse_cp/489

Entrepreneurial Mindset of Students in Central and Eastern Europe: Factors that Determine Intentions and Actions*

*Ivan Todorović, Milan Okanović, Slavica Cicvarić Kostić, Igor Pihir, Miha Marič***

Abstract

The paper discusses the importance of fostering an entrepreneurial mindset, particularly in Central and Eastern Europe. The study focuses on 471 students from public universities in Slovenia, Croatia, and Serbia, examining factors influencing their entrepreneurial mindset, intentions, and actions. Results highlight differences between countries, with female students in Slovenia and Serbia being more action-oriented than males. Key factors influencing entrepreneurial intentions include academic success, formal education, extracurricular activities, and prior entrepreneurial experience. The study suggests that extracurricular activities play a more significant role in shaping entrepreneurial behaviour than formal education.

Keywords: entrepreneurial mindset, formal entrepreneurship education, extracurricular activities, university students, Central and Eastern Europe
JEL Codes: A20, I23, L26

1. Introduction

Entrepreneurship is a dynamic and multifaceted phenomenon that plays a pivotal role in economic development and societal progress (Shane/Venkataraman 2000), particularly relevant within the transforming societies of Central and Eastern Europe – CEE (Hashi/Krasniqi 2011). In recent scholarly discourse, an entrepreneurial mindset (EM) has gained increasing attention (Kuratko et al. 2021, Larsen 2022, Daspit et al. 2023). Notably, the EM of students has assumed great importance, given the proliferation of initiatives directed explicitly towards cultivating entrepreneurial tendencies among the youth. Scholars have progres-

* Received: 31.1.24, accepted: 26.8.24, 1 revision.

** *Ivan Todorović*, Teaching Assistant, University of Belgrade, Faculty of Organizational Sciences. Email: ivan.todorovic@fon.bg.ac.rs. Main research interests: business models, business consulting, startup management, entrepreneurship, organizational design, restructuring
Milan Okanović, Ph.D., Associate Professor, University of Belgrade, Faculty of Organizational Sciences. Email: milan.okanovic@fon.bg.ac.rs. Main research interests: entrepreneurial marketing, market research, digital communications
Slavica Cicvarić Kostić, Ph.D., Full Professor, University of Belgrade, Faculty of Organizational Sciences. Email: slavica.cicvaric.kostic@fon.bg.ac.rs. Main research interests: brand management, strategic communications, digital communications
Igor Pihir, Ph.D., Associate Professor, University of Zagreb, Faculty of Organization and Informatics. Email: ipihir@foi.unizg.hr. Main research interests: business process modelling and improvement, application of information and communication technologies, digital transformation, measurement of organizational efficiency
Miha Marič, Ph.D., Associate Professor, University of Maribor, Faculty of Organizational Sciences. Email: miha.maric@um.si. Main research interests: power, leadership, organizational behaviour, human resource management, organization and management

sively directed their attention toward exploring the impact of entrepreneurship education (EE) on the shaping of this mindset and individuals capable of identifying opportunities, navigating challenges, and fostering innovation in dynamic environments (Neck et al. 2014, Handayati et al. 2020, Colombelli et al. 2022, Cui/Bell 2022).

Understanding the personal, situational, or contextual factors, including education (Pfeifer et al. 2016), that contribute to the development of EM, and entrepreneurial intentions and behaviour is essential for educational institutions and researchers in the field of entrepreneurship.

In terms of education, entrepreneurship programs play a vital role in shaping students' EM (Kuratko 2005, Gibb 2011). Entrepreneurship education encompasses diverse formal and informal learning experiences designed to generate principal entrepreneurial skills, attitudes, and behaviours. EE aims to reshape students' perspectives and mindsets on innovative and risk-taking activities in business (Jones et al. 2017). Higher education institutions are one of the sources of EE in both formal and informal forms of education. EE has become an integral part of academic curricula worldwide, and universities and business schools offer specialized courses, degree programs, and workshops dedicated to nurturing entrepreneurial skills, shaping EM, and cultivating students' behaviour (Kuratko 2005, Rauch/Hulsink 2015, Thomassen et al. 2020).

Entrepreneurship is a relevant development area in CEE countries (Korpysa 2009). Since the quality of higher education is one of the critical factors for economies that want to move up the value chain (Krueger/Lindahl 2001), it is essential to pay attention to the topic of EE in these countries. The development and unleashing of entrepreneurial skills, which may be inherent but not adequately stimulated, is one of the pillars of entrepreneurship development in transition countries (Tyson et al. 1994), which further emphasizes the importance of research focused on the development of education in the field of entrepreneurship.

For this research, three CEE countries were selected, which differ from each other in terms of the degree of transition from the post-socialist period and the level of European integration: the Republic of Slovenia, as a long-standing member of the European Union (EU), the Republic of Croatia, as a country that joined later, and the Republic of Serbia, as a candidate. During the end of the 20th and the beginning of the 21st century, entrepreneurs in CEE reshaped traditional industries and created new industries, combining innovative ideas with traditional competencies (Purg et al. 2018). The observed countries were once part of the Socialist Federal Republic of Yugoslavia. Still, they are characterized by numerous socioeconomic and cultural differences, such as macroeconomic indicators, labour markets, education systems, and social protection systems (Rakić et al. 2019). Cultural differences between the three countries should

not be overlooked either (Nedeljković et al. 2018). Although these countries are geographically close and partly have a shared history, which at first glance suggests that they should be at a similar stage of development when it comes to entrepreneurship, their transition processes to a market economy differed (Lubik-Reczek 2015). Consequently, the level of entrepreneurial development, the entrepreneurial ecosystem, available incentives, and profiles of entrepreneurs in these countries still differ (Palalić et al. 2018). Accordingly, they represent an extremely interesting sample for horizontal analysis in various spheres. Due to the evident differences in educational systems, culture, socio-demographic indicators, and entrepreneurship in general, it is essential to conduct comparative research on factors affecting students' EM.

This paper aims to investigate and compare the factors that shape the EM of students and determine their intentions and actions in three countries of CEE – Slovenia, Croatia, and Serbia. In addition, the paper will explore how entrepreneurial intentions and behaviour can be influenced through higher education in these three cultural and socioeconomic contexts. Since the results of EE depend on the national context (Walter/Dohse 2012, Thomassen et al. 2020, Chafloque-Cespedes et al. 2021), this study is focused on analysing the influencing factors in these three countries.

By comprehending the nuances of how EE influences the mindsets, intentions, and actions of students across three national contexts, this paper not only adds to recent theoretical advancements in these domains but also provides insights for educators and practitioners aiming to foster the expansion of entrepreneurship activities within academic institutions.

Although the influence of educational measures on attitudes and intentions has been researched and tested empirically, this paper represents the initial endeavour to explore factors influencing EM among university students, their intentions, and actions in three CEE countries.

The structure of the paper is as follows: the second section explores the literature on entrepreneurship, explicitly focusing on EM and EE, providing a theoretical foundation for the issue. The third section outlines the methodology employed in the study. In the fourth section, the study's findings are presented along with an explanation of the results. The fifth section discusses the results. Lastly, the sixth section offers concluding remarks and practical implications.

2. Theoretical Background

The theoretical framework for this study is grounded on the Theory of Reasoned Actions – TRA by Ajzen and Fishbein (1975) and its extension, the Theory of Planned Behaviour – TPB (Ajzen 1991). TRA posits that individuals' behaviour is determined by their intention, which is influenced by their attitudes towards

the behaviour and subjective norms. TPB incorporates perceived behavioural control, proposing that individuals' intentions and behaviours are influenced by their perceived ability to perform the behaviour. Looking through these theoretical lenses, intentions have been identified as an unbiased predictor of subsequent action, while specific attitudes predict intentions. Numerous scholars view entrepreneurship as a prototypical illustration of intentionally planned behaviour (Krueger/Carsrud 1993, Fayolle/Degeorge 2006, Ajike et al. 2015, Sabah 2016, Pejic Bach et al. 2018). In studying the effects of EE, the authors conclude that the influence of educational measures on attitudes toward entrepreneurship has been recognized, but the impact of EE on intentions toward entrepreneurship hasn't been thoroughly examined (Von Graevenitz et al. 2010).

2.1. Entrepreneurial Mindset

Mathisen and Arnulf (2014) explain that mindsets, rooted in the Würzburg School of psychological research from the late 19th century, are automated cognitive processes that aid in task performance and are shaped by experience. These mental sets, influenced by experience, shape individuals' automatic and unconscious responses to stimuli, thus contributing to reaching their goals that occur without conscious awareness.

Despite a growing interest in comprehending EM, there may not be a universally agreed-upon definition of EM, its developmental process, or its specific outcomes. By analysing definitions presented by the various authors, Naumann (2017) underscores that EM is closely tied to cognitive processes. Some extend their scope to include actions and the distinctive manner entrepreneurs utilize and connect resources to exploit opportunities. According to these definitions, it can be asserted that the current conceptualization of EM is rooted in a cognitive perspective. Accordingly, EM is regarded as a way of thinking that empowers individuals to generate value by identifying and pursuing opportunities and making decisions with limited information within complex, uncertain, and dynamic conditions (Daspit et al. 2023).

To better understand the concept of EM and the ways for its development, scholars agree that it comprises distinct perspectives: cognitive – how people use mental models to think, behavioural – how they act for opportunities, as well as emotional – what they feel in entrepreneurship (McGrath/MacMillan 2000, Davis et al. 2015, Kuratko et al. 2021).

Various research studies have examined the correlations between this cognitive process and the business performance of entrepreneurial ventures. Jeraj et al. (2015) imply that entrepreneurial curiosity holds dominant importance throughout all the stages of entrepreneurial activities and positively affects company growth. On the other hand, innovativeness in the entrepreneurship process represents a driver for internationalization (Leković et al. 2023). Entrepreneurial

orientation significantly affects performance in the context of minimum viable product (MVP) creation, first customer acquisition, initial revenue stream, and investment for the next phase of tech venture development (Okanović et al. 2023).

To measure EM, Mathisen and Arnulf (2014) developed a scale that quantitatively measures the intensity of unique mindsets associated with different stages of entrepreneurial engagement. This scale assesses elaborating mindset, implementing mindset, and compulsiveness related to business ideas and provides a comprehensive assessment of the various aspects that contribute to a well-rounded EM. The scale has been accepted and validated in theory and practice (Cao/Ngo 2019, Kania 2022).

The initial phase in the journey towards entrepreneurial actions involves the development of an elaborating mindset. Elaborating mindset, crucial during the initial goal-setting phase, involves answering "why" questions and considering the desirability and feasibility of entrepreneurial activities. Implementing mindset focuses on the practical aspects of engaging in entrepreneurial activities, leading to closed-mindedness and transforming wishes into actionable intentions for goal attainment. Compulsiveness refers to the automatic and involuntary nature of particular behaviour, often associated with successful entrepreneurs, that observers easily perceive as personality traits (Mathisen/Arnulf 2014).

2.2. Sociodemographic Characteristics as the Predictors of Entrepreneurial Mindset

Grounding on the Entrepreneurial Potential Model, proposed by Krueger and Brazeal (1994), that focuses on identifying individual characteristics and environmental factors that contribute to entrepreneurial potential, studies exploring the predictors of EM among students frequently examine diverse sociodemographic variables. Although specific results may differ between studies, some commonly explored sociodemographic predictors can be grouped as follows: students' country (Chafloque-Cespedes et al. 2021), gender (Piva/Rovelli 2022, Franceško et al. 2022), educational background (Arranz et al. 2017, Palalić et al. 2017, Cui/Bell 2022), family background (Franceško et al. 2022), and students' experience (Palalić et al. 2017, Chafloque-Cespedes et al. 2021).

A student's country can be a predictor of EM, reflecting the influence of cultural, economic, and institutional factors. National contexts shape attitudes towards risk-taking, innovation, and entrepreneurial activities, thereby impacting the development of EM among students. Cross-country studies have indicated variations in EM based on cultural values, societal norms, the level of economic development, and the entrepreneurial ecosystem and support structures in a country (Acs/Szerb 2009, Liñán/Fayolle 2015). Therefore, the country of origin

serves as a significant contextual variable influencing the EM of students, and we hypothesize that:

Hypothesis 1: The components of an entrepreneurial mindset (elaborating mindset, implementing mindset, and compulsiveness related to business ideas) vary among students from CEE countries.

In terms of gender, studies suggest that gender may influence EM. Santos et al. (2016) reported that men tend to have more favourable entrepreneurial intentions and attitudes than women. Still, while some research implies that males tend to exhibit a higher inclination towards entrepreneurship than females (Wilson et al. 2004), others indicate that entrepreneurial curiosity is greater among women (Marič et al. 2017). Observing the student population, research consistently shows that male students tend to have higher entrepreneurial intentions than female students (Haase et al. 2012; Lo et al. 2012). However, some studies have found no significant difference in entrepreneurial intentions between male and female students (Majumdar/Varadarajan 2013). These conflicting findings suggest that the gender gap in EM may vary across different contexts and populations.

When it comes to educational background, it encompasses general educational background (Liñán/Fayolle 2015), particularly in the field of entrepreneurship (Cui/Bell 2022), year of study, and attitude toward more entrepreneurship courses (Palalić et al. 2017), as well as participation in extracurricular activities (Arranz et al. 2017). Family background as a predictor of students' EM specifically focuses on the entrepreneurial experience of parents (Franceško et al. 2022). Students' experience as a group of predictors includes whether they study or study and work, whether they participate in or run a business (Chafloque-Cespedes et al. 2021), and prior students' entrepreneurial experience (Palalić et al. 2017). Therefore, we hypothesize that:

Hypothesis 2: The impact of various sociodemographic factors on the components of an entrepreneurial mindset (elaborating mindset, implementing mindset, and compulsiveness related to business ideas) varies among students from CEE countries.

2.3. Entrepreneurial Mindset and Education

EE has a vital role in exploring EM among students, particularly in facilitating the development of their beliefs, attitudes, and behaviours reflecting EM. Even though entrepreneurial intention is predominantly shaped by personal factors, Remeikiene, Startiene, and Dumciuviene (2013) found that EE could further strengthen these factors. Nonetheless, Mohamad, Lim, Yusof, and Soon (2015) confirmed the relevance of integrating EE, encompassing both formal and infor-

mal approaches, into the curriculum to foster entrepreneurial intentions. Higgins and Elliott (2011) enhanced the comprehension of entrepreneurial learning by acknowledging that, in higher education, this type of learning extends beyond classroom learning experiences. This paper focuses on examining both formal and informal EE at the university level for the development of students 'entrepreneurial intentions and, consequently, their actions, so we hypothesize that:

Hypothesis 3: There is a difference in the impact of formal higher education and student extracurricular activities on the components of students' entrepreneurial mindset (elaborating mindset, implementing mindset, and compulsiveness related to business ideas).

3. Methodology

3.1. Entrepreneurial Mindset Measurement

To assess students' EM, we utilized a scale developed by Mathisen and Arnulf (2014) that measures the intensity of elaborating and implementing mindsets and compulsiveness regarding business ideas, presented in Table 1. To reduce the construct of EM to a smaller number of dimensions, we conducted an exploratory factor analysis on the collected data from all three countries using the Principal Component Method. Variables with loadings above 0.5 were retained, resulting in a Kaiser-Meyer-Olkin value of 0.960, exceeding the recommended threshold of 0.6 (Kaiser, 1970). The Bartlett test of sphericity was statistically significant (Sig. <.000), indicating that the correlation matrix was factorable.

The principal component method revealed three components with eigenvalues above 1, explaining 49.7 %, 6.8 %, and 5.4 % of the total variance, respectively. Together, these generated factors accounted for 61.9 % of the factor solution. This implies that 61.9 % of the information is contained in 25 items distributed across three factors.

Table 1: Scale for measuring students' entrepreneurial mindset

Rotated Component Matrix	Component		
	1	2	3
I consider both the positive and negative aspects of entrepreneurial activities.	.325	**.612**	.246
I contemplate whether I have enough time to initiate entrepreneurial activities.	.370	**.671**	.249
I reflect on whether I have the financial means to start entrepreneurial activities.	.248	**.751**	.216
I research and analyse available information for commencing entrepreneurial activities.	.494	**.580**	.240
I contemplate whether it is the right moment to start entrepreneurial activities.	.457	**.652**	.226
I think about specific business ideas on which I could base entrepreneurial activities.	.460	**.658**	.164
I reflect on whether I truly want to start entrepreneurial activities.	.065	**.781**	.153
When considering starting ent. activities, I sometimes feel it is the "right thing" and sometimes that it is wrong.	.099	**.707**	.217
I regularly follow information and news relevant to starting entrepreneurial activities.	**.542**	.355	.338
I am entirely confident that I have or can acquire the necessary knowledge to start entrepreneurial activities.	**.628**	.275	.090
I believe that now is the right time to start entrepreneurial activities.	**.594**	.225	.315
I have made the decision to start entrepreneurial activities.	**.744**	.156	.374
I have a plan/strategy on how to start entrepreneurial activities.	**.747**	.184	.355
When I identify an opportunity, I will seize it and start entrepreneurial activities.	**.709**	.399	.078
When thinking about my business idea, I am determined to start entrepreneurial activities.	**.740**	.322	.291
I know when I will start entrepreneurial activities.	**.687**	.112	.363
During conversations with other people, new entrepreneurial ideas come to me.	.348	.460	**.462**
When contemplating new entrepreneurial ideas, thoughts come to me uncontrollably.	.327	.444	**.533**
My friends and acquaintances think I am too interested in developing entrepreneurial ideas.	.306	.279	**.695**
My thoughts about entrepreneurial ideas disrupt and influence other aspects of my life.	.232	.118	**.744**
While thinking about entrepreneurial ideas, it is a challenge for me to "get rid" of those thoughts.	.066	.094	**.750**
In the evening, before sleeping, I think about entrepreneurial ideas.	.334	.343	**.641**
I think about entrepreneurial ideas while engaging in other activities.	.329	.373	**.653**
I immerse myself deeply when thinking about entrepreneurial ideas.	.510	.330	**.532**
I share thoughts about my entrepreneurial ideas with many other people.	.313	.225	**.565**

Nominal values, i. e., arithmetic means of all corresponding items, were calculated for all generated factors. The values of the three factors and the reliability measure of the scales are presented in Table 2.

Table 2: Nominal values of generated factors

	Number of items	Cronbach's Alpha	Mean	N	Std. Deviation
ELABORATING MINDSET	8	.909	3.2365	471	.95791
IMPLEMENTING MINDSET	8	.903	2.8161	471	.94197
COMPULSIVNESS	9	.899	2.4797	470	.90831

3.2. Sample

The research involved 471 participants from three related faculties in Slovenia (the Faculty of Organizational Sciences, University of Maribor), Croatia (the Faculty of Organization and Informatics, University of Zagreb), and Serbia (the Faculty of Organizational Sciences, University of Belgrade), where management and informatics are studied. The sample represents around 6 % of the total population of organizational sciences students in three selected countries. In proportion to the total number of students, the sample included 201 participants from Serbia (42.7 %), 163 participants from Croatia (34.6 %), and 107 participants from Slovenia (22.7 %). The sample comprised 72.6 % undergraduate students and 27.4 % master's students. The participants have an average age of 21.3 years, and 38.8 % are female.

The majority of the observed sample consists of students in the field of Management and Business (62.4 %), compared to the other part consisting of students in Informatics and Computer Science (37.6 %). A significant portion of the observed sample has had entrepreneurship-related topics during their studies (82.8 %), and 24.8 % have been involved in some entrepreneurial ventures. Half of the respondents (49.5 %) have parents who either had or currently run an entrepreneurial venture as their additional or dominant occupation. Most of the participants have work experience through part-time, full-time, or freelance employment (58.4 %).

4. Results

4.1. Cross-country Comparative Analysis

To explore differences in EM construct among respondents from the observed countries, mean values of the factors for each country were presented individually, and an analysis of variance (ANOVA) with LSD post-hoc test was conducted. A difference in the Elaborating mindset was identified between students in Serbia and Croatia, the Implementing mindset among surveyed students in Croatia and Slovenia, and the Compulsiveness between students from Serbia and Croatia, as well as between students in Croatia and Slovenia (Table 3). Thus, the results confirm our first hypothesis.

Considering the gender of the respondents in the entire sample and applying an independent samples T-test, a statistically significant difference in the values of all three generated factors of EM was identified, where the level of all three types of mindsets is higher among female respondents (see Table 4) This pattern is consistent across all three observed countries (see Figure 1). The highest statistically significant difference between respondents of different genders in all observed countries was found in the Implementing mindset (Mean Difference 0.3486; Sig. < 0.000).

Table 3: Comparative analysis of Slovenia, Croatia and Serbia

Multiple Comparisons										
LSD										
FACTOR	Country	N	Mean	Std. Dev.	Country	Mean Difference	Std. Error	Sig.	95 % Confidence Interval	
									Lower Bound	Upper Bound
ELABORATING MINDSET	**Serbia**	201	3.3483	.95516	**Croatia**	**.23062***	.10061	**.022**	.0329	.4283
					Slovenia	.14072	.11422	.219	-.0837	.3652
	Croatia	163	3.1176	.95372	Serbia	-.23062*	.10061	.022	-.4283	-.0329
					Slovenia	-.08990	.11876	.449	-.3233	.1435
	Slovenia	107	3.2075	.95438	Serbia	-.14072	.11422	.219	-.3652	.0837
					Croatia	.08990	.11876	.449	-.1435	.3233
IMPLEMENTING MINDSET	Serbia	201	2.8474	.95516	Croatia	.14932	.09902	.132	-.0453	.3439
					Slovenia	-.08969	.11242	.425	-.3106	.1312
	Croatia	163	2.6981	1.01371	Serbia	-.14932	.09902	.132	-.3439	.0453
					Slovenia	**-.23900***	.11688	**.041**	-.4687	-.0093
	Slovenia	107	2.8161	.88943	Serbia	.08969	.11242	.425	-.1312	.3106
					Croatia	.23900*	.11688	.041	.0093	.4687
COMPULSIVNESS	**Serbia**	201	2.5922	.90361	**Croatia**	**.32627***	.09463	**.001**	.1403	.5122
					Slovenia	-.00264	.10741	.980	-.2137	.2084
	Croatia	163	2.2659	.85882	Serbia	-.32627*	.09463	.001	-.5122	-.1403
					Slovenia	**-.32891***	.11157	**.003**	-.5482	-.1097
	Slovenia	107	2,4797	.93955	Serbia	.00264	.10741	.980	-.2084	.2137
					Croatia	.32891*	.11157	.003	.1097	.5482
*. The mean difference is significant at the 0.05 level.										

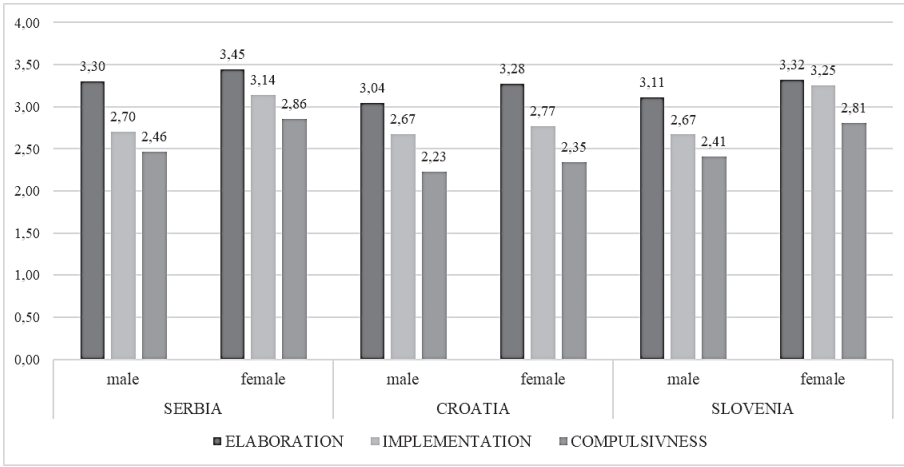


Figure 1: A cross-country comparison of entrepreneurial mindset between genders

Considering individual countries, it was found that among respondents in Serbia, there is a statistically significant difference between genders in both the Implementing mindset (Mean Difference 0.4362; Sig. < 0.01) and the Compulsiveness (Mean Difference 0.3926; Sig. < 0.01). In Slovenia, a significant mean difference between genders is observed for the same two factors, 0.5831 for the Implementing mindset (Sig. < 0.01) and 0.3982 for the Compulsiveness (Sig. < 0.05).

Table 4: Comparison of entrepreneurial mindset between genders

Independent Samples Test											
	Gender	N	Mean	SD	Std. Error	F	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
ELABORATING MINDSET	Male	287	3.178	0.983	.05803	2.423	-1.919	467	.056	-.17250	.08990
	Female	182	3.350	0.892	.06609						
IMPLEMENTING MINDSET	Male	287	2.687	0.910	.05369	0.073	-3.979	467	.000	-.34864	.08763
	Female	182	3.036	0.948	.07029						
COMPULSIVNESS	Male	286	2.376	0.887	.05247	0.263	-3.295	466	.001	-.28034	.08509
	Female	182	2.656	0.913	.06767						

4.2. Interdependence Analysis

The following sections of the paper present the correlation between six observed independent variables (Academic Success, Entrepreneurship Education, Extracurricular Activities, Work During Studies, Parents as Entrepreneurs, Start-up Experience) and three generated factors of EM. Except for academic success,

which was measured by the average grade in studies, the other observed independent variables were measured on qualitative scales describing the level of the observed activities. The strength of the linear relationship was measured using Pearson's or Spearman's correlation coefficient, considering the scale of the variable. Linear correlations were examined in the entire sample and the samples of respondents from three observed countries (see Table 5 and Table 6).

The results confirm the second hypothesis. The highest number of identified significant linear relationships between the observed independent variables and the generated factors was found for the level of previous Startup Experience and all factors of EM. These positive and predominantly moderate strength relationships were mapped in all observed countries. In addition, there are several connections between variables describing the level of Entrepreneurship Education and the level of Extracurricular Activities, which also correlate with almost all generated factors of EM. This is predominantly observed among students in Serbia and Croatia, to a much lesser extent among students in Slovenia.

Additionally, the results of the correlation analysis indicate significant connections between the level of Parents' entrepreneurial experience and two mindset factors, specifically for respondents in Croatia. There is also an inverse correlation between Academic Success and all factors of EM among respondents from Serbia. It can be concluded that the Implementing mindset and Elaborating mindset correlate with the highest number of independent variables, 11 and 10 respectively, while Compulsiveness correlates with eight observed independent variables. The correlation analysis of the observed independent variables and the three factors of EM is presented in Table 5 and Table 6.

The results related to the variables Entrepreneurship Education and Extracurricular Activities presented in Table 5 confirm our third hypothesis.

Three multiple linear regression models were generated to examine the impact of the observed independent predictors on the generated factors of EM (see Table 7). These multiple linear regression models explain 19.2 % (Sig. < 0.01), 28.6 % (Sig. < 0.01), and 26.4 % (Sig. < 0.01) of the variance in the dependent variables (elaborating mindset, implementing mindset, and compulsiveness), respectively.

Table 5: Correlations of the observed predictors related to entrepreneurship education and academic success, and entrepreneurial mindset

		Academic Success					Entrepreneurship Education					Extracurricular Activities			
		ALL	SRB	CRO	SLO		ALL	SRB	CRO	SLO		ALL	SRB	CRO	SLO
ELABORATING MINDSET	r	-0.028	-.252**	0.03	0.056	r	.146**	.177*	.251**	.061	r	.178**	.194**	0.107	.206*
	Sig.	0.606	0.004	0.732	0.625	Sig.	0.002	.012	.001	.529	Sig.	0	0.006	0.173	0.034
	N	346	132	135	79	N	471	201	163	107	N	471	201	163	107
IMPLEMENTING MINDSET	r	-.106*	-.173*	-0.017	-0.216	r	.139**	.151*	.220**	.053	r	.170**	.166*	.192*	0.181
	Sig.	0.049	0.047	0.841	0.055	Sig.	0.003	.032	.005	.586	Sig.	0	0.019	0.014	0.062
	N	346	132	135	79	N	471	201	163	107	N	471	201	163	107
COMPULSIVNESS	r	-0.041	-.225**	0.127	-0.167	r	.132**	.228**	.184*	.063	r	.223**	.263**	.169*	0.178
	Sig.	0.45	0.01	0.142	0.141	Sig.	0.00	.001	.019	.520	Sig.	0	0	0.031	0.067
	N	345	131	135	79	N	470	200	163	107	N	470	200	163	107

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6: Correlations of the observed predictors related to the working and entrepreneurial experience of students and their parents, and entrepreneurial mindset

		Work During Studies					Parents as Entrepreneurs					Startup Experience			
		ALL	SRB	CRO	SLO		ALL	SRB	CRO	SLO		ALL	SRB	CRO	SLO
ELABORATING MINDSET	r	.223**	.330**	.070	.163	r	.144**	.044	.242**	.129	r	.326**	.293**	.360**	.348**
	Sig.	.000	.000	.375	.093	Sig.	.002	.531	.002	.185	Sig.	.000	.000	.000	.000
	N	471	201	163	107	N	471	201	163	107	N	471	201	163	107
IMPLEMENTING MINDSET	r	.182**	.233**	.189*	.011	r	.179**	.154*	.213**	.111	r	.392**	.379**	.396**	.383**
	Sig.	.000	.001	.016	.914	Sig.	.000	.029	.006	.253	Sig.	.000	.000	.000	.000
	N	471	201	163	107	N	471	201	163	107	N	471	201	163	107
COMPULSIVNESS	r	.204**	.306**	.091	.059	r	.138**	.092	.147	.100	r	.368**	.310**	.404**	.375**
	Sig.	.000	.000	.247	.547	Sig.	.003	.195	.062	.305	Sig.	.000	.000	.000	.000
	N	470	200	163	107	N	470	200	163	107	N	470	200	163	107

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7: Regression models of entrepreneurial mindset

Model	Independent variable	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	F	Sig.
Model 1	ELABORATING MINDSET	.438	.192	.178	.88501	1.931	13.418	.000
Model 2	IMPLEMENTING MINDSET	.535	.286	.274	.81405	1.869	22.680	.000
Model 3	COMPULSIVNESS	.514	.264	.251	.80349	1.810	20.201	.000

The first multiple linear regression model (see Table 8) explains 19.2 % of the variability of the Elaborating mindset (R=0.438; R2=0.192; F=13.418; Sig. < 0.01). Alongside the constant (B=1.969; Sig. < 0.01), five predictors participate in the regression model: Entrepreneurship Education (beta=0.118, Sig. < 0.05), Extracurricular Activities (beta=0.114, Sig. < 0.05), Work During Studies (beta=0.119, Sig. < 0.05), Parents as Entrepreneurs (beta=0.135, Sig. < 0.01), and Startup Experience (beta=0.281, Sig. < 0.01). The second model of multiple linear regression (see Table 9) explains 28,6 % of the variability of the Implementing mindset (R=0.535; R2=0.286; F=22.680; Sig. < 0.01), and alongside the constant (B=2.060; Sig. < 0.01), five predictors are involved: Academic Success (beta=-0.102, Sig. < 0.05), Entrepreneurship Education (beta=0.114, Sig. < 0.05), Extracurricular Activities (beta=0.143, Sig. < 0.01), Parents as Entrepreneurs (beta=0.088, Sig. < 0.05), and Startup Experience (beta=0.419, Sig. < 0.01). Third regression model (see Table 10) explains 24,6 % variability of the Compulsiveness (R=0.514; R2=0.246; F=20.201; Sig. < 0.01) and includes the constant (B=1.351; Sig. < 0.01) and four predictors: Entrepreneurship Education (beta=0.093, Sig. < 0.05), Extracurricular Activities (beta=0.117, Sig. < 0.01), Work During Studies (beta=0.099, Sig. < 0.05), and Startup Experience (beta=0.392, Sig. < 0.01).

Table 8: Predictors of elaborating mindset

MODEL 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	**1.959**	**.484**		**4.046**	**.000**
Academic Success	-.028	.054	-.025	-.506	.613
Entrepreneurship Education	**.110**	**.046**	**.118**	**2.393**	**.017**
Extracurricular Activities	**.096**	**.042**	**.114**	**2.267**	**.024**
Work During Studies	**.115**	**.049**	**.119**	**2.369**	**.018**
Parents as Entrepreneurs	**.108**	**.040**	**.135**	**2.694**	**.007**
Startup Experience	**.477**	**.086**	**.281**	**5.546**	**.000**

Dependent Variable: ELABORATING MINDSET

Table 9: Predictors of implementing mindset

MODEL 2	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	**2.060**	**.445**		**4.625**	**.000**
Academic Success	**-.110**	**.050**	**-.102**	**-2.191**	**.029**
Entrepreneurship Education	**.104**	**.042**	**.114**	**2.465**	**.014**
Extracurricular Activities	**.118**	**.039**	**.143**	**3.027**	**.003**
Work During Studies	.055	.045	.058	1.226	.221
Parents as Entrepreneurs	**.069**	**.037**	**.088**	**1.883**	**.061**
Startup Experience	**.695**	**.079**	**.419**	**8.782**	**.000**

Dependent Variable: IMPLEMENTING MINDSET

Table 10: Predictors of compulsiveness towards business ideas

MODEL 3	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	**1.351**	**.440**		**3.068**	**.002**
Academic Success	-.051	.050	-.049	-1.030	.304
Entrepreneurship Education	**.083**	**.042**	**.093**	**1.993**	**.047**
Extracurricular Activities	**.141**	**.039**	**.177**	**3.668**	**.000**
Work During Studies	**.091**	**.044**	**.099**	**2.055**	**.041**
Parents as Entrepreneurs	.037	.036	.049	1.028	.305
Startup Experience	**.630**	**.078**	**.392**	**8.076**	**.000**

Dependent Variable: COMPULSIVNESS

5. Discussion

A cross-country analysis of students' entrepreneurial mindsets revealed statistically significant differences among Slovenia, Croatia, and Serbia. Despite the similarity in analysed institutions, the country of origin consistently emerged as a predictor of EM. This follows previous research showing that various economic, cultural, and social factors contribute to the identified differentiations (Chafloque-Cespedes et al. 2021). In this particular scenario, economic variables can be elucidated by considering one long-term member of the European Union (EU), one recent EU associate, and one EU candidate. The EU adopted the Europe 2020 Strategy to increase, among others, the level of entrepreneurship and innovation to raise the region's global competitiveness (Pradhan et al. 2020). Thus, the advantages of EU membership and the impacts of its policies manifest in distinct entrepreneurial ecosystems and mechanisms for supporting entrepreneurship. Additionally, macroeconomic causes such as gross domestic product (GDP), average salary, and unemployment rate play a role. When combined with cultural and social variations shaped by national perspectives, these factors offer sufficient parameters to account for country-based variances in

students' EM. This aligns with previous research demonstrating a relationship between culture and entrepreneurship (Lounsbury et al. 2021, Bullough et al. 2022). Despite the historical connection of these three countries through the former state of Yugoslavia, all respondents were born and raised after its separation, experiencing different environments moulded by diverse national contexts that have influenced their attitudes, including aspirations toward entrepreneurship.

The results reveal an intriguing pattern, indicating a higher level of all three components of EM among female respondents compared to males across all three observed countries. Previous research shows that women are more motivated by a higher need for autonomy (Sullivan/Meek 2012), which may explain their more decisive attitude towards entrepreneurship in student days. Despite the highest significant difference between genders being found in the Implementing mindset, official statistical data in the region presents a contrasting scenario, with most entrepreneurs being men. Notably, in Serbia, a statistically significant difference between genders exists in both the Implementing mindset and Compulsiveness. However, data from the Chamber of Commerce and Industry of Serbia (2022/2023) indicate that the proportion of women among the total number of entrepreneurs is approximately one-third, meaning there are still twice as many male entrepreneurs. When examining the share of women among company founders in Serbia, this proportion drops to one-fourth. Although these figures have been gradually increasing in recent years, the progress is relatively slow. A significant mean difference between genders is observed in Slovenia for the same two factors. Despite this, the female-to-male entrepreneurship ratio in Slovenia is among the lowest in Europe, according to reports from the Organization for Economic Cooperation and Development (2020). In the context of socially constructed gender stereotypes in entrepreneurship, Gupta et al. (2009) revealed that successful entrepreneurs are predominantly perceived to possess masculine characteristics. According to Fossen (2012), female entrepreneurs tend to be more risk-averse and fear failure more than male entrepreneurs (Koellinger et al. 2013). This might explain the significantly higher number of male entrepreneurs compared to female, despite the more expressed EM among female students in our sample. In Croatia, there is no statistically significant relation between gender and the three observed components of EM within the sample.

Findings regarding academic success and EM suggest that formal curricula fail to motivate students with entrepreneurial aspirations to prioritize achieving better grades. This aligns with previous research, which found an insignificant relation between students' grade point average and entrepreneurial skills (Onyebu 2015). While formal entrepreneurship education exhibits a significant positive correlation with Elaborating mindset, Implementing mindset, and Compulsiveness, overall academic success is either not significantly correlated or negatively

affects students' EM. In Serbia, this correlation is negative and significant for all three components of EM. These results raise questions about the educational system's effectiveness in promoting entrepreneurship, which is recognized as a strategic goal of the Republic of Serbia (Jaško et al., 2023) and the Faculty of Organizational Sciences in Belgrade (The Development Strategy 2023–2033). Several explanations are possible. Students with entrepreneurial intentions may not be inclined to pursue an academic career. It could be assumed that the curricula encourage entrepreneurship effectively, but the issue may be inadequate evaluation methods. Nevertheless, academic success does not emerge as a factor with a significant positive impact on all the observed components of EM.

On the other hand, education in entrepreneurship emerges as a robust predictor of Elaborating mindset, Implementing mindset, and Compulsiveness associated with business ideas. This holds for both curricular and extracurricular activities. The findings of earlier research, which demonstrated the impact of entrepreneurship education on students' entrepreneurial intentions (Remeikiene et al., 2013; Mohamad et al., 2015), have been confirmed in observed countries. However, in line with recent research (Debarliev et al. 2022), our study advances this understanding by revealing that informal education is a more potent predictor for all three EM components than formal education. This bears significant implications for decision-makers in institutions where entrepreneurship is studied since extracurricular activities bypass formal accreditation procedures, making their introduction, management, and adaptation considerably more flexible. The accreditation cycle in higher education in the analysed countries typically lasts seven years. While minor adjustments are possible during this period, substantial corrections to study programs and curricula usually require several years. Given the rapid technological progress and changes in the startup ecosystem, this system proves too rigid. For instance, during the last accreditation cycle, we witnessed the swift evolution of blockchain technology and artificial intelligence, which change daily. It becomes evident that university programs and courses struggle to keep pace with these trends. This is where informal education can be crucial, bridging the gap between evolving trends and curricula. Such activities not only guide students toward elaboration and planning but also prompt action. Our results demonstrate the impact of entrepreneurship education on the deliberative phase, influencing elaborating mindset and compulsiveness, as well as on the implementation of entrepreneurial ideas. Implementing mindset, being closer to action, is expected to develop during the planning phase, focusing on where, when, and how to execute a plan, transforming a wish into an intention (Mathisen/Arnulf 2014).

Remarkably, the most influential factor in students' entrepreneurial activity in the observed countries is their previous startup experience. There is a consensus among researchers that prior startup experience positively affects entrepreneurial behaviour (Bignotti/Le Roux 2020) and, at first glance, it seems logical that

individuals who have initiated their own business, either alone or in a team, exhibit a more pronounced EM. Nevertheless, institutional support for embarking on an entrepreneurial venture can serve as a significant motivator for engagement in entrepreneurship. Considering that successful startup founders typically succeed after multiple attempts and failures, it becomes evident that faculties offering such opportunities tend to nurture the EM of their students.

Another personal characteristic recognized as a factor influencing EM in earlier research is family background (Franceško et al., 2022). In our study, where we conducted a separate analysis for all three components of EM, we identified parents' entrepreneurial experience as a significant predictor of students' entrepreneurial behaviour. The results reveal that students whose parents have managed or are currently managing a company exhibit a more pronounced Implementing mindset, both at the overall sample level and at the country level, in Croatia and Serbia. In Slovenia, such a correlation exists but lacks statistical significance. Considering the impact of family background on students' intentions, reflected in Elaborating mindset and Compulsiveness toward business ideas, we can infer that these students intend to engage in entrepreneurial ventures but not necessarily initiate new ones. The explanation may lie in their inclination to continue a family business, guiding them toward entrepreneurial behaviour focused on developing an existing business rather than starting a new one.

The findings present a contrasting scenario for students who work during their studies. Although this variable predicts Elaborating mindset, Implementing mindset, and Compulsiveness, its impact is more pronounced in the elaboration phase and on entrepreneurial intention rather than tangible actions. The primary reason for this observation could be their emphasis on employment rather than business initiation. Their time constraints might hinder them from completing the planning process and transitioning to the implementation phase, yet they continue contemplating business ideas. This finding contributes to the ongoing debate on the relationship between the different work experiences of students and their entrepreneurial intentions (Miralles et al. 2017).

6. Conclusion and Implications

Building on entrepreneurship education and the entrepreneurial mindset, this study conceptualizes how EM cultivated through higher education establishes dimensions of an entrepreneur mindset: Elaborating mindset, Implementing mindset, and Compulsiveness. These dimensions distinct entrepreneurial intentions and actions.

To foster students' EM and facilitate the translation of entrepreneurial intentions into behaviour, higher education institutions should not only concentrate on developing formal programs but also on extracurricular activities, particularly those related to entrepreneurship and startups. Initiatives such as engagement

in student organizations, informal entrepreneurship courses, training sessions, workshops, and round-table discussions on startup-related topics positively impact cognitive processes and entrepreneurial behaviour. Additionally, students should be encouraged and supported in launching their businesses while studying, as startup experience emerges as the strongest predictor for all three types of EM, particularly the implementing component. While formal EE remains a crucial focus for higher education institutions due to its significant positive correlation with Elaborating mindset, Implementing mindset, and Compulsiveness related to business ideas, greater attention should be directed towards extracurricular activities, as they emerge as more influential in driving students' entrepreneurial actions.

6.1. Limitations and directions for the future research

Like any research, this study has limitations that point toward avenues for future exploration. The respondents were drawn from three related institutions and major faculties of organizational sciences in the region. While there are other faculties focusing on management or informatics, these three are the only ones with such a mix of study programs and curricula. Although this selection enhances sample credibility by eliminating variables related to the study program and teaching methods, it also suggests directions for further research. Including more institutions and study programs would be essential to test whether educational background correlates with EM in the selected countries. Expanding the research to include other faculties can broaden the scope to other countries in the CEE region, moving away from organizational sciences and the only three faculties where they are studied in this region, already covered in this analysis. Moreover, a comparative analysis of the CEE region and other global regions could represent another area for further research.

One pressing topic highlighted by the findings of this research is women's entrepreneurship. The results indicate a higher inclination of female students toward implementing entrepreneurial ideas, but practice shows a significantly lower number of women entrepreneurs than men. Further research could identify the barriers and obstacles, besides general risk-averseness, that hinder women in the CEE from executing their student business ideas.

Recognizing extracurricular activities as strong predictors of students' EM and considering their more manageable and faster integration into the educational process compared to changes in formal programs, further research should focus on identifying the specific types of activities that exert the most decisive influence on students' entrepreneurial intentions and subsequent actions.

References

Acs, Z. J./Szerb, L. (2009): The global entrepreneurship index (GEINDEX). Foundations and Trends® in Entrepreneurship, 5, 5, 341–435.

Ajike, D. E./Kelechi, N. G./Hamed, A./Onyia, V./Kwarbai, J. D. (2015): Entrepreneurship education and entrepreneurial intentions: The role of theory of planned behaviour. International Journal of Advanced Research in Social Engineering and Development Strategies, 3, 1, 118–135.

Ajzen, I. (1991): The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50, 2, 179–211.

Ajzen, I./Fishbein, M. (1975): A Bayesian analysis of attribution processes. Psychological Bulletin, 82, 2, 261–277.

Arranz, N./Ubierna, F./Arroyabe, M. F./Perez, C./Fdez. de Arroyabe, J. C. (2017): The effect of curricular and extracurricular activities on university students' entrepreneurial intention and competences. Studies in Higher Education, 42, 11, 1979–2008.

Bignotti, A./Le Roux, I. (2020): Which types of experience matter? The role of prior start-up experiences and work experience in fostering youth entrepreneurial intentions. International Journal of Entrepreneurial Behavior & Research, 26, 6, 1181–1198.

Bullough, A./Guelich, U./Manolova, T. S./Schjoedt, L. (2022): Women's entrepreneurship and culture: gender role expectations and identities, societal culture, and the entrepreneurial environment. Small Business Economics, 58, 2, 985–996.

Cao, V. Q./Ngo, T. T. T. (2019): Linking entrepreneurial intentions and mindset models: A comparative study of public and private universities in Vietnam. Gadjah Mada International Journal of Business, 21, 2, 115–133.

Chafloque-Cespedes, R./Alvarez-Risco, A./Robayo-Acuña, P. V./Gamarra-Chavez, C. A./Martinez-Toro, G. M./Vicente-Ramos, W. (2021): Effect of sociodemographic factors in entrepreneurial orientation and entrepreneurial intention in university students of Latin American business schools, in Universities and entrepreneurship: meeting the educational and social challenges, 151–165.

Chamber of Commerce and Industry of Serbia (2022/2023): White book – recommendations for improving the sector of female entrepreneurship. Belgrade.

Colombelli, A./Loccisano, S./Panelli, A./Pennisi, O. A. M./Serraino, F. (2022): Entrepreneurship education: the effects of challenge-based learning on the entrepreneurial mindset of university students. Administrative Sciences, 12, 1, 10.

Cui, J./Bell, R. (2022): Behavioural entrepreneurial mindset: How entrepreneurial education activity impacts entrepreneurial intention and behaviour. The International Journal of Management Education, 20, 2, 100639.

Daspit, J. J./Fox, C. J./Findley, S. K. (2023): Entrepreneurial mindset: An integrated definition, a review of current insights, and directions for future research. Journal of Small Business Management, 61, 1, 12–44.

Davis, M.H./Hall, J.A./Mayer, P.S. (2015): Developing a new measure of entrepreneurial mindset: reliability, validity, and implications for practitioners. Consulting Psychology Journal: Practice and Research, 68, 1, 21–48.

Debarliev, S./Janeska-Iliev, A./Stripeikis, O./Zupan, B. (2022): What can education bring to entrepreneurship? Formal versus non-formal education. Journal of Small Business Management, 60, 1, 219–252.

Fayolle, A./Degeorge, J. M. (2006): Attitudes, intentions, and behaviour: New approaches to evaluating entrepreneurship education. International entrepreneurship education. Issues and newness, 74–89.

Fossen, F. M. (2012): Gender differences in entrepreneurial choice and risk aversion–a decomposition based on a microeconometric model. Applied Economics, 44, 14, 1795–1812.

Franceško, M./Nedeljković, J./Njegomir, V. (2022): Attitudes towards work, organizational values, and students' sociodemographic characteristics as predictors of entrepreneurial orientation. Economic research-Ekonomska istraživanja, 35, 1, 799–818.

Gibb, A. (2011): Concepts into practice: Meeting the challenge of development of entrepreneurship educators around an innovative paradigm: The case of the International Entrepreneurship Educators' Programme (IEEP). International Journal of Entrepreneurial Behavior & Research, 17, 2, 146–165.

Gupta, V. K./Turban, D. B./Wasti, S. A./Sikdar, A. (2009): The role of gender stereotypes in perceptions of entrepreneurs and intentions to become an entrepreneur. Entrepreneurship Theory and Practice, 33, 2, 397–417.

Haase, H./Lautenschläger, A./Thomas, A. (2012): Entrepreneurial intentions of university students: a gender perspective. International Journal of Entrepreneurship and Small Business, 17, 3, 378–393.

Handayati, P./Wulandari, D./Soetjipto, B. E./Wibowo, A./Narmaditya, B. S. (2020): Does entrepreneurship education promote vocational students' entrepreneurial mindset?. Heliyon, 6, 11, 1–7.

Hashi, I./Krasniqi, B. A. (2011): Entrepreneurship and SME growth: evidence from advanced and laggard transition economies. International Journal of Entrepreneurial Behavior & Research, 17, 5, 456–487.

Higgins, D./Elliott, C. (2011): Learning to make sense: what works in entrepreneurial education? Journal of European Industrial Training, 35, 4, 345–367.

Jaško, O./Čudanov, M./Krivokapić, J./Todorović, I. (2023): Development of Entrepreneurship in Serbia: Main External Factors and Influences, in Entrepreneurship Development in the Balkans: Perspective from Diverse Contexts. Leeds: Emerald Publishing Limited, 237–260.

Jeraj, M./Marič, M./Todorović, I./Čudanov, M./Komazec, S. (2015): The role of openness and

entrepreneurial curiosity in Company's growth. Amfiteatru Economic Journal, 17, 38, 371–389.

Jones, P./Maas, G./Pittaway, L. (2017): New Perspectives on Entrepreneurship Education, Entrepreneurship Education (Contemporary Issues in Entrepreneurship Research, Vol. 7), Leeds: Emerald Publishing Limited, 1–13.

Kaiser, H. F. (1970): A second generation little jiffy. Psychometrika, 35, 4, 401–415.

Kania, R. (2022): From Entrepreneurial Mindset to Enterprising Mindset: Analyses in Entrepreneurship Course. Journal of Entrepreneurship Education, 25, 6, 1–15.

Koellinger, P./Minniti, M./Schade, C. (2013): Gender differences in entrepreneurial propensity. Oxford Bulletin of Economics and Statistics, 75, 2, 213–234.

Korpysa, J. (2009): Entrepreneurship in central-eastern European countries. SEER: Journal for Labour and Social Affairs in Eastern Europe, 12, 3, 391–406.

Krueger Jr., N. F./Brazeal, D. V. (1994): Entrepreneurial potential and potential entrepreneurs. Entrepreneurship: Theory & Practice, 18, 3, 91–104.

Krueger, A. B./Lindahl, M. (2001): Education for growth: Why and for whom?. Journal of Economic Literature, 39, 4, 1101–1136.

Krueger, N. F./Carsrud, A. L. (1993): Entrepreneurial intentions: Applying the theory of planned behaviour. Entrepreneurship & Regional Development, 5, 4, 315–330.

Kuratko, D. F. (2005): The emergence of entrepreneurship education: Development, trends, and challenges. Entrepreneurship Theory and Practice, 29, 5, 577–597.

Kuratko, D. F./Fisher, G./Audretsch, D. B. (2021): Unraveling the entrepreneurial mindset. Small Business Economics, 57, 1681–1691.

Larsen, I. B. (2022): Fostering an entrepreneurial mindset: A typology for aligning instructional strategies with three dominant entrepreneurial mindset conceptualizations. Industry and Higher Education, 36, 3, 236–251.

Leković, B./Amidžić, R./Vojinović, D./Ivanović-Đukić, M. (2023): Drivers for the Internationalization of Nascent Entrepreneurs and New Business Owners in Southeast European Countries. JEEMS Journal of East European Management Studies, 28, 1, 182–214.

Liñán, F./Fayolle, A. (2015): A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda. International Entrepreneurship and Management Journal, 11, 907–933.

Lo, C./Sun, H./Law, K. (2012): Comparing the entrepreneurial intention between female and male engineering students. JWEE, 1–2, 28–51.

Lounsbury, M./Cornelissen, J./Granqvist, N./Grodal, S. (2021): Culture, innovation and entrepreneurship, in Culture, Innovation and Entrepreneurship, Routledge, 1–12.

Lubik-Reczek, N. (2015): Transformation of the Countries of Central and Eastern Europe–an Attempt at Comparing Croatia and Slovenia. Przegląd Politologiczny, 3, 79–92.

Majumdar, S./Varadarajan, D. (2013): Students' attitude towards entrepreneurship: does gender matter in the UAE?. Foresight, 15, 4, 278–293.

Marič, M./Todorović I./Čudanov, M./Jordan, G. (2017): The Effect of Gender, Age and Education on Entrepreneurial Curiosity. Innovation Management, Entrepreneurship and Sustainability (IMES 2017), 566–574.

Mathisen, J. E./Arnulf, J. K. (2014): Entrepreneurial mindsets: theoretical foundations and empirical properties of a mindset scale. International Journal of Management and Business, 5, 1, 81–97.

McGrath, R.G./MacMillan, I.C. (2000): The entrepreneurial mindset. Boston: Harvard Business School Press.

Miralles, F./Giones, F./Gozun, B. (2017): Does direct experience matter? Examining the consequences of current entrepreneurial behavior on entrepreneurial intention. International Entrepreneurship and Management Journal, 13, 881–903.

Mohamad, N./Lim, H. E./Yusof, N./Soon, J. J. (2015): Estimating the effect of entrepreneur education on graduates' intention to be entrepreneurs. Education+Training, 57, 8/9, 874–890.

Naumann, C. (2017): Entrepreneurial Mindset: A Synthetic Literature Review. Entrepreneurial Business and Economics Review, 5, 3, 149–172.

Neck, H. M./Greene, P. G./Brush, C. G. (2014): Practice-based entrepreneurship education using actionable theory, in Annals of entrepreneurship education and pedagogy-2014, 3–20. Edward Elgar Publishing.

Nedeljković, M./Vukonjanski, J./Nikolić, M./Hadžić, O./Šljukić, M. (2018): A comparative analysis of Serbian national culture and national cultures of some European countries by GLOBE project approach. Journal of the Geographical Institute "Jovan Cvijic", SASA, 68, 3, 363–382.

Okanović, M./Milosavljević, M./Cicvarić Kostić, S./Dlačić, J. (2023): Embryonic tech ventures' orientation and performance. Management: Journal of Sustainable Business and Management Solutions in Emerging Economies, 28, 3, 87–99.

Onyebu, C. M. (2015): The role of entrepreneurial skills in academic performance: a case study of selected universities in Abia State, Nigeria. Review of Public Administration and Management, 4, 8, 121–130.

Organization for Economic Cooperation and Development (2020): Inclusive Entrepreneurship Policies – Country Assessment Notes Slovenia.

Palalić, R./Dana, L. P./Ramadani, V. (Eds.). (2018): Entrepreneurship in former Yugoslavia: Diversity, institutional constraints and prospects. Springer.

Palalić, R./Ramadani, V./Đilović, A./Dizdarević, A./Ratten, V. (2017): Entrepreneurial intentions of university students: a case-based study. Journal of Enterprising Communities: People and Places in the Global Economy, 11, 3, 393–413.

Pejic Bach, M./Aleksic, A./Merkac-Skok, M. (2018): Examining determinants of entrepreneurial intentions in Slovenia: applying the theory of planned behaviour and an innovative cognitive style. Economic research-Ekonomska istraživanja, 31, 1, 1453–1471.

Pfeifer, S./Šarlija, N./Zekić Sušac, M. (2016): Shaping the entrepreneurial mindset: Entrepreneurial intentions of business students in Croatia. Journal of Small Business Management, 54, 1, 102–117.

Piva, E./Rovelli, P. (2022): Mind the gender gap: the impact of university education on the entrepreneurial entry of female and male STEM graduates. Small Business Economics, 59, 1, 143–161.

Pradhan, R. P./Arvin, M. B./Nair, M./Bennett, S. E. (2020): The dynamics among entrepreneurship, innovation, and economic growth in the Eurozone countries. Journal of Policy Modeling, 42, 5, 1106–1122.

Purg, D./Sauka, A./Mets, T. (2018): Introduction: Entrepreneurship development and internationalization in Central and Eastern Europe, Ukraine and the Commonwealth of Independent States, in Entrepreneurship in Central and Eastern Europe, Routledge, 3–8.

Rakić, J. Ž./Krstić, G./Oruč, N./Bartlett, W. (2019): Income inequality in transition economies: A comparative analysis of Croatia, Serbia and Slovenia. Economic Annals, 64, 223, 39–60.

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. Academy of Management Learning & Education, 14, 2, 187–204.

Remeikiene, R./Startiene, G./Dumciuviene, D. (2013): Explaining entrepreneurial intention of university students: The role of entrepreneurial education, in International conference 2013 Knowledge Management and Innovation, 299–307.

Sabah, S. (2016): Entrepreneurial intention: Theory of planned behaviour and the moderation effect of start-up experience, in Entrepreneurship-practice-oriented perspectives. IntechOpen, 87–101.

Santos, F. J./Roomi, M. A./Liñán, F. (2016): About gender differences and the social environment in the development of entrepreneurial intentions. Journal of Small Business Management, 54, 1, 49–66.

Shane, S. /Venkataraman, S. (2000): The promise of entrepreneurship as a field of research. Academy of Management Review, 25, 1, 217–226.

Sullivan, D. M./Meek, W. R. (2012): Gender and entrepreneurship: a review and process model. Journal of Managerial Psychology, 27, 5, 428–458.

The Development Strategy of the Faculty of Organizational Sciences 2023–2033 (2023): available at https://en.fon.bg.ac.rs/wp-content/uploads/2023/12/Strategija_FON_ENG.pdf

Thomassen, M. L./Williams Middleton, K./Ramsgaard, M. B./Neergaard, H./Warren, L. (2020): Conceptualizing context in entrepreneurship education: a literature review. International Journal of Entrepreneurial Behavior & Research, 26, 5, 863–886.

Tyson, L. D. A./Petrin, T./Rogers, H. (1994): Promoting entrepreneurship in Eastern Europe. Small Business Economics, 6, 165–184.

Von Graevenitz, G./Harhoff, D./Weber, R. (2010): The effects of entrepreneurship education. Journal of Economic Behavior & Organization, 76, 1, 90–112.

Walter, S. G./Dohse, D. (2012): Why mode and regional context matter for entrepreneurship education. Entrepreneurship & Regional Development, 24, 9–10, 807–835.

Wilson, F./Marlino, D./Kickul, J. (2004): Our entrepreneurial future: Examining the diverse attitudes and motivations of teens across gender and ethnic identity. Journal of Developmental Entrepreneurship, 9, 3, 177–197.

Entrepreneurship Education at University: Towards a Review of Effective Learning Models*

*Katarina Milosavljević, Zoran Rakićević, Jovana Rakićević***

Abstract

Expanding upon existing reviews on entrepreneurship education, this article provides an overview of effective learning models classified as either generalised, augmented, motivational, or training type. By subjecting a broader set of studies (N = 3,291) to bibliometric analysis, followed by a systematic literature review focusing on a smaller subset (n = 90), 25 models were identified. Further investigation revealed that 11 of these models were of the generalised type, eight were based on augmented approaches, four focused on training, and two represented the motivational type of entrepreneurship education.

Keywords: entrepreneurship education, systematic literature review, learning models, students
JEL Codes: I21, I23, L26

I. Introduction

Entrepreneurship involves a dynamic progression from an innovative concept to enterprise establishment and its evolution into a business capable of generating substantial value (Yıldırım/Aşkun 2012). While entrepreneurship can take many forms, they all entail willingness to take initiative and accept risks in the pursuit of value creation and economic prosperity (Pantea 2018; Tiberius/Weyland 2023). Rakićević et al. (2022) define entrepreneurship as the capacity to overcome resource limitations to capitalise on opportunities. As the conceptual initiators who possess the creativity and drive to realise an idea in practice, entrepreneurs play a crucial role in this process (Yener/Arslan/Demirtaş 2018). Given these attributes, it is not surprising that entrepreneurship is considered crucial for fostering economic growth and generating employment. Although it starts with an individual, it can be promoted not only by governmental and pro-

* Received: 7.2.24, accepted: 26.8.24, 2 revisions.

** *Katarina Milosavljević,* PhD Student of Management and Organization, Faculty of Organizational Sciences, University of Belgrade, Belgrade, Serbia. Email: km20225005@student.fon.bg.ac.rs. Main research interests: Entrepreneurship, Project Management, Strategic Project Management.
Zoran Rakićević, Associate Professor, Department for Production and Services Management, Faculty of Organizational Sciences, University of Belgrade, Belgrade, Serbia. Email: zoran.rakicevic@fon.bg.ac.rs. Main research interests: Entrepreneurship, Management of Small and Medium-sized Enterprises, Production Planning.
Jovana Rakićević, Teaching Assistant, Department for Management of Technology, Innovation, and Sustainable Development, Faculty of Organizational Sciences, University of Belgrade, Belgrade, Serbia. Email: jovana.rakicevic@fon.bg.ac.rs. Main research interests: Technology Management, Technology Entrepreneurship, Entrepreneurship Ecosystem Support.

fessional bodies, but also higher education institutions (HEIs), by cultivating an economy with a strong entrepreneurial focus. HEIs serve as vital hubs of fresh knowledge and consistently replenish the entrepreneurial pool with a dynamic influx of students and researchers.

Entrepreneurship has also attracted considerable research interest, contributing to a debate on whether it is an innate personal characteristic or a disposition and skill set that can be learned (Yener et al. 2018). Those taking the latter perspective advocate for the inclusion of entrepreneurship at all educational levels while promoting lifelong learning and ensuring equitable access to all sociodemographic groups. This approach was adopted by the European Union (EU), leading to the establishment of the Lisbon Strategy for fostering lifelong entrepreneurship education in 2000 (João Rodrigues 2006; Cotoi/Bodoasca/Catana/Cotoi 2011; Čekić-Marković 2015). The goal of this initiative was to transform the EU into the world's most competitive and vibrant knowledge-driven economy. In many EU member states, entrepreneurship content is already integrated into the curriculum across different educational levels. For example, in Slovenia, as a part of the "Entrepreneurship on the Agenda" project funded by the Ministry of Education and Research, primary and secondary school students receive the support needed to start their mini-enterprises, thus contributing to the "Development of Entrepreneurial Culture and Creativity Among Young People" (Lapčević 2017). Similarly, "Junior Achievement" and "K-6" programmes implemented in Estonia allow elementary and high school students to learn about entrepreneurship through play (Lapčević 2017; Hiiemäe-Metsar/Raudsaar/Uibu 2021; Loogma/Peterson/Rekkor 2021). Although education has already experienced a considerable shift toward a more interactive and participatory model, focusing specifically on entrepreneurship is a remarkable shift within the educational framework. Inclusion of such subjects in secondary and tertiary education is of particular importance, as students can utilise the knowledge gained to start a business upon graduation (Dorji 2021; Ibrahim/Mohd Razali/Shekh/Zain/Ismail/Ya 2021). While business schools seem the most logical places for learning about entrepreneurship, such education should be offered as a part of other disciplines (Christensen/Arendt/Hjorth 2023), such as art, science, and engineering (Rajchamaha/Prapojanasomboon 2022). Most importantly, entrepreneurship should be taught via a formal and structured programme, enabling students to master the key concepts while developing the much-needed discipline and perseverance.

The growth in entrepreneurship education at universities has also inspired a large number of studies exploring its impact on students' entrepreneurial intentions. For example, Hanandeh et al. (2021) found that this kind of education promotes an entrepreneurial mindset, increasing the likelihood that students will pursue their innovative ideas through start-ups. Ncanywa and Dyantyi (2022) similarly noted that universities might mitigate the growing graduate unemploy-

ment by incorporating entrepreneurship education in their curricula. Loboda et al. (2019) concur with this view, adding that this process could be aided by Information and Communication Technology (ICT) tools. Still, the success of such initiatives depends on the appropriate selection of entrepreneurship education models (Boldureanu/Ionescu/Bercu/Bedrule-Grigoruță/Boldureanu 2020), as challenge-based learning (Colombelli/Loccisano/Panelli/Pennisi/Serraino 2022) has been shown to boost students' confidence in their ability to start a business.

Against this backdrop, the aim of the present study is to provide a comprehensive overview of entrepreneurship education. The obtained findings are used to categorise entrepreneurship learning models adopted at HEIs into four predefined groups, while identifying those that are most effective in promoting entrepreneurship.

Accordingly, after presenting an introduction and a theoretical background, the research methodology is described in detail. The obtained results are discussed next, and the key conclusions are drawn, complemented by a review of entrepreneurial learning models provided in the Appendix. Finally, study limitations are delineated, along with suggestions for future research directions in this domain.

II. Theoretical background

Entrepreneurship education is a dynamic and multifaceted process that aligns with the spirit of innovation and originality. Its primary goal is equipping students with the knowledge and skills needed to pursue a career path of their choice with drive and enthusiasm (Gundry/Ofstein/Kickul 2014). Whether they opt for conventional employment, initiate their entrepreneurial ventures, or pursue advanced studies upon graduation, students should be taught within an environment that is conducive to personal growth and achievement (Krpalek/Krpálková Krelová/Berková 2018).

As Vivekananth et al. (2023) pointed out, entrepreneurship education at HEIs is vital for empowering the entrepreneurial ecosystem and contributing to job creation and economic growth. Thus, it has to promote an entrepreneurial mindset and propensity for innovation but also address the practicalities of organisational management, financial planning, and other aspects involved in starting and growing a business (Raudsaar/Kaseorg 2016). Most importantly, entrepreneurship education must integrate practical elements rooted in entrepreneurial experiences (Kremel/Wetter-Edman 2019). This entails creating a learning environment where students are immersed in a wide range of entrepreneurial activities, gaining a genuine understanding of the challenges and opportunities that may arise in real-life scenarios (De Carolis/Litzky 2019; Xiaoxing 2020). Such a comprehensive approach bridges the gap between theory and practice, enabling students to navigate the complexities of the entrepreneurial landscape with con-

fidence and competence (Kremel/Wetter-Edman 2019). Although entrepreneurship has traditionally been associated with small business initiation (including visionary spinout companies) and the expansion of small enterprises (Yıldırım/Aşkun 2012), academic institutions are increasingly shifting toward other entrepreneurship types.

The wide variety of forms that entrepreneurship education may take is also reflected in the diversity of studies on this topic. As shown in Table 1, Shabbir et al. (2022) conducted bibliometric analysis using VOSviewer and Scopus database, providing valuable insights into the utility of this approach in enhancing research in this field. Inspired by their work, bibliometric analysis supported by Bibliometrix and the Web of Science database was adopted as a research methodology for the present study. Similarly, drawing upon the typology proposed by Sirelkhatim and Gangi (2015), who categorised entrepreneurship learning into three types—learning about, for, and through entrepreneurship—a type-oriented approach was utilised to provide a detailed overview of various entrepreneurship models and their applications. As a part of their recent qualitative study, Jardim and Sousa (2023) analysed ten influential articles on entrepreneurship education, highlighting its importance for academic success as well as career prospects in the digital era, thus justifying the need for the research presented here.

Given the variety of factors that influence the success of any educational framework, identifying the most effective entrepreneurship education model is challenging, as this necessitates consensus on not only what entrepreneurship education entails but also how its outcomes are measured. Thus, rather than attempting to address this issue, the aim of this study is to provide a holistic overview of the currently utilised entrepreneurship education models. Its novelty lies in the unique approach for scrutinising the existing models and emphasising their practical implications for students.

Table 1 Overview of selected articles with corresponding insights

Type of analysis	Number of examined articles	Key findings	Future research paths	Literature source
Quantitative Bibliometric analysis (bibliographic coupling, keyword co-occurrence, distance-based mapping, clustering, and co-citation analysis)	1,531 articles published between 1950 and 2021	Research trends: Over the past 15 years, research focus has shifted from conventional approaches to entrepreneurship education towards more nuanced and outcome-oriented factors such as intentions, motivation, attitude, and behaviour. Hot topics: Entrepreneurial intentions emerged as the predominant research topic, closely followed by practice, innovation, and entrepreneurial learning.	Scrutinising entrepreneurial intentions in general (Ruiz-Alba/Guzman-Parra/Vila Oblitas/Morales Mediano 2021) and focusing on undergraduates' entrepreneurial ambitions (Tingting/Jiangfeng/Yinghua 2022).	Shabbir et al. (2022)
Qualitative Systematic literature review (six phases)	129 articles categorised into two groups: 32 considering entrepreneurial learning (EL) and 97 focusing on entrepreneurship education (EE)	EL: Entrepreneurial competencies include creative problem-solving, opportunity recognition and assessment, risk management, value creation, and leveraging social connections. These competencies are developed through learning by doing, learning from failure, case studies, real projects, role-playing, scenarios, and discussions. EE: Three main EE goals are identified – raising awareness *about* entrepreneurship, *for* entrepreneurship (awakening students' intentions to become entrepreneurs in the future), and *through* entrepreneurship (suggesting learning "with" and "through" real-life entrepreneurship to enable students to experience "being" entrepreneurs).	Analysing the role of EL and EE by comparing online and blended entrepreneurship education (Chen/Ifenthaler/Yau 2021) and drawing parallels with learning from failure (Lattacher/Wdowiak 2020).	Sirelkhatim and Gangi (2015)
Qualitative Detailed overview of ten articles published in a selected special issue on entrepreneurship education	Ten articles	Considerations for the future: Adequate entrepreneurship education should equip students for the modern workforce. Novel learning methodologies: Students consider problem-based learning crucial for their progression through university courses.	Additional detailed analysis of articles considering the impact of EE on the rise of several firms established by students (Breznitz/Zhang 2022).	Jardim and Sousa (2023)

III. Research methodology

The research methodology adopted for this study consists of a bibliometric metadata analysis followed by a systematic literature review.

A. Bibliometric analysis

The Web of Science database was chosen for metadata analysis due to its recognised integrity and reliability (Birkle/Pendlebury/Schnell/Adams 2020; Dabić/Marzi/Vlačić/Daim/Vanhaverbeke 2021). Using the phrase "models of entrepreneurship education for students" and the "All Fields" option, comprehensive searches across all searchable fields with a single query were conducted on August 18th 2023, yielding 3,291 articles.

To facilitate the analysis of such a large corpus of papers, Bibliometrix was adopted, as this software incorporates various essential bibliometric analysis methods and is commonly used in quantitative scientometric and bibliometric research (Aria/Cuccurullo 2017). Specifically, the Biblioshiny application was utilised due to its user-friendly interface (Aria/Cuccurullo 2017). The key metadata pertaining to the analysed 3,291 articles is provided in Figure 1.

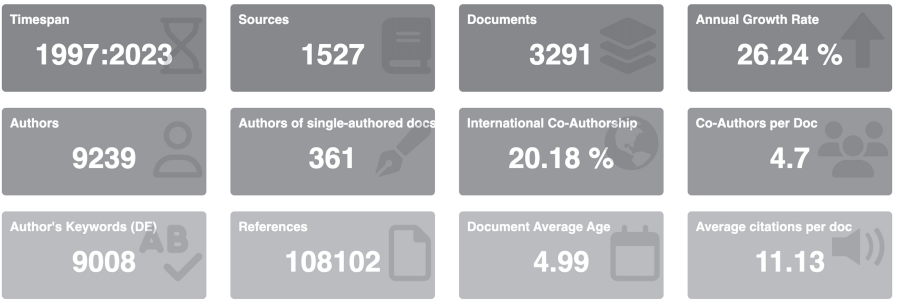


Figure 1 The key characteristics of the articles included in bibliometric metadata analysis

As can be seen from Figure 1, in the 1997–2023 period chosen for the analysis, the number of publications pertaining to entrepreneurship education models increased at an annual rate of 26.24 %. However, significant growth began in 2012 and peaked in 2022 with 607 papers (Figure 2), indicating that this is a rapidly expanding research field.

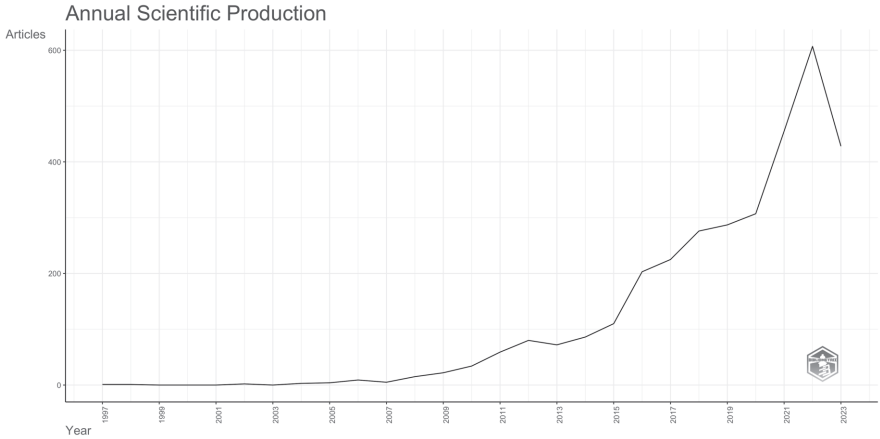


Figure 2 Annual scientific production

As shown in Figure 3, the most frequently used words in these publications are "education" (532 occurrences), "impact" (414), and "model" (400).

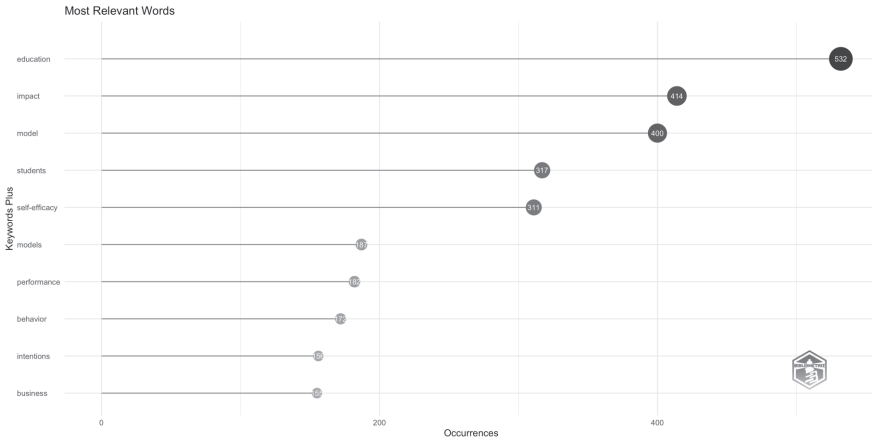


Figure 3 Most frequently featured words

The collaborative country map depicted in Figure 4 illustrates the participation of different nations in joint entrepreneurship education endeavours driven by the scientific community.

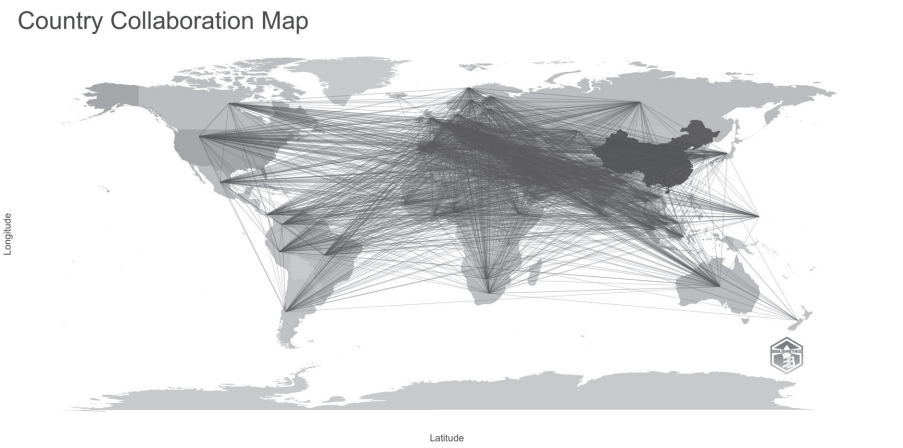


Figure 4 Country collaboration map

Table 2 presents an overview of publications resulting from collaborations between researchers from Central and Eastern European countries.

Table 2 Number of publications resulting from research collaborations involving Central and Eastern European countries

Participating countries	Number of publications
Estonia and Poland	9
Ukraine and Poland	5
Romania and Poland	5
Czech Republic and Romania	5
Czech Republic and Poland	4
Hungary and Romania	4
Hungary and Czech Republic	3
Lithuania and Latvia	2

B. Systematic literature review

The systematic literature review comprised the identification, screening, eligibility, and inclusion phases, as recommended by Xiao and Watson (2019) and depicted in Figure 5.

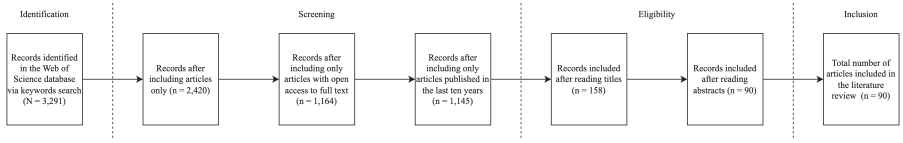


Figure 5 Systematic literature review flow (Xiao/Watson 2019)

During the screening phase, papers featured in conference proceedings, meeting abstracts, book reviews, and similar documents were excluded, thus reducing the initial pool of 3,291 articles to 2,420. Next, by eliminating articles that could not be accessed in full, the sample was reduced further to 1,164. Finally, by restricting the focus on the papers published in the last ten years, 1,145 remained. This set was further narrowed down to 158 by reading the titles and subsequently to 90 by evaluating the abstracts. Only 21 of these articles described one or more entrepreneurship learning models, resulting in 25 models that were subjected to further scrutiny.

Guided by the classification adopted by Hasan et al. (2017), Panfilova et al. (2019), and Boldureanu et al. (2020), the following types of entrepreneurship education were identified: generalised, motivational, augmented, and training. According to Hasan et al. (2017), generalised entrepreneurship education aims to provide the theoretical knowledge students can rely upon as they transition into real-life opportunities. On the other hand, motivational entrepreneurship education focuses on promoting the self-determination and self-confidence needed to create and lead an enterprise (Hasan et al. 2017). The aim of augmented entrepreneurship education is to simulate business practices, allowing students to develop and maintain sophisticated entrepreneurial skills (Hasan et al. 2017; Panfilova et al. 2019; Boldureanu et al. 2020). While a similar approach is taken by the training-based models based on real projects, they are typically implemented within academic institutions, whereas augmented education may be provided by other stakeholders with expertise in business or a specific industry sector (Hasan et al. 2017; Panfilova et al. 2019; Boldureanu et al. 2020). Table A (presented in the Appendix) provides an overview of the 25 models described in the 21 reviewed articles, categorised into one of the aforementioned types of entrepreneurship education. Where available, the number of study participants is included, along with the study programmes into which the models are incorporated and the key findings.

IV. Discussion and conclusion

As can be seen from Table A presented in the Appendix, 11 of the described models belong to the generalised type of entrepreneurship education, while eight pertain to the augmented, four to the training, and two to the motivational category. However, two of the generalised models pivot towards the practical application of holistic entrepreneurship learning. One of these models suggests replacing the traditional undergraduate thesis with start-up programme management (Liu/Galichkina/Kurilova/Vlasova 2021), while the other proposes online learning that connects universities, government, and industry (Tóth-Pajor/Bedő/Csapi 2023).

Analyses further revealed that the emphasis on innovation is the key focal point of both generalised and augmented models. Whether promoted through

studio-based projects, game theory applications, simulations, or virtual reality experiences, innovation stands out as a consistent objective of education aimed at fostering entrepreneurial skills. Several models are developed from a global perspective, exemplified by initiatives like the Network of multidisciplinary ideation and business model generation (NETMIB) incubation platform. This international orientation prioritises collaboration among universities from different parts of the world with the goal of addressing the common socioeconomic challenges on a global scale (Tóth-Pajor et al. 2023). Moreover, most augmented models emphasise the benefits of integrating technology such as virtual reality, computer-assisted instruction (CAI), and gamification into the curriculum to enrich the learning experience and create a dynamic and engaging educational environment for students. Oe and Tanaka (2023) also advocate for the inclusion of business-oriented activities, such as SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis, to complement materials based on the social learning theory.

Training models expose students to various ways of founding and organising start-ups, helping them learn the practical aspects of establishing and running entrepreneurial ventures. There are numerous examples of such initiatives, including LearnFab—a company run by students who are in charge of managerial and operational activities—which led to the creation of six start-ups (Fischer/Rosilius/Schmitt/Bräutigam 2021). Gruendungsgarage, another start-up accelerator programme, has brought 130 new jobs to the economy (Glinik 2019). Motivational models are particularly effective in enhancing student motivation as they often include gamified entrepreneurship courses and promote engagement of alumni entrepreneurs in start-up initiatives.

Some of the models described in the reviewed articles are geared toward specific learning outcomes. For instance, the NETMIB incubation platform aims to elevate participants' self-esteem, whereas the CAI model is designed to enhance entrepreneurial interest, skills, and knowledge among musical talents. The level of learning process interactivity also varies, whereby models such as the hackathon and the Virtual Reality-Interactive Learning Model (VR-ILM)-based Smart Space focus on hands-on, interactive experiences, while others often rely on a more conventional lecture-based approach.

Evidence of the significant impact of specific entrepreneurship models on students' skills and intentions supports theories correlating entrepreneurship education and entrepreneurial success. The innovative practices featured in these models also align with the theories advocating experimental and interactive learning methods. Their practical application in different fields of study—including business, economics, engineering, technology, medicine, agriculture, journalism, art, and other domains—highlights the versatility of entrepreneurship education. Many of these models also emphasise the importance of the learning experience. For

example, VR-ILM-based Smart Space incorporating virtual reality and computer-supported systems was shown to increase employment in the real estate services sector by 43 % (Pan 2022), while the CAI model increased students' entrepreneurial interest, skills, and knowledge by 55.62 %, 57.32 %, and 72.12 %, respectively (Cao 2022). Some models include policymakers among the influential factors, as their decisions determine whether entrepreneurship education will be offered as a part of the curriculum and at which levels. They are also responsible for encouraging practical learning experiences like live case studies and hackathons. A brief overview of the aforementioned implications is given in Table 3.

Table 3 Theoretical, practical, and policy implications of the study findings

Theoretical implications	Practical implications	Policy implications
Entrepreneurship education types (generalised, augmented, motivational, and training) provide a diverse theoretical framework for analysing educational outcomes.	Different models are applied across diverse fields (business, engineering, medicine, and others), highlighting their versatility.	Policymakers are encouraged to integrate entrepreneurship education at all levels, focusing on practical experiences like case studies and hackathons.
Applied models significantly impact students' skills and intentions, supporting the theoretically postulated correlation between education and success.	Learning is enhanced through virtual reality and computer-supported systems.	NETMIB incubator platform exemplifies global collaboration in entrepreneurship education and problem-solving initiatives.
Innovative practices align with theories promoting experimental and interactive learning.	VR-ILM-based Smart Space increased employment by 43 % (Pan 2022) and the CAI model enhanced participants' skills/knowledge by over 55 % (Cao 2022).	

V. Limitations and future directions

The limitations of this study primarily stem from the research methodology and the restrictions imposed on the publication language when conducting database searches. First, as only the Web of Science database—which is one of many relevant databases available—was consulted, this narrowed the research scope. Additionally, a single keyword combination was chosen to obtain a broad range of articles, but other sources could have been potentially uncovered if other combinations were explored.

It is also important to note that the chosen query encompassed "All Fields", which can sometimes result in less precise outcomes due to searching across all metadata. The inclusion of open access papers published in languages familiar to the authors further reduced the range of articles available for review.

These limitations, however, also offer opportunities for future research in this field, as exploring a larger number of databases and using new keyword combinations would facilitate a more comprehensive analysis. The obtained findings

can also be supplemented by qualitative studies involving expert interviews or focus group discussions with relevant stakeholders.

References

Aria, M./Cuccurullo, C. (2017): Bibliometrix: An R-tool for comprehensive science mapping analysis, in: Journal of Informetrics, 11, 4, 959–975.

binti Ibrahim, I. I./bin Mohd Razali, M. F./binti Shekh, R./Zain, M. N. B. M. N./binti Ismail, I./binti Ya, S. (2021): The essential of entrepreneurship inclination in higher learning institution (HLI), in: International Journal of Academic Research in Business and Social Sciences, 1, 7, 1677–1686.

Birkle, C./Pendlebury, D. A./Schnell, J./Adams, J. (2020): Web of Science as a data source for research on scientific and scholarly activity, in: Quantitative Science Studies, 1, 1, 363–376.

Boldureanu, G./Ionescu, A. M./Bercu, A. M./Bedrule-Grigoruță, M. V./Boldureanu, D. (2020): Entrepreneurship education through successful entrepreneurial models in higher education institutions, in: Sustainability, 12, 3, 1267.

Breznitz, S. M./Zhang, Q. (2022): Entrepreneurship education and firm creation, in: Regional Studies, 56, 6, 940–955.

Cao, H. (2022): Entrepreneurship education-infiltrated computer-aided instruction system for college Music Majors using convolutional neural network, in: Frontiers in Psychology, 13, 900195.

Čekić-Marković, J. (2015): Entrepreneurial Education: Comparative overview of educational policies, models and practices, in: Social Inclusion and Poverty Reduction Team, Government of the Republic of Serbia.

Chen, C. (2022): Research on Structuring a "Student-Centered" Training Model of Innovative and Entrepreneurial Graduates in Colleges and Universities, in: Scientific Programming, 2022, 1, 9003869.

Chen, L./Ifenthaler, D./Yau, J. Y. K. (2021): Online and blended entrepreneurship education: a systematic review of applied educational technologies, in: Entrepreneurship Education, 4, 2, 191–232.

Christensen, B. T./Arendt, K. M./Hjorth, D. (2023): How learning spaces matter in entrepreneurship education: introducing the concept of topopraxis, in: Entrepreneurship & Regional Development, 35, 3–4, 317–336.

Colombelli, A./Loccisano, S./Panelli, A./Pennisi, O. A. M./Serraino, F. (2022): Entrepreneurship education: the effects of challenge-based learning on the entrepreneurial mindset of university students, in: Administrative Sciences, 12, 1, 10.

Cotoi, E./Bodoasca, T./Catana, L./Cotoi, I. (2011): Entrepreneurship European development strategy in the field of education, in: Procedia-Social and Behavioral Sciences, 15, 3490–3494.

Dabić, M./Marzi, G./Vlačić, B./Daim, T. U./Vanhaverbeke, W. (2021): 40 years of excellence: an overview of Technovation and a roadmap for future research, in: Technovation, 106, 102303.

De Carolis, D. M./Litzky, B. E. (2019): Unleashing the potential of university entrepreneurship education: A mandate for a broader perspective, in: New England Journal of Entrepreneurship, 22, 1, 58–66.

Dorji, T. (2021): Content Analysis of Entrepreneurship Education in Primary and Secondary School Textbooks, in: Research in Educational Policy and Management, 3, 1, 42–59.

Fischer, S./Rosilius, M./Schmitt, J./Bräutigam, V. (2021): A brief review of our agile teaching formats in entrepreneurship education, in: Sustainability, 14, 1, 251.

Glinik, M. (2019): Gruendungsgarage: A Best-Practice Example of an Academic Start-up Accelerator, in: International Journal of Engineering Pedagogy, 9, 3, 33–43.

Gundry, L. K./Ofstein, L. F./Kickul, J. R. (2014): Seeing around corners: How creativity skills in entrepreneurship education influence innovation in business, in: The International Journal of Management Education, 12, 3, 529–538.

Hanandeh, R./Alnajdawi, S. M. A./Almansour, A./Elrehail, H. (2021): The impact of entrepreneurship education on innovative start-up intention: the mediating role of entrepreneurial mind-sets, in: World Journal of Entrepreneurship, Management and Sustainable Development, 17, 4, 856–871.

Hasan, S. M./Khan, E. A./Nabi, M. N. U. (2017): Entrepreneurial education at university level and entrepreneurship development, in: Education + Training, 59, 7–8, 888–906.

Hasche, N./Linton, G. (2021): University–industry collaboration: constructing a business model lab for student venture creation, in: International Journal of Entrepreneurial Behavior & Research, 27, 5, 1241–1263.

He, Z./Liu, Y./Wang, X./Li, R./Lv, N. (2023): Gamified Entrepreneurship Courses Motivate College Students' Satisfaction: An Integrated Flow Framework, in: SAGE Open, 13, 2, 21582440231177029.

Hiiemäe-Metsar, K./Raudsaar, M./Uibu, K. (2021): Development of entrepreneurial literacy in upper secondary school with Junior Achievement tasks, in: Eesti Haridusteaduste Ajakiri, Estonian Journal of Education, 9, 2, 184–211.

Huang, Y./Bu, Y./Liu, L./Xu, D./Xu, Z./Zhao, G. (2022): Relationship between entrepreneurship education curriculum and agricultural students' satisfaction in China, in: Frontiers in Psychology, 13, 884565.

Jackson, A./Henry, S./Jackman, K. M./Jones, L./Kamangar, F./Koissi, N./Hohmann, C. F. (2023): A Student-Centered, Entrepreneurship Development (ASCEND) Undergraduate Summer Research Program: Foundational Training for Health Research, in: CBE—Life Sciences Education, 22, 1, ar13.

Jardim, J./Sousa, M. J. (2023): Research and Trends in Entrepreneurship Education, in: Education Sciences, 13, 7, 673.

João Rodrigues, M. (2006): The Lisbon Strategy after the mid-term review: implications for innovation and life-long learning, in: Corporate Governance: The International Journal of Business in Society, 6, 4, 349–357.

Klucznik-Törő, A. (2021): The new progression model of entrepreneurial education – guideline for the development of an entrepreneurial university with a sustainability approach, in: Sustainability, 13, 20, 11243.

Kremel, A./Wetter-Edman, K. (2019): Implementing design thinking as didactic method in entrepreneurship education. The importance of through, in: The Design Journal, 22, 1, 163–175.

Krpalek, P./Krpálková Krelová, K./Berková, K. (2018): Entrepreneurship in relation to contemporary concepts of education, in: Marketing and Management of Innovations, 2, 11–22.

Lapčević, Z. D. (2017): Entrepreneurship in the subject of technical and informatical education teaching, in: Veljović, A. Proceedings of the second national conference with international participation entitled "Information Technologies, Education and Entrepreneurship 2017 – ITOP17" Technical Faculty Čačak, University of Kragujevac, 475–4841, 978–86–7776–211–7.

Lattacher, W./Wdowiak, M. A. (2020): Entrepreneurial learning from failure. A systematic review, in: International Journal of Entrepreneurial Behavior & Research, 26, 5, 1093–1131.

Lee, Y./Lee, Y. H. (2020): University start-ups: The relationship between faculty start-ups and student start-ups, in: Sustainability, 12, 21, 9015.

Liu, Z. J./Galichkina, M./Kurilova, A./Vlasova, S. (2021): "Start-Up" in E-Learning Mode as a Basic Project of the Final Year of Entrepreneurship Education, in: International Journal of Emerging Technologies in Learning (iJET), 16, 4, 82–94.

Loboda, V./Ostrovskyi, I./Katernyak, I. (2019): Developing Entrepreneurial Mindset in University Undergraduates, in: E-Methodology, 5, 5, 114–131.

Long, Z./Zhao, G./Wang, J./Zhang, M./Zhou, S./Zhang, L./Huang, Z. (2021): Research on the Drivers of Entrepreneurship Education Performance of Medical Students in the Digital Age, in: Frontiers of Psychology, 12, 733301.

Loogma, K./Peterson, B./Rekkor, S. (2021): The implementation of entrepreneurship education in Estonian vocational education, in: Eesti Haridusteaduste Ajakiri, Estonian Journal of Education, 9, 1, 88–116.

Ncanywa, T./Dyantyi, N. (2022): The Role of Entrepreneurship Education in Higher Education Institutions, in: E-Journal of Humanities, Arts and Social Sciences 3, 11, 75–89.

Oe, H./Tanaka, C. (2023): Qualitative Evaluation of Scaffolded Teaching Materials in Business Analysis Classes: How to Support the Learning Process of Young Entrepreneurs, in: Education Sciences, 13, 3, 311.

Pan, Y. (2022): Designing Smart Space Services by Virtual Reality-Interactive Learning Model on College Entrepreneurship Education, in: Frontiers in Psychology, 13, 913277.

Panfilova, E. E./Demkina, O. V./Galichkina, M. A./Istomina, A. I./Latysheva, V. V./Teymurova, V. E. (2019): Learning models based on a real project in entrepreneurial education, in: Journal of Entrepreneurship Education, 22, 2, 1–12.

Pantea, M. C. (2018): Employment-to-Entrepreneurship Interface in the Context of Tech Innovation: A Qualitative Analysis in Romania, in: JEEMS Journal of East European Management Studies, 23, 1, 128–146.

Rajchamaha, K./Prapojanasomboon, J. (2022): Influence of role models on the entrepreneurial skills of science and technology undergraduates, in: Education + Training, 64, 7, 981–995.

Rakićević, Z./Rakićević, J./Anđelković Labrović, J./Ljamić-Ivanović, B. (2022): How Entrepreneurial Education and Environment Affect Entrepreneurial Readiness of STEM and Business Students? A Longitudinal Study, in: Engineering Economics, 33, 4, 414–432.

Raudsaar, M./Kaseorg, M. (2016): Development of Entrepreneurship Education in Estonian Universities: Case of University of Tartu, in: European Proceedings of Social and Behavioural Sciences, 828–837.

Ruiz-Alba, J. L./Guzman-Parra, V. F./Vila Oblitas, J. R./Morales Mediano, J. (2021): Entrepreneurial intentions: a bibliometric analysis, in: Journal of Small Business and Enterprise Development, 28, 1, 121–133.

Shabbir, M./Batool, F./Mahmood, A. (2022): Trends in entrepreneurship education: a systematic literature review, in: Higher Education, Skills and Work-Based Learning, 12, 6, 1040–1056.

Sirelkhatim, F./Gangi, Y. (2015): Entrepreneurship education: A systematic literature review of curricula contents and teaching methods, in: Cogent Business & Management, 2, 1, 1052034.

Sörensson, A./Bogren, M. (2020): Organizing an entrepreneurial learning programme: The role of people, process and place, in: Industry and Higher Education, 34, 1, 13–23.

Szymanska, I./Sesti, T./Motley, H./Puia, G. (2020): The effects of hackathons on the entrepreneurial skillset and perceived self-efficacy as factors shaping entrepreneurial intentions, in: Administrative Sciences, 10, 3, 73.

Tiberius, V./Weyland, M. (2023): Entrepreneurship education or entrepreneurship education? A bibliometric analysis, in: Journal of Further and Higher Education, 47, 1, 134–149.

Tingting, G./Jiangfeng, Y./Yinghua, Y. (2022): A bibliometric analysis of college students' entrepreneurial intention from 2000 to 2020: Research trends and hotspots, in: Frontiers in Psychology, 13, 865629.

Tóth-Pajor, Á./Bedő, Z./Csapi, V. (2023): Digitalization in entrepreneurship education and its effect on entrepreneurial capacity building, in: Cogent Business & Management, 10, 2, 2210891.

Vivekananth, S./Indiran, L./Kohar, U. H. A. (2023): The Influence of Entrepreneurship Education on University Students' Entrepreneurship Self-Efficacy and Entrepreneurial Intention, in: Journal of Technical Education and Training, 15, 4, 129–142.

Xiao, Y./Watson, M. (2019): Guidance on conducting a systematic literature review, in: Journal of Planning Education and Research, 39, 1, 93–112.

Xiaoxing, Q. (2020): Research on Innovation and Entrepreneurship Education, in: Higher Education Research, 9, 2, 209–213.

Yang, Q./Zhang, Y./Lin, Y. (2022): Study on the Influence Mechanism of Virtual Simulation Game Learning Experience on Student Engagement and Entrepreneurial Skill Development, in: Frontiers in Psychology, 12, 772157.

Yener, S./Arslan, A./Demirtaş, Ö. (2018): The mediating role of temperament and character on the relationship between mindfulness and entrepreneurial personality, in: Journal of East European Management Studies, 23, 3, 404–425.

Yıldırım, N./Aşkun, O. B. (2012): Entrepreneurship Intentions of Public Universities in Turkey: Going Beyond Education and Research, in: Procedia – Social and Behavioral Sciences, 58, 953–963.

Zeng, M./Zheng, Y./Tian, Y./Jebbouri, A. (2022): Rural E-Commerce Entrepreneurship Education in Higher Education Institutions: Model Construction via Empirical Analysis, in: Sustainability, 14, 17, 10854.

Zhu, H./Wang, Q. (2022): The development dilemma and path choice of innovation and entrepreneurship education based on game theory, in: Advances in Multimedia, 2022, 1, 2232253.

VII. Appendix

Table A An overview of analysed entrepreneurship education models

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Generalised	Programme A is based on studio work, focusing on business creation and management driven by innovation and organisational adjustments. Mandatory courses are held in purposely designed business studios on campus.	80	In team-based entrepreneurship education, a conceptual model of topo-praxis types is constructed based on the spatial aspects of social interactions.	Business	Christensen et al. (2023)
Generalised	Programme B is identical to Programme A described above but with a 50:50 student ratio in terms of background (business versus art).	50		Business and Art	Christensen et al. (2023)
Generalised	Integrated model – Education about, for, and through entrepreneurship.	Not specified	The authors advocate for the incorporation of sustainability components in new progression models for university entrepreneurship education.	Universal	Klucznik-Törő (2021)
Generalised	The Network of multidisciplinary ideation and business model generation (NETMIB) incubation platform is a diverse and global online environment that combines incubation programmes offered by higher education institutions (HEIs) in different countries. Guided by the Triple Helix model, the primary goal of this initiative is facilitating collaboration among the public, private, and governmental sectors in order to support individuals in launching new ventures, ultimately contributing to socioeconomic growth. NETMIB also addresses current socioeconomic challenges by encouraging students to generate relevant business ideas.	291	At the end of the study, members of the online incubation platform reported improvements in self-esteem relative to the levels at registration.	Universal	Tóth-Pajor et al. (2023)

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Generalised	Game theory is applied to analyse and enhance innovation and entrepreneurship education (IEE) in colleges and universities, as well as to elucidate the dynamics among government, universities, and students engaged in the IEE process. One model explains the external interactions between universities and students and the internal dynamics among students. Another model explores the strategies employed by various stakeholders to maximise their benefits and the resulting impacts on these stakeholders.	Not specified	The key innovation and entrepreneurship education challenges are identified, including inadequate management systems, insufficient resources, curriculum design issues, suboptimal talent development, unqualified educators, and cognitive dislocation. Recommendations include improving teaching conditions and providing government support for IEE.	Universal	Zhu and Wang (2022)
Generalised	Since the first use of simulation games in education in 1957, this approach has been widely used, with a notable upsurge in its acceptance in the last four decades. This trend coincided with the growing popularity of personal computers (PCs), allowing computer simulation games to be incorporated into management courses.	177	Game elements such as 'goal and feedback' and 'selectivity' did not impact student engagement but positively affected entrepreneurial skill development.	Business	Yang et al. (2022)
Generalised	Foley's model—focusing on process, people, and place—is applied to entrepreneurial learning. These three categories converge into an innovative process that results in a creative profile, leading to specific outcomes.	Not specified	While people are recognised as the central factor in entrepreneurial learning, certain adjustments to the model are needed to optimise it for students.	Universal	Sörensson and Bogren (2020)
Generalised	Model focusing on the steps involved in implementing start-up projects as an alternative to traditional graduation thesis. This approach promotes better comprehension of the taught material, preparing students for running online and offline businesses.	Not specified	The authors propose a final-year entrepreneurship education model based on e-learning, consisting of three key components: students as idea generators, mentors as essential support, and online channels as primary information sources.	Economics, Management, Engineering, Journalism, and others	Liu et al. (2021)
Generalised	As a new approach to higher education in China, student-centred innovation and entrepreneurship education model emphasises student development and learning effects. It also addresses issues like content integration, convergence, and teacher quality.	Not specified	This student-centred educational model requires a shift in teaching and evaluation methods to focus on student learning.	Universal	Chen (2022)
Generalised	A student-centred evaluation model for rural e-commerce entrepreneurship education at universities integrated with professional education.	Not specified	Educational support and feedback effectiveness indicators received relatively high scores, while lower scores were associated with indicators related to learning input and educational process.	Universal	Zeng et al. (2022)

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Generalised	Model based on the social learning theory (which postulates that learning is enhanced through sharing and reflection) developed using a semi-structured questionnaire and scaffolding materials in entrepreneurship education.	24	Scaffolding materials helped participants understand conceptual models, thus stimulating deeper content understanding and more dynamic class discussions. Accordingly, social learning theory is suggested as a useful framework for entrepreneurship education.	Universal	Oe and Tanaka (2023)
Augmented	Virtual Reality-Interactive Learning Model (VR-ILM) implemented as a Smart Space serves as a multi-user interactive learning environment that promotes the development of unique cognitive skills. The risk of anxiety and self-consciousness associated with limited interaction opportunities is reduced through immersive learning experiences, engaging entrepreneurial activities, and meaningful socialisation within the virtual environment. Students can revisit course content as well as engage in real-time interactions with teachers.	Not specified	The programme has significantly impacted employment in various industries, generating 43 % additional jobs in the real estate services sector.	Mining and Technology	Pan (2022)
Augmented	Computer-Assisted Instruction (CAI) model incorporating IEE was proposed to enhance the quality and efficacy of music education by fostering creativity among music talents. In addition to adopting a multidisciplinary approach to fostering relationships among educators, students, and teaching methods, CAI relies on multimedia and technology, making learning more engaging and interactive.	Not specified	The proposed CAI model increased students' entrepreneurial interest, skills, and knowledge by 55.62 %, 57.32 %, and 72.12 %, respectively.	Music	Cao (2022)
Augmented	Hackathon is proposed as a new entrepreneurship education model. At the beginning of the workshop, each team receives a packet containing the assignment, simulation materials, and an agenda for the day. Students are then introduced to the Business Model Canvas (BMC), a strategic template for business model development. Pre- and post-workshop surveys focusing on entrepreneurial knowledge and self-efficacy are used to assess program success, while emphasising creativity and teamwork when judging the proposed start-up models.	Not specified	Learning outcomes from the hackathon were not influenced by class standing, prior entrepreneurial knowledge, or gender. However, hackathon participants experienced significant increases in entrepreneurial self-efficacy compared to the baseline as well as their peers taught in traditional class settings.	Accounting, Economics, Management, and Marketing	Szymanska et al. (2020)

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Augmented	Danish-based model focusing on processes that generate value through entrepreneurship and innovation.	Not specified	The authors highlight the importance of incorporating sustainability components in new progression models for university entrepreneurship education.	Universal	Klucznik-Törő (2021)
Augmented	A 3P (presage–process–product) college learning model incorporating students' individual characteristics, learning experience, and learning methods (considered a process variable), as well as performance and gains (as the outcome variable). The interaction among the three Ps forms a dynamic system.	177	Teamwork experience and general self-efficacy positively impacted student engagement and entrepreneurial skill development.	Universal	Yang et al. (2022)
Augmented	A business model lab allowing students to test new venture ideas and business models in the electric utility industry. The four participating companies expected to incorporate new models into their businesses by learning from students and gaining valuable insights into future customer preferences.	Not specified	The authors recognised various types of tensions due to the inherent difficulties in managing student venture creation within a co-curricular setting.	Universal	Hasche and Linton (2021)
Augmented	An innovative approach to involving African and minoritised students in the scientific workforce, using a Summer Research Institute (SRI) as an entry point into a multiyear National Institutes of Health Building Infrastructure Leading to Diversity (NIH BUILD)-funded research training programme.	Not specified	The authors noted increases in students' science self-efficacy and science identity after participation in the SRI training programme.	Science, Technology, Engineering, and Mathematics (STEM) and Social Behavioural Science	Jackson et al. (2023)
Augmented	Entrepreneurship practice with on- and off-campus mentors.	24,677	Factors such as entrepreneurship courses, faculty involvement, competition, practice opportunities, and policy drive the entrepreneurship education performance of medical students.	Medicine	Long et al. (2021)
	Entrepreneurship practice supported by a dedicated start-up fund.				
	An integrated entrepreneurship practice service offered by the school.				
	An independent college students' pioneer park for entrepreneurship practice.				
	Dedicated off-campus practice base for entrepreneurship practice.				
	High degree of integration of practical entrepreneurship projects with professional studies.				

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Training	A limited liability company "LearnFab" formed and managed by students in the first phase of model implementation was subsequently subjected to case study analysis. Students worked in groups with 7–12 members, while allowing others to join. The second phase entailed creating a curriculum for the general elective subject.	7–12	The educational project led to the creation of six student start-ups. All participants reported increased professional, cooperation, and personal competencies due to the involvement in project activities.	Business and Engineering	Fischer et al. (2021)
Training	British-based model involving start-up process simulation.	Not specified	The study findings underscore the value of incorporating sustainability components in new progression models for university entrepreneurship education.	Universal	Klucznik-Törő (2021)
Training	Model based on the premise that start-ups are conducive to organisational growth, technological development, product innovation, and expansion into new markets. In the academic context, faculty-led start-ups are utilised to commercialise technologies developed within universities as an alternative to patents and technology transfers. Conversely, student-founded start-ups emerge due to the practical application of entrepreneurship education in identifying and capitalising on new opportunities.	Not specified	Faculty labour costs and government research funds influence the success of faculty-led start-ups. University-affiliated start-ups have the potential to generate financial returns for research and development investments. By establishing collaborative partnerships with industries, these start-ups also play a crucial role in job creation and thus contribute to the economic growth of local communities.	Medicine and Engineering	Lee and Lee (2020)
Training	The "Gruendungsgarage" entrepreneurship initiative was established by the University of Graz (KFU) and the Graz University of Technology (TUG) faculty as an interdisciplinary and inter-university elective course. Initially, students worked on their real business concepts while receiving guidance from university experts and experienced industry professionals. Due to its popularity and continuous refinement, Gruendungsgarage evolved into a full-fledged academic start-up accelerator programme.	205	The Gruendungsgarage has been effective in encouraging diversity among start-up entrepreneurs. It currently serves as a successful global model that enables students and academic staff to rapidly transform their business ideas into marketable products or services. After taking part in the programme, numerous teams launched businesses, many of which are still in existence. To date, the programme has also generated over 130 jobs.	Technology	Glinik (2019)
Motivational	Model based on the engagement of alumni members from the industry in the entrepreneurship education.	1,223	Both faculty and students recognised the knowledge transfer by the industry specialists as instrumental in the programme's success.	Agricultural	Huang et al. (2022)

EE[1] type	Short model description	Number of participants	Key findings	Field(s) of study	Literature source
Motivational	Model based on gamified entrepreneurship courses with the aim of enhancing the effectiveness of college-level entrepreneurship teaching via interactive and immersive learning experiences.	205	The course satisfaction is influenced by the degree of alignment between course content and participants' competencies, autonomy, and relatedness needs, in line with the self-determination theory (SDT).	Technology	He et al. (2023)

[1] Entrepreneurship Education.

Roadmap for Competency Development in Entrepreneurship Education: An Action Research*

*Milica Jovanović, Jelena Anđelković Labrović, Ivana Kužet, Jasna Petković***

Abstract

The paper outlines a multidisciplinary approach to entrepreneurial education by providing a framework for the development of entrepreneurial competencies in higher education. It entails devising a roadmap for the development of soft and technical skills of an entrepreneur using technology entrepreneurship and human resource management tools. The approach was designed and tested through action research, in two cycles, with two generations of students at an Eastern European university. The results imply that the framework provides insights for curriculum enhancements and that the model successfully fosters creativity, idea validation, and teamwork. The model can be applied beyond business education in diverse educational domains.

Keywords: entrepreneurial education, entrepreneurial competencies, human resource management, technology entrepreneurship, lean startup, team canvas
JEL Codes: I23, L26, O15

1. Introduction

Human resource management (HRM) is becoming increasingly important for creating a sustainable organization and offers great potential for developing entrepreneurial mindset and competencies (Castrogiovanni/Urbano/Loras 2011). Entrepreneurial mindset is an important concept in entrepreneurship and entrepreneurial education and refers to a specific way of thinking, acting, and feeling entrepreneurial opportunities and challenges (Kuratko/Fisher/Audretsch 2021). Rauch and Hulsink (2015) highlight that an entrepreneurial mindset goes beyond starting a business, but also encompasses a set of attitudes and behaviours that can be cultivated and applied in various contexts. Daspit et

* Received: 23.2.24, accepted: 3.9.24, 1 revision.

** *Milica Jovanović*, Ph.D., Assistant Professor, University of Belgrade – Faculty of Organizational Sciences. Email: milica.jovanovic@fon.bg.ac.rs. Main research interests: technology management, technology entrepreneurship, technology transfer, Triple Helix model, performance measurement
Jelena Anđelković Labrović, Ph.D., Associate Professor, University of Belgrade – Faculty of Organizational Sciences. Email: jelena.andjelkovic.labrovic @fon.bg.ac.rs. Main research interests: human resource managemetn, training and development, entrperneurship and employee competencies, e-learning
Ivana Kužet, Teaching Assistant, University of Belgrade – Faculty of Organizational Sciences. Email: ivana.kuzet@fon.bg.ac.rs. Main research interests: human resource management, business psychology, entrperneurship and employee competencies, teamwork
Jasna Petković, Ph.D., Associate Professor, University of Belgrade – Faculty of Organizational Sciences. Email: jasna.petkovic@fon.bg.ac.rs. Main research interests: technology management, technology entrepreneurship, technology transfer, technology forecasting, SMEs development

al. (2021) gave a comprehensive overview of the concept of entrepreneurial mindset and offered an integrated definition explaining that "*Entrepreneurial mindset is defined as a cognitive perspective that enables an individual to* ***create value*** *by* ***recognizing and acting*** *on opportunities,* ***making decisions*** *with limited information, and remaining* ***adaptable and resilient*** *in conditions that are often uncertain and complete*".

HRM and entrepreneurial activities are close-knit. Zehir/Gurol/Karaboga/Kole (2016) claim that entrepreneurial orientation positively affects both a company's financial performance and an employee's performance within a company. Recent studies emphasize the specificities of HRM practices in entrepreneurial ventures (see e. g., Hubner/Baum 2018; Moustaghfir/Fatihi/Benouarrek 2020; Orakwue/Iguisi 2020; Nikam/Lahoti/Ray 2023).

Entrepreneurship education has emerged as a crucial component in preparing individuals to thrive in a global landscape characterized by rapid technological advancements, dynamic market trends, and an innovation-led society. It can enhance the capabilities and skills of students, leading to greater self-reliance and enabling them to establish new businesses more effectively (Galvão/Marques/Ferreira 2020). Societal and economic benefits of entrepreneurship require ever-evolving entrepreneurial education practices (Ratten/Usmanij 2021). Entrepreneurship education should develop the entrepreneurial mindset of students (Wardana/Narmaditya/Wibowo/Mahendra/Wibowo/Harwida/Rohman 2020; Jiatong/Murad/Bajun/Tufail/Mirza/Rafiq 2021), it requires practical approaches (Bell/Bell 2020; Lackéus 2020; Anwar/Abdullah 2021), insists on multidisciplinarity (Mavlutova/Lesinskis/Liogys/Hermanis 2020; Huang-Saad/Bodnar/Carberry 2020), enhances the capabilities of students (Lee/Kreiser/Wrede/Kogelen 2018; Galvão et al. 2020; Shah/ Amjed/Jaboob 2020) and may enable students to establish new businesses more effectively (Kim 2023; Dalziel/Basir 2024).

Although the importance and impact of startups on the economy and the necessity of entrepreneurial education are unquestionable, there are many questions about the effectiveness of traditional educational practices on entrepreneurial performance. Shenkoya, Hwang and Sung (2023) research shows that traditional theoretical entrepreneurship courses have no significant effect on the success of student startup ventures. However, other classroom approaches – simulation games and experiential practical activities are highly correlated with students' entrepreneurial intentions and performance (Olokundun/Moses/Iyiola/Ibidunni/Ogbari/Peter/Borishade 2018; Pradubthong/Petsangsri/Pimdee 2019; Zulfiqar/Sarwar/Aziz/Ejaz Chandia/Khan 2019).

An extensive literature review and the authors' practical experience showed there is a lack of multidisciplinary educational approaches that foster entrepreneurial spirit among students. Firstly, there is a need for additional prac-

tical educational approaches that can develop specific entrepreneurial skills. Secondly, the complex nature of entrepreneurship requires a holistic approach, recognizing that successful entrepreneurs are not only capable of identifying opportunities and managing risks but also possess a diverse set of skills spanning creativity, critical thinking, communication, and teamwork.

Multidisciplinary educational approaches have a rising impact on learning experiences (Crnkovic/Aleksic-Maslac/Jerkovic 2006; Thana/Adiatma/Ramli 2022). These approaches integrate knowledge and tools from multiple disciplines to address different teaching domains and improve the understanding of complex problems (Selhorst-Koekkoek/Rusman 2023). For example, Banerjee et al. (2020) integrate mechanical and industrial engineering technologies with approaches from business and IT to improve students' problem-solving skills and entrepreneurial intentions. Multidisciplinary approach to education has shown its effectiveness in medical education (Bismala/Manurung/Andriany/Siregar 2022), engineering education (Jacques/Bissey/Martin 2016; [7] Banerjee/Zgalai/Boukareva 2020), natural sciences (Nagamani/Lakshmi/Sailaja 2023). Furthermore, some authors perceive it as a holistic approach that observes various perspectives of domain education – it combines domain education with business management and entrepreneurship topics (Crnkovic et al. 2006; Weber/Englehart 2011; Nagamani et al. 2023).

The objective of this paper is to provide a roadmap for creating a multidisciplinary approach to competency development in entrepreneurship education by: 1) identifying targeted entrepreneurial competencies, 2) implementing tools for developing entrepreneurship competencies, 3) assessing students' performance, and 4) identifying possible room for improvement of the approach. The paper proposes a roadmap for developing entrepreneurship competencies in higher education with a particular emphasis on human resource skills: teamwork, leadership, conflict resolution, understanding and using benefits of diversity, as well as presentation and communication skills. This approach was designed and tested trough action research in two cycles with two generation of students.

2. Literature review

2.1 Entrepreneurial education

Entrepreneurial skills, competencies, and orientation highly affect performance of both established companies and startups (Moustaghfir et al. 2020; Galvão et al. 2020). Entrepreneurial education has an important role in developing entrepreneurial mindset and skills (Boocock/Frank/Warren 2009; Aly/Audretsch/Grimm 2021; Coyle, 2022). Thus, recent years have seen a growing number of entrepreneurship modules in higher education, international conferences, published articles and books (Henry/Lewis 2018) covering different topics in entrepreneurial education and its diverse objectives. Hubner and Baum

(2018) emphasize the role of human resources development in entrepreneurial ventures and accentuate it as a competitive advantage.

According to Moberg et al. (2012) entrepreneurial education includes "content, methods and activities supporting the creation of knowledge, competencies and experiences that make it possible for students to initiate and participate in entrepreneurial value creating processes" (Moberg/Stenberg/Vestergaard 2012). Many studies have shown that the main goal in entrepreneurial education is to develop entrepreneurial competencies among students (Jiang/Xiong/Cao 2017; Byun/Sung/Park/Choi 2018) by teaching them theoretical and practical aspects of setting up and running a business (European Commission 2016), but also to develop personal competencies such as initiative and creativity, entrepreneurial consciousness and thinking (Jones/Iredale 2014). Athayde suggests that successful entrepreneurs have competencies and attributes which are derived from entrepreneurial education (Athayde 2009). The link between entrepreneurial education and successful entrepreneurial competencies development is presented in many studies (Lai/Lv/Jiang 2015; Kristová/Malach 2017; Potishuk/Kratzer 2017). Studies go further by exploring how entrepreneurial education is linked with company performance through entrepreneurial competencies (Minai/Raza/bin Hashim/Zain/Tariq 2018). Thus, entrepreneurial educators should continue to evolve, promote, and encourage their graduates even after graduation (Bauman/Lucy 2021).

Entrepreneurial education requires innovative approaches, switching from traditional, content-based, passive and single-oriented teaching, to entrepreneurial teaching, which is more active, competency-based, project-centric, collaborative, experiential and multidisciplinary (Kirby 2004). The responsibility for developing competencies in learners is increasingly laid onto educational institutions (Child/Shaw 2020). Since the focus in entrepreneurial education is the development of entrepreneurial competencies, Sutanto and his colleagues suggest implementation of competency-based education and training in entrepreneurship education (Sutanto/Kodrat/Christiani 2021). Competency-based education (CBE) has existed since the early 1970 s, but in recent years, with more focus on competency development, this approach has gained in popularity (Burnette 2016) making it the fastest growing model in higher education. The focus is on assessment and development of students' competencies (Cunningham/Key/Capron 2016), but besides that a full range of supporting learning goals must be articulated, ordered, and located within the educational process (Curry/Docherty 2017). It is important how the teacher structures learning, what its purpose is and how it is defined to students, the way every class is integrated in the course, while keeping all instructions in line with learning objectives (Gervais 2016). In CBE, the assessment mode is also important, since the students are assessed on what they know and how they perform, rather than how much time they spend in a classroom (Ordonez 2014). Sturgis and colleagues suggest that the advantages

of CBE are that "competencies include explicit, measurable, transferable learning objectives, assessment is meaningful and a positive learning experience for students, students receive support based on their individual learning needs, and learning outcomes emphasize competencies that include application and creation of knowledge, along with the development" (Sturgis/Patrick/Pittenger 2011). Also, there is evidence form practice on how employers view employees who followed CBE programs (Henrich 2016). Henrich highlights how much employers value collaboration with colleges since the quality of the curriculum and the firsthand experience students gain helps them solve real-life problems. For a successful implementation of entrepreneurship education and CBE, all stakeholders – the student, teachers and community partners – must collaborate and support each other through constructive feedback (Johnstone/Soares 2014). Specifically, hands-on entrepreneurship courses are one of the key factors affecting the profitability of student startup companies (Shenkoya/Hwang/Sung 2023).

2.2 Entrepreneurial competencies, frameworks, and models

Competencies can be defined as a set of observable and measurable 'attributes' required for individuals' effective work performance, and include knowledge, skills, abilities, values, personal traits, and motives (Boyatzis 1982; Wong 2020). They can be expressed as behaviours that an individual needs to demonstrate, or as minimum standards of performance, or defined level of proficiency (Chacko 2014). In that way, we can define entrepreneurial competencies as a set of skills for problem-solving and decision-making, positive social attitudes, knowledge for innovation, personal traits as creativity, leadership, and the ability to explore and seize opportunities (Crespí/Queiruga-Dios/Queiruga-Dios 2022). Entrepreneurial competencies are a specific group of competencies that are necessary for successful entrepreneurship and the main strategic elements which make companies and startups more successful (Mitchelmore/Rowley 2010).

Researchers tried to categorize entrepreneurial competencies, to better explain which skills, attitudes, and abilities they include. Silveyra grouped entrepreneurial competencies in four categories: entrepreneurship, management and business, human resources, and interpersonal skills (Silveyra/Herrero/Pérez 2021). Tittel and Terzidis categorized them as domain-specific competencies (which include management competencies, organizational and communication skills) personal competencies, and relational competencies (Tittel/Terzidis 2020). Duening et al. (2015) list five crucial skills of entrepreneurial expertise: 1) creating value, 2) lean startup method, 3) consumer discovery and product validation, 4) business model canvas, 5) entrepreneurial method. Lackéus (2014) puts emphasis on cognitive entrepreneurial competencies, based on intellectual skills, and non-cognitive entrepreneurial competencies, which include firsthand experiences. Karcsics and Szakács (2010) explain the importance of personality

traits of entrepreneurs, putting focus on leadership skills, good adaptation skills and a strong ability to shape social relations. Soft skills play a great role in entrepreneurship, as six of 20 reasons for startup failure are people-related (CBInsights 2021): burnout, lack of passion, poor networking skills, unsuitable team, lack of focus, poor team management skills.

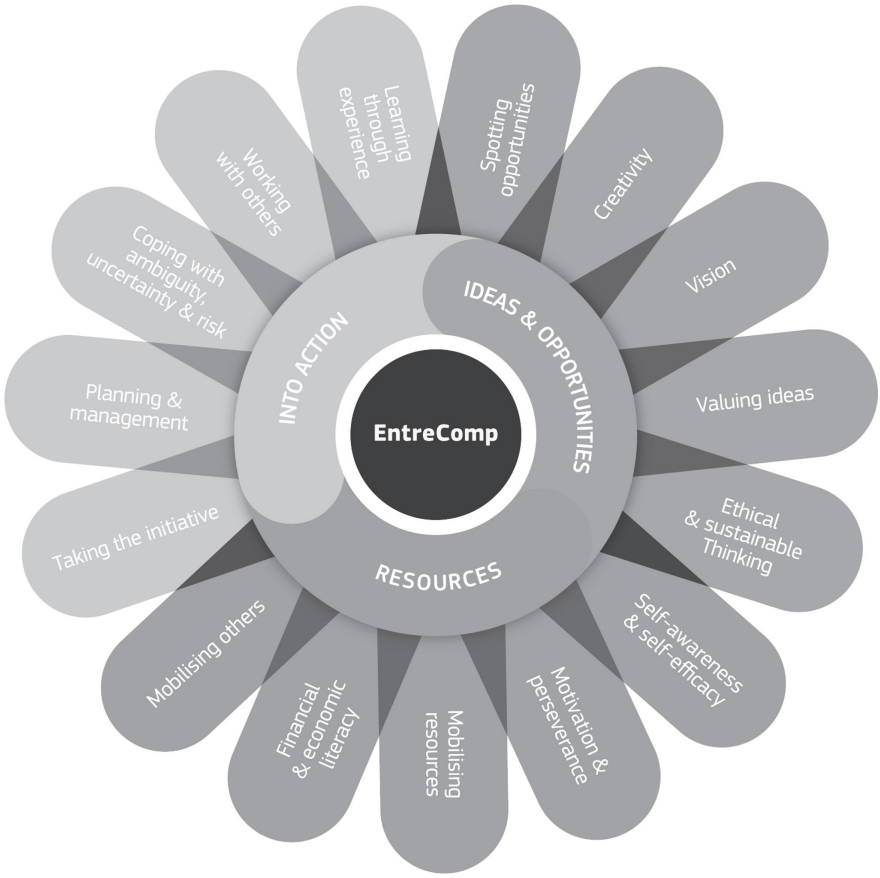


Figure 1: Entrepreneurship Competence Framework (Bacigalupo et al. 2016)

Competencies can be organized through frameworks and models. Competencies frameworks and models represent a list of competencies that are expected for specific job positions or industry. Frameworks and models should integrate job related characteristics, the organizational context, and personal characteristics of an individual, with the aim to provide the best performance (Abdul Hamid/Sentosa 2012). Cooper defines a competency model as a "collection of competencies and standards of performance establishing qualifications for a specific job position" (Cooper 2000). Lucia and Lepsinger (1999) suggest that a competency

model can be used as a descriptive tool that helps a business to meet its strategic objectives. There are already developed competency models and frameworks for entrepreneurial competencies. Amini and colleagues in their meta-analysis identify 42 entrepreneurial competencies (in the health care sector), and develop a framework that has five main dimensions, including communication competencies, personal competencies, managerial competencies, social competencies and health professional entrepreneurial competencies (Amini/Arasti/Bagheri 2018). The European Commission provides a comprehensive framework of entrepreneurship competencies (Figure 1) with the aim to unite education, work, and civic engagement in entrepreneurship (Bacigalupo/Kampylis/Punie/Van den Brande 2016).

Competency frameworks and models can be developed for a variety of purposes, including professional practices and educational processes. Numerous education programs have defined learning outcomes based on competencies that students should develop. The problem arises when those competencies are not defined through comprehensive competencies frameworks and properly delivered across all courses. Shankararaman and Ducrot (2016) suggest a mode of applying a competency framework in education, connecting it with the content of the course and making it more approachable to students. Competencies and models should be aligned with job functions, so industry leaders could help educators to define competency models, and integrate such knowledge, skills, and attitudes into the learning experiences (Ford/Meyer 2015). Despite a high number of frameworks and models developed for different job positions, there is a lack of organized frameworks, variability in methodology for frameworks development, inconsistency in reported results and lack of evaluation of frameworks (Batt/Williams/Rich/Tavares 2021).

2.3. Competency development and the learning process

John Dewey (1938), a renowned American educational theorist, emphasized the experiential aspects of learning. He advocated that learning takes place through individual experiences, lifelong learning, and the way of thinking acquired through education. Dewey (1938) emphasized that the human intellect grows when challenged by problems and dilemmas. The role of education is not to completely satisfy a student's preferences or to impose a curriculum that disregards a student's individual traits. Dewey listed that learning and research cannot be scheduled and that students need time to pursue their own questions and investigations. Therefore, students should be challenged through questions, discussions and suggestions and encouraged by parents, teachers, and peers.

David Kolb (1984) gave the most complete theoretical basis for experiential learning. Kolb asserted that not every experience results in learning; for experience to transform into learning, it must be processed. The essence of Kolb's ex-

periential learning theory is the explanation of the process by which experience is transformed into learning. Kolb's model is based on the experiential learning cycle that has four basic phases (Figure 2): 1) Concrete Experience, 2) Reflective Observation, 3) Abstract Conceptualization, and 4) Active Experimentation.

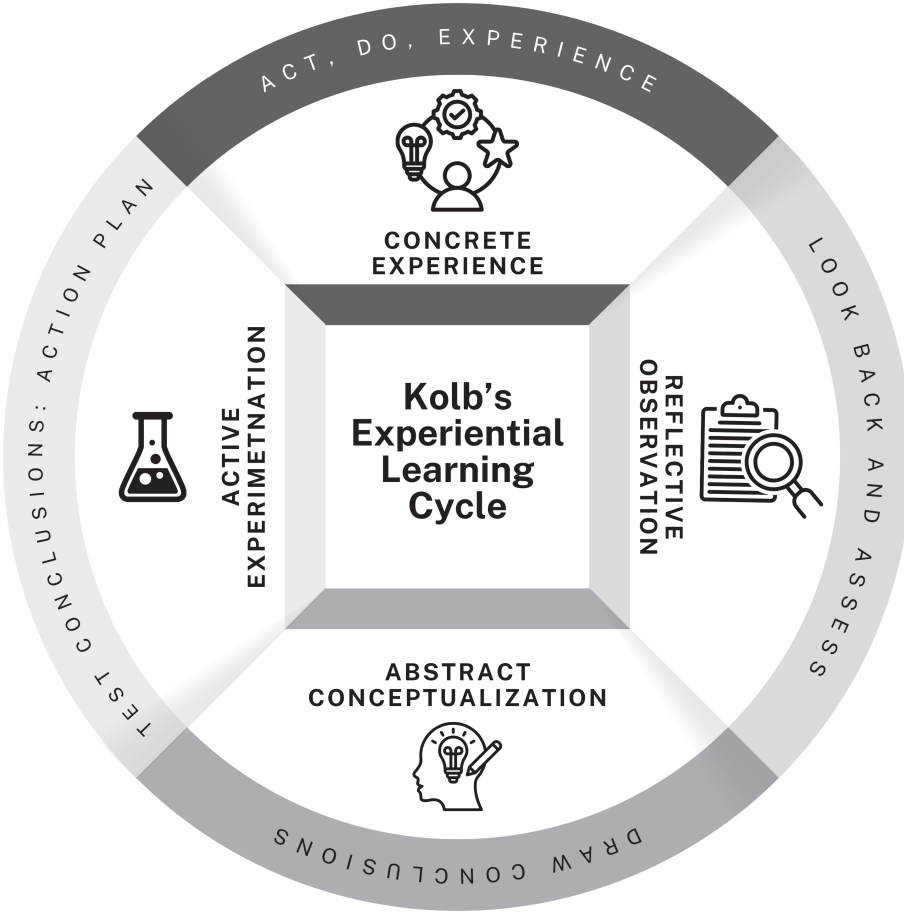


Figure 2: The Kolb's Experiential Learning Cycle (Adapted from Toronto MU (n.d))

Learning from experience is also a foundation of Revans' (1982) Action Learning theory. Action Learning is a problem-solving approach that involves acting and reflecting on the outcomes. This method aims to enhance the problem-solving process and create more straightforward solutions. It is a cycle of "doing" and "reflecting" stages. In most forms of action learning, a coach is included and responsible for promoting and facilitating learning, as well as encouraging the team to be self-managing. The Action Learning process includes: 1) an important and often complex problem; 2) a diverse problem-solving team; 3) an

environment that promotes curiosity, inquiry, and reflection; 4) a requirement that talk be converted into action and, ultimately, a solution; 5) a collective commitment to learning.

When designing the learning process, it is crucial to investigate the importance of creativity in selecting and implementing appropriate educational and training methods. Creative methods and techniques disrupt stereotypical thinking and lead to surprising, original solutions. They foster freedom, novelty, openness, creative observation, flexibility, divergent thinking, rich emotional and intellectual experiences, and tolerance (Milosavljević/Mijanović 2011, p. 8). Common to creative methods and techniques in education is the emphasis on thinking outside established patterns, developing imagination, generating new ideas, and considering different points of view (Milosavljević/Mijanović 2011, p. 27).

The competency development model proposed in this paper builds on these concepts, emphasizing the importance of experiential and action learning. It posits that students can develop entrepreneurial competencies through hands-on experience in entrepreneurship education. Within the suggested model, creative methods such as creating startup projects, help students go through concrete experiences, reflective observation, abstract conceptualization, and active experimentation, thereby enhancing their entrepreneurial skills. Additionally, students are challenged to solve concrete problems in diverse teams and design and present potential solutions to these problems.

2.4. Developing entrepreneurial competencies in higher education

In higher education settings, the predominant approach to fostering competency development often involves lectures delivered by subject matter experts, facilitated discussions on pertinent topics, and interactive workshops featuring case studies that present real-world business challenges (Minniti/Bygrave/Autio/Arenius 2017). Researchers have demonstrated that certain educational methodologies yield superior outcomes in developing entrepreneurial knowledge, competencies, and experiences. For instance, simulation methods allow students to engage in activities mirroring authentic scenarios, encouraging them to experiment without fear of failure, thereby facilitating deeper understanding and competency development (Davies 2002; Shin/Sok/Hyun/Kim 2015). Moreno-Guerrero et al. (2020) highlight additional benefits such as skill enhancement and the cultivation of positive attitudes such as responsibility, self-regulation, and self-efficacy. Furthermore, studies by Walters et al. (2017) underscore the efficacy of simulation techniques in enhancing participants' knowledge, motivation, and competencies. Chernikova et al. (2020) extend these findings by demonstrating that simulation-based learning contributes to the development of complex skills across diverse domains.

Apart from simulations, collaborative teamwork and project-based learning significantly contribute to entrepreneurial competency development through knowledge sharing among team members (Smirnov 2023) and deeper learning experiences (Weber/Funke 2012; Harms 2015; Lackeus 2020). Teamwork significantly contributes to the initial stages of business ideation and planning, since collaboration fosters idea generation, decision-making, and problem-solving skills necessary for developing innovative business models (Knipfer/Schreiner/Schmid/Peus 2018). The Team Canvas is a tool that supports essential aspects of teamwork, and helps teams to set a clear purpose, common and personal goals, values, roles, activities, strengths, and weaknesses (Ivanov/Voloshchuk 2015). It is used as a collaborative tool designed to foster transparency and mutual understanding, while enhancing cohesion work towards common goals (Benson/Dresdow Huffman 2021).

Moreover, university support centres play a crucial role in nurturing students' entrepreneurial competencies, emphasizing characteristics such as active experimentation, authenticity, social interaction, sense of ownership, and resolution support (Man 2019). Ho et al. (2021) emphasize the pivotal role of educators in fostering entrepreneurial abilities through their behaviours and support structures within educational institutions. Additionally, exposure to experienced entrepreneurs who share expertise in problem-solving and business development planning positively impacts students' skills and capabilities (Smirnov 2023). These findings underscore the diverse and impactful educational approaches that effectively cultivate entrepreneurial competencies among university students.

Adaptability is one of the main entrepreneurial competencies that should be addressed in the entrepreneurial orientation (Mojab/Zaefarian/Azizi 2011). One of the most used approaches in early phase startup development is the Lean Startup methodology (Bortolini/Nogueira Cortimiglia/Danilevicz/Ghezzi 2021). Eric Ries developed the Lean Startup methodology to present a startup development approach that focuses on rapid iteration, minimal waste (expenses), and validated learning process (Reis 2011). Lean Startup process is based on: 1) creating a minimum viable product (MVP) – product that has sufficient features to be used and tested by customers; 2) testing the product with customers – early adopters, gathering their feedback, and 3) making data-driven decisions to improve the product. These three steps are known as *Build-Measure-Learn loop* that fosters a culture of continuous innovation. Overall, the Lean Startup methodology provides a systematic approach for startups to launch products efficiently, validate their business ideas, and accelerate their path to success by focusing on customer needs and feedback. Stagars (2015) emphasizes that the Lean Startup is the "ideal approach" in the world of university startups and spin-offs, which helps them validate their idea quickly, and make market-driven changes.

Devising a business model and a successful presentation for the investors is of essential importance for entrepreneurs (Mojab et al. 2011). Entrepreneurial practice offers model canvases as tools for concise presentation of the business models. Although Osterwalder's Business Model Canvas is one of the most used tools for business modelling, Lean Canvas is a strategic tool that is more suitable in early development phases. Maurya (2009) adapted Business Model Canvas to better suit the Lean Startup methodology and provide a more agile customer-centric approach to business development. Link (2016) emphasizes that the Lean Canvas is a valuable tool for student startup teams that seek early customer feedback and work in interdisciplinary teams.

3. Methodology

The roadmap presented in the paper is a two-level multidisciplinary approach consisting of: 1) the framework for model development based on the action research approach, and 2) the implementation of the model for entrepreneurial competency development.

Action research is the most effective, immediate, and natural way of simultaneously changing and adapting (improving) educational practice. It naturally checks or analyses the methods, forms, means of teacher's work or some other educational issues (Kundačina/Banđur 2004, p. 89). The main purpose of pedagogical action research is the systematic research of teaching/learning to facilitate practice, with the dual goal of 1) improving that practice, and 2) contributing to theoretical knowledge for the benefit of the students' learning process (Norton 2009, p. xvi). The spiral flow of action research is evident in the completion of research tasks, which take place through multiple cycles. Steps that are similar are repeated in an analogous order in different phases of an action research. It leads to fine-tuned results based on the previous activities and research. The cyclical nature of action research enables rapid response by participants – the previous cycle is used to decide how to proceed in later cycles. The most crucial step in each cycle is critical reflection on previous outcomes, leading to increased understanding and planning of next steps. The most frequently mentioned model in action research (see Figure 3) was proposed by Kemis and Mctaggart (1988) consisting of the following four steps: planning, action, observation, and reflection (Kundačina/Banđur 2004, p. 132). The initial stimulus is always a real problem or reality that is perceived as unsatisfactory (or even as a crisis), and the first step of research is usually determining research/action goals and planning immediate action. The action is followed by observation (data collection), which forms the basis for critical reflection (interpretation of observation data), i. e. validation of the action. Evaluation provides the basis for plan corrections, new actions, and further repetition of the cycle (Pešić 1998).

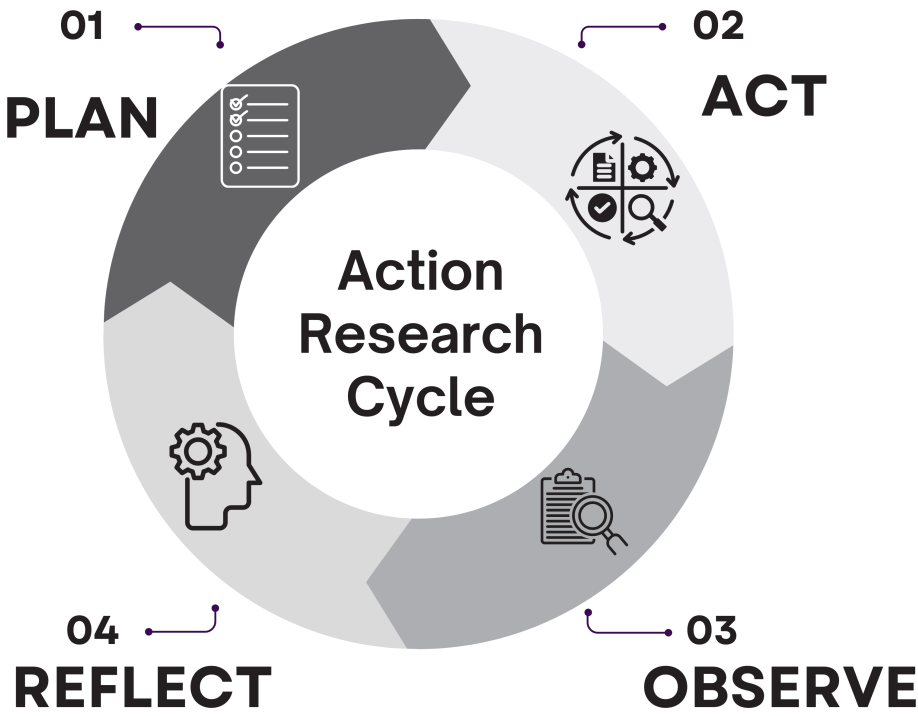


Figure 3: The action research spiral: model of the process of action research according to Kemmis and Mctaggart (McNiff 2013)

The essence of action research is that it is an iterative and ongoing process. The research in this paper was conducted in two cycles and every cycle was implemented through four phases: planning, action, observation, and reflection.

With the aim to use the entrepreneurship competency model and introduce a multidisciplinary approach to competency development in entrepreneurship education, in the first cycle we analysed previously proposed methodologies for the development of competency models and implementation in entrepreneurial education process (Ford/Meyer 2015; Olshanska/Gumennykova/Bila/Orel/Perova/Ivannikova 2019; Batt/Williams/Rich/Tavares 2021). Based on the literature review, we structured our approach as *Roadmap for entrepreneurship competency development*, presented in Figure 3. Five steps of the model were aligned in four phases of an action research (Table 1): 1) In the *Planning* phase we selected Entrepreneurship Competence Framework (Bacigalupo et al. 2016). Based on this framework we selected which competencies will be developed during the course and we chose appropriate tools. All tools and methods for competency development were arranged as items in a roadmap for entrepreneurship competency development. 2) *Action* phase considered implementation and testing of the proposed Roadmap through the delivery of the postgraduate course

Human resources and Technology Entrepreneurship in academic years 2022/23 and 2023/24 at the University of Belgrade, Faculty of Organizational Sciences. Students had a task to submit a project-based assignment consisting of four segments: Lean Startup methodology, Lean Canvas, Team Canvas, and Pitch presentation. 3) *Observation* phase analysed the results of student performance. Teachers assessed students' performance based on how successfully they prepared and presented the results of Lean Startup methodology, Lean Canvas, Team Canvas, and Project pitch. This phase should provide insights on how successful students were in adopting and developing targeted competencies. Based on their performance (assignment results) teachers will get feedback on curricula improvements. 4) Upon this analysis, in the *Reflection* phase, we should check whether the next cycle of the research (next generation) requires interventions based on the learning process. The teaching process could then be repeated using the updated roadmap.

Based on the action research approach and specific tools for technology entrepreneurship and HRM practices, we created the Roadmap for entrepreneurship competency development, presented in Figure 4.

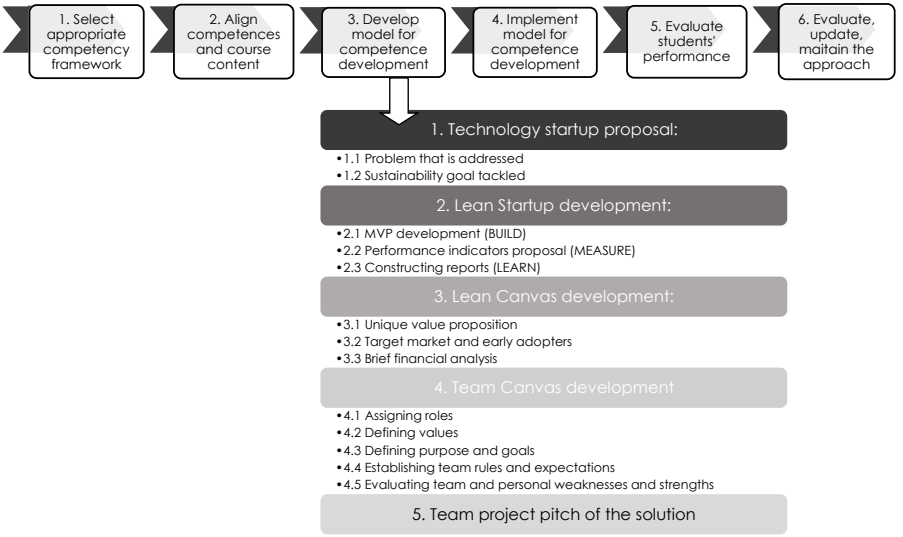


Figure 4: Roadmap for entrepreneurship competency development

The roadmap is a two-level hierarchy process. The first level steps serve to develop and regularly update the delivered method for competency development through action research steps explained in Table 1.

Table 1: Action research phases

Action research phases	Method/model steps	Action research implementation – Cycle I – generation 2022/23	Action research implementation – Cycle II – generation 2023/24
Planning	1. Select appropriate competency framework 2. Align competencies and course content 3. Design methods, tools, and techniques for competency development	1. Entrepreneurship Competence Framework (Bacigalupo et al. 2016) 2. Select competencies and tools for their development 3. Create a roadmap as a 5-step method with tools for competency development	1. Same 2. Same 3. Roadmap with interventions
Action	4. Implementing designed methods, tools, and techniques in class	4. Implementing designed Roadmap in class in the course *Human resources and Technology Entrepreneurship in 2022/23*: 43 students in 11 teams	4.1. Implementing teaching interventions 4.2. Implementing designed Roadmap in class in the course *Human resources and Technology Entrepreneurship in 2023/24:* 24 students in 6 teams
Observation	5. Evaluate students' performance	5. Presenting student performance	5. Presenting student performance
Reflection	6. Evaluate, revise, update this approach	6. Evaluating student performance and suggesting model improvement	6. Evaluating student performance and suggesting model improvement

Step 3 suggests the development of a model for competency development, and it depends on the subject that is being considered for competency development. The model presented in Figure 4 is a multidisciplinary approach that combines HRM and technology entrepreneurship tools. The first step of the method is a technology startup proposal, where a team of students has to target a specific problem they are addressing. Additionally, they need to specify to what sustainable development goal they will contribute with the proposed solution. The second step is to apply the Lean Startup method – propose a minimal viable product (MVP), create performance indicators for the evaluation of the startup success, and appropriate reports that will provide insights for further development. The third task is to create Lean Canvas (Appendix 1) to summarise the business model of the startup. To address teamwork and emphasise the role of people in the startup, students have to develop Team Canvas (Appendix 2). Finally, the last step of the approach is to present a solution to the panel of teachers followed by a Q&A session.

Table 2 matches targeted competencies from the competency framework (Figure 1) and tools used in the applied method for competency development (Figure 3). The proposed approach tackles 13 out of the 15 listed competencies.

Table 2: Targeted competencies and tools for competency development

Competency	Targeted	How is the competency developed
Spotting opportunities	Yes	1.1 Technology startup proposal: problem that is addressed
Creativity	Yes	2.1 Lean Startup: MVP development
Vision	No	
Valuing ideas	Yes	2.3 Lean Startup: Constructing reports 3.1 Lean Canvas: Unique value proposition 3.2 Lean Canvas: Target market and early adopters
Ethical & Sustainable Thinking	Yes	1.2 Technology startup proposal: Sustainability goal tackled
Taking the initiative	Yes	1. Technology startup proposal
Planning & management	Yes	2.2 Lean Startup: Performance indicators proposal 2.3 Lean Startup: Constructing reports 3.2 Lean Canvas: Target market and early adopters
Coping with ambiguity, uncertainty & risk	Yes	4.5 Team Canvas: Evaluating team weaknesses and strengths
Working with others	Yes	4. Team Canvas development
Learning through experience	Yes	All steps
Financial & economic literacy	Yes	2.2 Lean Startup: Performance indicators proposal 3.3 Lean Canvas: Brief financial analysis
Mobilising others	Yes	4. Team Canvas development
Mobilising resources	No	
Motivation & perseverance	Yes	4.3 Team Canvas: Defining purpose and goals
Self-awareness & self-efficacy	Yes	4.1 Team Canvas: Assigning roles 4.5 Team Canvas: Evaluating team and personal weaknesses and strengths

The Entrepreneurship Competence Framework describes in detail the level of each competency (knowledge, skills, and abilities) that can be achieved (see Bacigalupo et al. 2016, p.18). The authors defined three levels of proficiency through learning outcomes: *Foundation*, *Intermediate,* and *Advanced* and their descriptors are provided in Table 3. For example, for competency *Spotting opportunities* descriptors are (Bacigalupo et al. 2016, p.18):

– Foundation level: *Learners can find opportunities to generate value for others*,
– Intermediate level: *Learners can recognize opportunities to address needs that have not been met*, and
– Advanced level: *Learners can seize and shape opportunities to respond to challenges and create value for others.*

This model is based on the principles of Bloom's taxonomy, and we will use it further to assess the level of developed competency on a 10-point scale, where scores 1–3 describe the Foundation level, 4–7 describe the Intermediate level, and scores 8–10 signify the Advanced level of developed competencies.

The model was implemented twice:

1) February 2023 for master level postgraduate students in the course *Human resources and Technology Entrepreneurship* for 43 students grouped into 11 teams.
2) December 2023 for master level postgraduate students in the course *Human resources and Technology Entrepreneurship* for 24 students grouped into 6 teams.

4. Evaluation of students' performance

Table 2 shows the results of the evaluated teams and gives the overview of the scores they achieved for the observed tool. This evaluation provided teachers with the feedback about the developed skills and served as a base for possible interventions for curricula improvement (for example, the Lean Startup methodology required more attention and interventions as students scored the lowest out of the maximum points). Additionally, after the project pitch and the Q&A session, teachers got further insights into students' understanding of concepts, entrepreneurial intentions, and ability to work in startup teams.

Table 3: Results of the students' performance 2022/23

Team	Lean Startup	Lean Canvas	Team Canvas	Project Pitch	TOTAL
Points	[0–4]	[0–8]	[0–10]	[0–8]	[0–30]
Team 1	4	8	9	6	**27**
Team 2	3	7	10	8	**28**
Team 3	4	7	9	8	**28**
Team 4	4	8	7	8	**27**
Team 5	2	9	10	8	**29**
Team 6	4	8	10	8	**30**
Team 7	4	8	10	8	**30**
Team 8	3	7	7	6	**23**
Team 9	1	6	6	6	**19**
Team 10	4	8	9	8	**29**
Team 11	1	6	8	7	**22**
Average	3.09	7.45	8.64	7.36	26.55
Percentage	77.27 %	93.18 %	86.36 %	92.05 %	88.48 %

The lowest score in Lean Startup methodology and additional question in the Q&A session indicated that students failed to capture the specificities of MVP development, as well as performance indicators. Students also failed to understand some core HRM terms: defining purpose, goals, and values in the Team Canvas tool.

The results implied that teachers needed to put more effort into explaining these concepts, provide more practical examples, and offer student additional

office hours. Understanding of these concepts also varied depending on the students' previous educational background. For example, students who graduated in engineering had better understanding of lean startup than students who graduated in social sciences. Through the sessions, students reported improved entrepreneurial intentions. They also stated they considered starting their own business. Evaluation insights contributed to improved curricula development for the next generation: 1) there were more examples and conversation about Lean Startup methodology, especially MVP development; 2) teachers gave in-depth explanations of teamwork characteristics, focusing on the importance of common goals, values, and purpose.

Table 4 shows the performance of the second cohort of postgraduate students, which provided additional insights for the improvement and evaluation of developed competencies among students.

Table 4: Results of the students' performance 2023/24

Team	Lean Startup	Lean Canvas	Team Canvas	Project Pitch	TOTAL
Points	[0–4]	[0–8]	[0–10]	[0–8]	[0–30]
Team 1	3	7	6	6	**22**
Team 2	2	5	8	6	**21**
Team 3	4	8	9	7	**28**
Team 4	4	8	10	8	**30**
Team 5	3	8	9	8	**28**
Team 6	4	7	7	8	**26**
Average	3.33	7.17	8.17	7.17	25.83
Percentage	83.33 %	89.58 %	81.67 %	89.58 %	86.11 %

Revised curricula in the second cycle resulted in better performance in understanding Lean Startup methodology. However, Team Canvas still needs additional intervention.

5. Discussion

The proposed roadmap has been shown to be a helpful tool for designing the model for developing entrepreneurial competencies among students. The model implementation has shown that it is possible to detect weak links and make interventions in the teaching process. Table 5 evaluates the success of the model in developing targeted competencies based on teachers' evaluation of students' performance. The evaluation scores are on a 10-point scale. The category below the score describes the level of competency according to the implemented competency model, and the last column elaborates the given score. The evaluation was performed after the second cohort, upon the implemented intervention during the second cycle of the action research. The columns "Score

[1–10]" and the "Comment" reflect teachers' estimation on the level of competency development based on students' overall performance.

Table 5: Evaluation of the developed competencies

Competency	Score [1–10]	Comment
Spotting opportunities	4 Intermediate	Students were not given problems to be solved, so they had to identify the needs from their environment and respond with their solutions. However, they are not able to address scalable opportunities and most teams proposed IT solutions for SME's or local problems.
Creativity	10 Advanced	Students presented creative solutions with many different aspects and improvements of existing business ideas.
Valuing ideas	9 Advanced	The task required to define unique value proposition of the solution, and teams were very successful in clarifying the value of their proposal.
Ethical & Sustainable Thinking	9 Advanced	Many teams tackled environmental problems and circular economy, and proposed solutions oriented on SDGs.
Taking the initiative	5 Intermediate	In order to respond to teachers' requirements, students had to take initiative and propose startups. Nevertheless, there is doubt whether they would preserve in their initiative if it was not graded.
Planning & management	8 Advanced	The Lean Startup methodology shows great success in planning the initial phases of startup development and further management combined with Lean Canvas. Students gained a variety of management skills in developing a brief business model with Lean Canvas.
Coping with ambiguity, uncertainty & risk	2 Foundation	Though teams were very successful in identifying possible weaknesses of the team, they would need real entrepreneurial experience to develop these competencies.
Working with others	10 Advanced	Students successfully organized in teams, recognized their weaknesses, strengths, discussed ideas, made consensus, and resolved conflicts.
Learning through experience	6 Intermediate	Students passed through the initial phase of startup ideation, but they did not have the opportunity to experience real entrepreneurial dilemmas outside the classroom.
Financial & economic literacy	4 Intermediate	The topics of the course are not focused on financial management, so students did not obtain deep knowledge about these fields, although the approach did have a brief financial analysis.
Mobilising others	10 Advanced	Students had to find their team members and assign the roles in Team Canvas tool. They were very successful in identifying their strengths and weaknesses.
Motivation & perseverance	5 Intermediate	The approach highlights the continuous improvement with Lean Startup methodology. However, entrepreneurial perseverance could be fully developed with a longer implementation and a real startup journey.
Self-awareness & self-efficacy	8 Advanced	Team Canvas tool emphasizes the importance of recognizing each team member's weaknesses and strengths providing a great instrument for self-awareness development. Q&A session with teachers' feedback has been very successful in developing students' self-esteem.

The research shown the effectiveness of the proposed approach, but it would be crucial to test other competency development models to observe the true impact of the methodology and evaluate if other models could be more effective for developing entrepreneurial competencies of students. This will be implemented in future research with control groups that will undergo other competency development models. Another limitation of the approach is a limited access to real-world experience that is constrained by the fixed length of the module delivery at the master's level (four weeks in one semester). However, the Faculty offers a mentorship program that supports the development of students' ideas and further entrepreneurial skill development. During the teaching process, we inform students about the program and motivate them to join the process. The approach presented in this paper gives students a good starting point for their startup development as some student teams have successfully joined and completed the program. The proposed roadmap is conducted as a one country study, but international networks (for example, Danube Cup, Entrepreneurial Mindset Network, etc.) could be a good opportunity to re-validate the proposed multidimensional pedagogical strategy for entrepreneurship competency development in other countries.

The proposed model has been developed for entrepreneurial competencies in the field of technology entrepreneurship and human resources management, but the roadmap is applicable to any entrepreneurially oriented courses and disciplines. Future research will focus on applications in other areas such as biotechnology education. We will assess if the model is applicable and effective in other, non-business-oriented education, and make appropriate adjustments and conclusions.

6. Conclusion

This paper presented an effective, multidimensional pedagogical strategy for entrepreneurship competency development, in response to emerging trends in the entrepreneurial landscape. It provides a framework for the identification of an effective teaching method depending on the specific learning context. The approach presented in the paper combined several methods and tools from HRM and technology entrepreneurship practice to develop entrepreneurial competencies among students. The results of the roadmap implementation have shown that the action research steps are very useful in the creation of a novel approach for developing entrepreneurial competencies. On the other hand, the model for the subject has shown that it has potential to be more effective for some competencies such as: *Coping with ambiguity, uncertainty & risk*, *Financial & economic literacy*, and *Spotting opportunities*. The competencies could be developed by having a real-world experience explained in the Discussion section. Students need genuine entrepreneurial experience to cope with ambiguity, risk, and spot opportunities. Motivation and perseverance are also competencies

that could be developed with a real startup journey, as a highly challenging road. One-year master studies and short semesters are not the most suitable for gaining an authentic entrepreneurial experience. However, connecting the subject with non-formal and supportive university programmes besides regular curricula are an additional opportunity for students to start their entrepreneurial ventures.

The presented approach is very effective for developing an entrepreneurial mindset of students, fostering innovation and creativity that meets the real needs of the society. A more efficient practice leading to the establishment of a startup company would take a longer implementation period, supporting programmes, financial resources, and guided mentorship of student teams.

The approach proposed in this paper is based on the Serbian conditions and has additional value for national contexts that have limited entrepreneurial orientation due to national cultural characteristics that highly affect entrepreneurial activity within a country (see Jovanović/Jevtić/Petković 2018). This is especially important for Eastern and Central European countries that have gone through economic transitions and switched from a predominantly socialist to a capitalistic society. The presented framework is based on the extensive experience of the authors with students that have limited awareness of their entrepreneurial opportunities and interest to pursue an entrepreneurial career path. It could serve as valuable material for educators in post-socialist countries that strive to induce entrepreneurial mindset of students, as it offers several tools for entrepreneurial education that could be implemented in various educational fields.

Further implementation of the roadmap should provide improvements and better insights that will nurture future entrepreneurs and cultivate intrapreneurial qualities, fostering a culture of innovation within organizations. We recognize great value of this approach in other educational domains, especially natural and life sciences to foster entrepreneurial spirit of future biotechnologists, agriculturalists, physicists, that could cultivate the development of student startups in this field. Future research will show the efficiency of the approach in these areas and identify new tools and techniques to improve the Roadmap.

References

[1] Abdul A.H/Sentosa, I. (2012): Human Resource Competency Models: Changing Evolutionary Trends. *Interdisciplinary Journal of Research in Business, 1*(11), 11–25.

[2] Aly, M./Audretsch, D.B./Grimm, H. (2021): Emotional skills for entrepreneurial success: the promise of entrepreneurship education and policy. *The Journal of Technology Transfer, 46*(5), 1611–1629. https://doi.org/10.1007/s10961-021-09866-1

[3] Amini, Z./Arasti, Z./Bagheri, A. (2018): Identifying social entrepreneurship competencies of managers in social entrepreneurship organizations in healthcare sector. *Journal of Global Entrepreneurship Research, 8*(1), 19. https://doi.org/10.1186/s40497-018-0102-x

[4] Anwar, G./Abdullah, N.N. (2021): Inspiring future entrepreneurs: The effect of experiential learning on the entrepreneurial intention at higher education. *International Journal of English Literature and Social Sciences, 6*. https://doi.org/10.22161/ijels.62.26

[5] Athayde, R. (2009): Measuring Enterprise Potential in Young People. *Entrepreneurship Theory and Practice, 33*(2), 481–500. https://doi.org/10.1111/j.1540-6520.2009.00300.x

[6] Bacigalupo, M./Kampylis, P./Punie, Y./Van den Brande, G. (2016): EntreComp: The entrepreneurship competence framework. *Luxembourg: Publication Office of the European Union*, *10*, 593884. https://core.ac.uk/download/pdf/38632642.pdf

[7] Banerjee, R./Zgalai, W./Boukareva, B. (2020): Curriculum Integration of engineering with business to enhance engineer's management competency-A multidisciplinary to interdisciplinary approach. In *2020 Advances in Science and Engineering Technology International Conferences (ASET)* (pp. 1–5). IEEE. https://doi.org/10.1109/ASET48392.2020.9118306

[8] Batt, A./Williams, B./Rich, J./Tavares, W. (2021): A Six-Step Model for Developing *Competency Frameworks in the Healthcare Professions. Frontiers in Medicine, 8,* 789828. https://doi.org/10.3389/fmed.2021.789828

[9] Bauman, A./Lucy, C. (2021): Enhancing entrepreneurial education: Developing competencies for success. *The International Journal of Management Education, 19*(1), 100293. https://doi.org/10.1016/j.ijme.2019.03.005

[10] Bell, R./Bell, H. (2020): Applying educational theory to develop a framework to support the delivery of experiential entrepreneurship education. *Journal of Small Business and Enterprise Development, 27*(6), 987–1004. https://doi.org/10.1108/JSBED-01-2020-0012

[11] Benson, J./Dresdow, S./Huffman, B. (2021): Visualizing Dynamics: Using Design Templates in Talent and Process Leadership. *The International Journal of Pedagogy and Curriculum, 28*(1), 149–159. https://doi.org/10.18848/2327-7963/CGP/v28i01/149-159

[12] Bismala, L./Manurung, Y.H./Andriany, D./Siregar, G. (2022): How does Entrepreneurial Education Promote Medical Students' Entrepreneurial Orientation?. *Journal of Education Research and Evaluation, 6*(4), 696–703. https://doi.org/10.23887/jere.v6i4.47747

[13] Boocock, G./Frank, R./Warren, L. (2009): Technology-based entrepreneurship education: Meeting educational and business objectives. *The International Journal of Entrepreneurship and Innovation, 10*(1), 43–53. https://doi.org/10.5367/00000000978741422

[14] Bortolini, R.F./Nogueira Cortimiglia, M./Danilevicz, A. d.M.F./Ghezzi, A. (2021): Lean Startup: a comprehensive historical review. *Management decision, 59*(8), 1765–1783. https://doi.org/10.1108/MD-07-2017-0663

[15] Boyatzis, R.E. (1982): *The competent manager: A model for effective performance.* Wiley.

[16] Burnette, D.M. (2016): The Renewal of Competency-Based Education: A Review of the Literature. *The Journal of Continuing Higher Education, 64*(2), 84–93. https://doi.org/10.1080/07377363.2016.1177704

[17] Byun, C.-G./Sung, C.S./Park, J.Y./Choi, D.S. (2018): A Study on the Effectiveness of Entrepreneurship Education Programs in Higher Education Institutions: A Case Study of Korean Graduate Programs. *Journal of Open Innovation: Technology, Market, and Complexity, 4*(3), 26. https://doi.org/10.3390/joitmc4030026

[18] Castrogiovanni, G.J./Urbano, D./Loras, J. (2011): Linking corporate entrepreneurship and human resource management in SMEs. *International Journal of Manpower*, *32*(1), 34–47. https://doi.org/10.1108/01437721111121215

[19] Chacko, T. (2014): Moving toward competency-based education: Challenges and the way forward. *Archives of Medicine and Health Sciences, 2*(2), 247. https://doi.org/10.4103/2321-4848.144365

[20] Chernikova, O./Smirnova, M./Gavrikova, E./Kurakina, O. (2020): Simulation-based learning in higher education: Students' satisfaction and educational outcomes. *European Journal of Contemporary Education, 9*(4), 931–942. https://doi.org/10.3102/0034654320933544

[21] Child, S.F.J./Shaw, S.D. (2020): A purpose-led approach towards the development of competency frameworks. *Journal of Further and Higher Education, 44*(8), 1143–1156. https://doi.org/10.1080/0309877X.2019.1669773

[22] Cooper, K. (2000): *Effective competency modeling & reporting: A step-by-step guide for improving individual & organizational performance.* AMACOM.

[23] Coyle, P. (2022): *Entrepreneurial Mindset.* Blurb

[24] Crespí, P./Queiruga-Dios, M./Queiruga-Dios, A. (2022): The Challenge of Developing Entrepreneurial Competence in the University Using the Project-Oriented Learning Methodology. *Frontiers in Psychology, 13,* 966064. https://doi.org/10.3389/fpsyg.2022.966064

[25] Crnkovic, I./Aleksic-Maslac, K./Jerkovic, H. (2006): Holistic approach in education-filling the gap between different disciplines. In *28th International Conference on Information Technology Interfaces, 2006.* (pp. 35–40). IEEE. https://doi.org/10.1109/ITI.2006.1708448

[26] Cunningham, J./Key, E./Capron, R. (2016): An evaluation of competency-based education programs: A study of the development process of competency-Based programs. *The Journal of Competency-Based Education, 1*(3), 130–139. https://doi.org/10.1002/cbe2.1025

[27] Curry, L./Docherty, M. (2017): Implementing Competency-Based Education. *Collected Essays on Learning and Teaching, 10,* 61–74. https://doi.org/10.22329/celt.v10i0.4716

[28] Dalziel, M./Basir, N. (2024): The technological imprinting of educational experiences on student startups. *Research Policy, 53*(2), 104940. https://doi.org/10.1016/j.respol.2023.104940

[29] Daspit, J.J./Fox, C.J./Findley, S.K. (2021): Entrepreneurial mindset: An integrated definition, a review of current insights, and directions for future research. *Journal of Small Business Management, 61*(1), 12–44. https://doi.org/10.1080/00472778.2021.1907583

[30] Davies, C. H. (2002): Student engagement with simulations: a case study. *Computers & Education, 39*(3), 271–282. https://doi.org/10.1016/S0360-1315(02)00046-5

[31] Duening, T.N./Hisrich, R.D./Lechter, M.A. (2015): *Technology Entrepreneurship: Taking Innovation to the Marketplace.* London: Elsevier

[32] Erbas, I. (2016): Using Case Study Method in Project Management Education as a Tool for Improvement of Project Manager's Skills. *European Journal of Social Sciences Education and Research,* 6(1), 117–127. https://doi.org/10.26417/ejser.v6i1.p121-127

[33] Ford, R./Meyer, R. (2015): Competency-based Education 101. *Procedia Manufacturing, 3,* 1473–1480. https://doi.org/10.1016/j.promfg.2015.07.325

[34] Galvão, A./Marques, C./Ferreira, J.J. (2020): The role of entrepreneurship education and training programmes in advancing entrepreneurial skills and new ventures. *European Journal of Training and Development*, *44*(6/7), 595–614. https://doi.org/10.1108/EJTD-10-2019-0174

[35] Gervais, J. (2016): The operational definition of competency-based education. *The Journal of Competency-Based Education, 1*(2), 98–106. https://doi.org/10.1002/cbe2.1011

[36] Harms, R. (2015): Self-regulated learning, team learning and project performance in entrepreneurship education: Learning in a lean startup environment. *Technological forecasting and social change, 100,* 21–28. https://doi.org/10.1016/j.techfore.2015.02.007

[37] Henrich, J. (2016): Competency-based education: The employers' perspective of higher education. *The Journal of Competency-Based Education, 1*(3), 122–129. https://doi.org/10.1002/cbe2.1023

[38] Henry, C./Lewis, K. (2018): A review of entrepreneurship education research: Exploring the contribution of the Education + Training special issues. *Education + Training, 60*(3), 263–286. https://doi.org/10.1108/ET-12-2017-0189

[39] Ho, C.S.M./Lu, J./Bryant, D.A. (2021): Understanding teacher entrepreneurial behavior in schools: Conceptualization and empirical investigation. *Journal of Educational Change, 22*(4), 535–564. https://doi.org/10.1007/s10833-020-09406-y

[40] Huang-Saad, A./Bodnar, C./Carberry, A. (2020): Examining current practice in engineering entrepreneurship education. *Entrepreneurship Education and Pedagogy, 3*(1), 4–13. https://doi.org/10.1177/2515127419890828

[41] Hubner, S.V./Baum, M. (2018): Entrepreneurs' human resources development. *Human Resource Development Quarterly, 29*(4), 357–381. https://doi.org/10.1002/hrdq.21328

[42] Ivanov, A./Voloshchuk, D. (2015): *Team Canvas*. The Team Canvas. https://www.theteamcanvas.com/

[43] Jacques, S./Bissey, S./Martin, A. (2016): Multidisciplinary Project Based Learning Within a Collaborative Framework A Case Study on Urban Drone Conception. *International Journal of Emerging Technologies in Learning (iJET), 11*(12), 36–44. https://doi.org/10.3991/ijet.v11i12.5996

[44] Jiang, H./Xiong, W./Cao, Y. (2017): Research on the Mechanism of Entrepreneurial Education Quality, Entrepreneurial Self-efficacy and Entrepreneurial Intention in Social Sciences, Engineering and Science Education. *EURASIA Journal of Mathematics, Science and Technology Education, 13*(7). https://doi.org/10.12973/eurasia.2017.00754 a

[45] Jiatong, W./Murad, M./Bajun, F./Tufail, M. S./Mirza, F./Rafiq, M. (2021): Impact of entrepreneurial education, mindset, and creativity on entrepreneurial intention: mediating role of entrepreneurial self-efficacy. *Frontiers in Psychology, 12*, 724440. https://doi.org/10.3389/fpsyg.2021.724440

[46] Johnstone, S.M./Soares, L. (2014): Principles for Developing Competency-Based Education Programs. *Change: The Magazine of Higher Learning, 46*(2), 12–19. https://doi.org/10.1080/00091383.2014.896705

[47] Jones, B./Iredale, N. (2014): Enterprise and entrepreneurship education: Towards a comparative analysis. *Journal of Enterprising Communities: People and Places in the Global Economy, 8*(1), 34–50. https://doi.org/10.1108/JEC-08-2012-0042

[48] Jovanović, M./Jevtić, M./Petković, J. (2018): The Role of Culture in Entrepreneurial Ecosystem: What Matters Most? In *16th International Symposium Symorg 2018—Doing Business in the Digital Age: Challenges, Approaches and Solutions* (pp. 1–9).

[49] Karcsics, É./Szakács, F. (2010): Personality Factors of Entrepreneurial Competitiveness. *Society and Economy, 32*(2), 277–295. https://www.jstor.org/stable/90002205

[50] Kim, J.W. (2023): What Makes Students Create Their Own Jobs?: Institutional Factors Affecting College Student Startups in Korean Universities. *경영교육연구, 38*(5), 213–238. https://doi.org/10.23839/kabe.2023.38.5.213

[51] Kirby, D.A. (2004): Entrepreneurship education: Can business schools meet the challenge? *Education + Training, 46*(8/9), 510–519. https://doi.org/10.1108/00400910410569632

[52] Knipfer, K./Schreiner, E./Schmid, E./Peus, C. (2018): The performance of pre-founding entrepreneurial teams: The importance of learning and leadership. *Applied Psychology, 67*(3), 401–427. https://doi.org/10.1111/apps.12126

[53] Kolb, D.A. (1984): *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall.

[54] Kristová, K./Malach, J. (2017): The Impact of School Education and Family Environment on Pupils' Entrepreneurial Spirit and Attitude to Entrepreneurship. *The New Educational Review, 49*(3), 101–114. https://doi.org/10.15804/tner.2017.49.3.08

[55] Kundačina, M./Banđur, V. (2004): *Akciono istraživanje u školi: nastavnici kao istraživači*. Učiteljski fakultet.

[56] Kuratko, D. F./Fisher, G.,/Audretsch, D. B. (2021): Unraveling the entrepreneurial mindset. *Small Business Economics, 57*(4), 1681–1691. https://doi.org/10.1007/s11187-020-00372-6

[57] Lackéus, M. (2014): An emotion based approach to assessing entrepreneurial education. *The International Journal of Management Education, 12*(3), 374–396. https://doi.org/10.1016/j.ijme.2014.06.005

[58] Lackéus, M. (2020): Comparing the impact of three different experiential approaches to entrepreneurship in education. *International Journal of Entrepreneurial Behavior & Research, 26*(5), 937–971. https://doi.org/10.1108/IJEBR-04-2018-0236

[59] Lai, C./Lv, W./Jiang, Y. (2015): Entrepreneurial Knowledge and the Influence of Entrepreneurship Education on Students' Entrepreneurial Abilities. *Open Journal of Social Sciences, 03*(07), 1–6. https://doi.org/10.4236/jss.2015.37001

[60] Lee, Y./Kreiser, P. M./Wrede, A. H./Kogelen, S. (2018): University-based education and the formation of entrepreneurial capabilities. *Entrepreneurship Education and Pedagogy, 1*(4), 304–329. https://doi.org/10.1177/2515127418788893

[61] Link, P. (2016): How to Become a Lean Entrepreneur by Applying Lean Start-up and Lean Canvas?. In *Innovation and entrepreneurship in education* (pp. 57–71). Emerald Group Publishing Limited. https://doi.org/10.1108/S2051-229520160000002003

[62] Lucia, A.D./Lepsinger, R. (1999): *The art and science of competency models: Pinpointing critical success factors in organizations.* Jossey-Bass/Pfeiffer.

[63] Man, T.W.Y. (2019): Nurturing entrepreneurial competencies through university-based entrepreneurship centers: a social constructivist perspective. In *Seminal Ideas for the Next Twenty-Five Years of Advances* (pp. 141–161). Emerald Publishing Limited. https://doi.org/10.1108/S1074-754020190000021006

[64] Maurya, A. (2009): *Lean canvas*. LEANFoundry. https://www.leanfoundry.com/tools/lean-canvas

[65] Mavlutova, I./Lesinskis, K./Liogys, M./Hermanis, J. (2020): The Role of Innovative Methods in Teaching Entrepreneurship in Higher Education: Multidisciplinary Approach. In *Reliability and Statistics in Transportation and Communication: Selected Papers from the 19th International Conference on Reliability and Statistics in Transportation and Communication, RelStat'19, 16–19 October 2019, Riga, Latvia* (pp. 684–693). Springer International Publishing. https://doi.org/10.1007/978-3-030-44610-9_66

[66] McNiff, J. (2013): *Action research: Principles and practice*. Routledge.

[67] Milosavljević, G./Mijanović, M. (2011): *Kreativne metode i tehnike u obrazovanju.* Beograd: FON.

[68] Minai, M.S./Raza, S./bin Hashim, N.A./Zain, A.Y.M./Tariq, T. A. (2018): Linking entrepreneurial education with firm performance through entrepreneurial competencies: A Proposed Conceptual framework. *Journal of Entrepreneurship Education, 21*(4), 1–9.

[69] Minniti, M./Bygrave, W./Autio, E./Arenius, P. (2005): Global Entrepreneurship Monitor: 2004 Executive Report. Babson College, Babson Park, MA.

[70] Mitchelmore, S./Rowley, J. (2010): Entrepreneurial competencies: A literature review and development agenda. *International Journal of Entrepreneurial Behavior & Research, 16*(2), 92–111. https://doi.org/10.1108/13552551011026995

[71] Moberg, K./Stenberg, E./Vestergaard, L. (2012): *Impact of entrepreneurship education in Denmark – 2012*. Odense, Denmark: The Danish Foundation for Entrepreneurship – Young Enterprise.

[72] 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

[73] Moreno-Guerrero, A.-J./Rodríguez-Jiménez, C./Gómez-García, G./Ramos Navas-Parejo, M. (2020): Educational Innovation in Higher Education: Use of Role Playing and Educational Video in Future Teachers' Training. *Sustainability, 12*(6), 2558, https://doi.org/10.3390/su12062558

[74] Moustaghfir, K./El Fatihi, S./Benouarrek, M. (2020): Human resource management practices, entrepreneurial orientation and firm performance: what is the link?. *Measuring Business Excellence*, *24*(2), 267–283. https://doi.org/10.1108/MBE-12-2019-0119

[75] Nagamani, B./Lakshmi, V.U./Sailaja, P. (2023): Towards a holistic approach to education in india: embracing multidisciplinary perspectives. In P. Beena (Ed), *Best Practices of Research and Innovation in Steam Higher Education* (pp. 153–160). Yes Dee Publishing Pvt Ltd.

[76] Nikam, R.U./Lahoti, Y./Ray, S. (2023): A Study of Need and Challenges of Human Resource Management in Start-up Companies. *Mathematical Statistician and Engineering Applications, 72*(1), 314–320. https://doi.org/10.17762/msea.v72i1.1868

[77] Norton, L. (2009): *Action research in teaching and learning: A practical guide to conducting pedagogical research in universities.* Routledge.

[78] Olokundun, M./Moses, C. L./Iyiola, O./Ibidunni, S./Ogbari, M./Peter, F./Borishade, T. (2018): The effect of non-traditional teaching methods in entrepreneurship education on students entrepreneurial interest and business startups: A data article. *Data in brief, 19,* 16–20. https://doi.org/10.1016/j.dib.2018.04.142

[79] Olshanska, O./Gumennykova, T./Bila, O./Orel, V./Perova, S./Ivannikova, M. (2019): Building a Competency Model Student Training. International Journal of Engineering and Advanced Technology, 8(6), 2689–2695. https://doi.org/10.35940/ijeat.F8758.088619

[80] Orakwue, A./Iguisi, O. (2020): Conceptualizing entrepreneurship in human resource management. *International Journal of Research in Business and Social Science (2147–4478),* 9(3), 85–93. https://doi.org/10.20525/ijrbs.v9i3.692

[81] Pešić, M. (1998): *Pedagogija u akciji: metodološki priručnik*. Filozofski fakultet, Institut za pedagogiju i andragogiju.

[82] Pradubthong, N./Petsangsri, S./Pimdee, P. (2019): Space Learning Model for Flipped Classroom: Startup to Improve Learning and Innovation Skills in Higher Education. *Scholar: Human Sciences, 11*(1), 170–180. Retrieved from http://www.assumptionjournal.au.edu/index.php/Scholar/article/view/2926

[83] Ratten, V./Usmanij, P. (2021): Entrepreneurship education: Time for a change in research direction?. *The International Journal of Management Education, 19(*1), 100367.

[84] 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. *Academy of management learning & education, 14*(2), 187–204.http://doi.org/10.5465/amle.2012.0293

[85] Revans, R.W. (1982): *The origin and growth of action learning*. Brickley, UK: Chartwell-Bratt.

[86] Ries, E. (2011): *The Lean Startup.* New York: Crown Publishing Group.

[87] Selhorst-Koekkoek, M./Rusman, E. (2023): Multidisciplinary Educational Design Framework to Facilitate Cross-Boundary Educational Design: Closing Gaps Between Disciplines. *International Journal of Mobile and Blended Learning (IJMBL), 15*(2), 1–18. https://doi.org/10.4018/IJMBL.319021

[88] Shah, I.A./Amjed, S./Jaboob, S. (2020): The moderating role of entrepreneurship education in shaping entrepreneurial intentions. *Journal of Economic Structures, 9*, 1–15. https://doi.org/10.1186/s40008-020-00195-4

[89] Shankararaman, V./Ducrot, J. (2016): Leveraging competency framework to improve teaching and learning: A methodological approach. *Education and Information Technologies, 21*(5), 1299–1327. https://doi.org/10.1007/s10639-015-9383-7

[90] Shenkoya, T./Hwang, K.Y./Sung, E.H. (2023): Student Startup: Understanding the Role of the University in Making Startups Profitable Through University—Industry Collaboration. *SAGE Open, 13*(3), 21582440231198601. https://doi.org/10.1177/21582440231198601

[91] Shin, H./Sok, S./Hyun, K.S./Kim, M.J. (2015): Competency and an active learning program in undergraduate nursing education. *Journal of Advanced Nursing, 71*(3), 591–598. https://doi.org/10.1111/jan.12564

[92] Silveyra, G./Herrero, Á./Pérez, A. (2021): Model of Teachable Entrepreneurship Competencies (M-TEC): Scale development. *The International Journal of Management Education, 19*(1), 100392. https://doi.org/10.1016/j.ijme.2020.100392

[93] Smirnov, S./Dmitrichenkova, S./Dolzhich, E./Murzagalina, G. (2023): Entrepreneurial Competence Development Program: Implementing Efficiency through Knowledge Sharing. *Administrative Sciences, 13*(6), 147.https://doi.org/10.3390/admsci13060147

[94] Stagars, M. (2015): The Lean Startup Changed Everything. In: *University Startups and Spin-Offs* (pp. 15–27). Apress, Berkeley, CA. https://doi.org/10.1007/978-1-4842-0623-2_2

[95] Sturgis, C./Patrick, S./Pittenger, P. (2011): *It's not a matter of time: Highlights from the 2011 Competency-Based Learning Summit*. Retrieved from https://www.aurora-institute.org/wp-content/uploads/iNACOL_Its_Not_A_Matter_of_Time_full_report.pdf

[96] Sutanto, J.E./Kodrat, D.S./Christiani, N. (2021): Competency Based Training Entrepreneurship to Improve Student's Entrepreneur Mentality. *International Journal of Economics, Business and Management Research, 5*(10), 28–36.

[97] Thana, P.M./Adiatma, T./Ramli, R.B. (2022): Developing Students' 21st-Century Skills Through a Multidisciplinary Approach. *Journal Of Digital Learning and Distance Education, 1*(7), 277–283. https://doi.org/10.56778/jdlde.v1i7.64

[98] Tittel, A./Terzidis, O. (2020): Entrepreneurial competences revised: Developing a consolidated and categorized list of entrepreneurial competences. *Entrepreneurship Education, 3*(1), 1–35. https://doi.org/10.1007/s41959-019-00021-4

[99] Toronto MU (n.d): Kolb's Experiential Learning Cycle. https://www.torontomu.ca/experiential-learning/faculty-staff/kolbs-el-cycle/

[100] Walters, B./Potetz, J./Fedesco, H.N. (2017): Simulations in the classroom: An innovative active learning experience. *Clinical Simulation in Nursing*, *13*(12), 609–615. https://doi.org/10.1016/j.ecns.2017.07.009

[101] Wardana, L.W./Narmaditya, B.S./Wibowo, A./Mahendra, A.M./Wibowo, N.A./Harwida, G./Rohman, A.N. (2020): The impact of entrepreneurship education and students' entrepreneurial mindset: the mediating role of attitude and self-efficacy. *Heliyon, 6*(9). https://doi.org/10.1016/j.heliyon.2020.e04922

[102] Weber, J.W./Englehart, S.W. (2011): Enhancing business education through integrated curriculum delivery. *Journal of Management Development, 30*(6), 558–568. https://doi.org/10.1108/02621711111135161

[103] Weber, S./Funke, S. (2014): A research-and evidence-based entrepreneurship education program at Ludwig-Maximilians University (LMU), Munich. In *Becoming an entrepreneur* (pp. 177–195). Brill.

[104] Wong, S.-C. (2020): Competency Definitions, Development and Assessment: A Brief Review. *International Journal of Academic Research in Progressive Education and Development, 9*(3), Pages 95–114. https://doi.org/10.6007/IJARPED/v9-i3/8223

[105] Zehir, C./Gurol, Y./Karaboga, T./Kole, M. (2016): Strategic human resource management and firm performance: The mediating role of entrepreneurial orientation. *Procedia-Social and Behavioral Sciences, 235*, 372–381. https://doi.org/10.1016/j.sbspro.2016.11.045

[106] Zulfiqar, S./Sarwar, B./Aziz, S./Ejaz Chandia, K./Khan, M.K. (2019): An Analysis of Influence of Business Simulation Games on Business School Students' Attitude and Intention Toward Entrepreneurial Activities. *Journal of Educational Computing Research, 57*(1), 106–130. https://doi.org/10.1177/0735633117746746

Appendix 1. Lean Canvas. Source: Mauryia (2009)

Problem List your customers top 3 problems	**Solution** Outline possible solution for each problem	**Unique Value Proposition** Single, clear, and compelling message that turns an unaware visitor into an interested prospect	**Unfair Advantage** Something that can't be easily copied or bought	**Customer Segments** List your target customers and users
Existing Alternatives List how these problems are solved today	**Key Metrics** List key numbers telling how business is doing today	**High level concept** List your X for Y analogy (e.g. YouTube = Flickr for videos)	**Channels** List your path to customers	**Early Adopters** List the characteristics of your ideal customers.
Cost structure List your fixed and variable costs.		**Revenue Structure** List your sources of revenue		

Appendix 2. Team Canvas. Source: Ivanov/Voloshchuk (2015)

The Team Canvas

Version 1.0 | English | theteamcanvas.com

Most important things to talk about in the team to make sure your work as a group is productive, happy and stress-free

TEAM NAME _____ **DATE** _____

PEOPLE & ROLES
What are our names and the roles we have in the team?

GOALS
What we want to achieve as a group? What are our key goals that are feasible, measurable and time-bounded?

VALUES
What do we stand for? What are guiding principles? What are our common values that we want to be at the core of our team?

RULES & ACTION POINTS
What are the rules we want to introduce after doing this session? How do we communicate and keep everyone up to date? How do we make decisions? How do we execute and evaluate what we do?

PURPOSE
Why are we doing what we are doing in the first place?

PERSONAL GOALS
What are our individual personal goals?
Are there personal agendas that we want to open up?

NEEDS & EXPECTATIONS
What each one of us needs to be successful? What are our personal needs towards the team to be at our best?

STRENGTHS & ASSETS
What are the skills we have in the team that will help us achieve our goals? What are interpersonal/soft skills that we have? What are we good at, individually and as a team?

WEAKNESSES & DEVELOPMENT AREAS
What are the weaknesses we have, individually and as a team? What our teammates should know about us? What are some obstacles we see ahead us that we are likely to face?

The Team Canvas by TheTeamCanvas.com
Alexey Ivanov

Designing for Success: A Framework for Integrating Design Thinking into University Entrepreneurship Course*

*Blaž Zupan, Anja Svetina Nabergoj***

Abstract

This study examines how integrating design thinking into university courses can enhance entrepreneurial education. Interviews with educators and students from four pioneering European and U.S. institutions identify nine critical components for successful projects, grouped into environmental factors—mentoring, tools and spaces, external recognition—and process factors—interdisciplinarity, fieldwork, experimentation, and user-centred research. Project continuity is emphasised as a critical indicator of course effectiveness. These findings contribute to a framework that empowers educators to develop design thinking-based entrepreneurship projects and fosters impactful student learning experiences.

Keywords: entrepreneurship education, design thinking, constructivist pedagogy
JEL Codes: M13, O32, I23

1. Introduction

Entrepreneurship education at universities has seen significant growth over the past few decades. Initially, only a handful of institutions offered courses related to entrepreneurship in the 1970 s, but by 2005, this figure had surged to over 1,600. Action-based learning, which emphasises learning by doing, has become one of the most popular course delivery methods. Universities offer less classroom-focused activities and more hands-on experiences in group settings (Rasmussen/Sørheim 2006), aligning more closely with the dynamic nature of entrepreneurship.

Action-based entrepreneurship education, characterised by hands-on experiences and group collaboration, aligns with the problem-solving approach inherent in design thinking methodology. Therefore, it is unsurprising that design thinking has been increasingly introduced as a teaching methodology in entrepreneurship courses (Daniel 2016). Its integration aligns seamlessly with the overarching emphasis on experiential learning and the development of innovative mindsets (Linton/Klinton 2019). By embracing design thinking principles, educators can effectively bridge theory and practice, equipping students with the skills and mindset necessary to navigate the complexities of entrepreneurship in a

* Received: 29.2.24, accepted: 3.9.24, 3 revisions.

** *Blaž Zupan*, PhD, Assistant professor, School of Economics and Business, University of Ljubljana, Slovenia. Email: blaz.zupan@ef.uni-lj.si. Main research interests: design thinking, entrepreneurship education, entrepreneurial mindset, social entrepreneurship.
Anja Svetina Nabergoj, PhD, Associate professor, School of Economics and Business, University of Ljubljana, Slovenia. Email: anja.svetina@ef.uni-lj.si. Main research interests: user-centred innovation methods, design thinking in scientific research, building internal innovation capabilities within organisations.

dynamic business landscape. Research increasingly highlights the parallels between design and entrepreneurship (Sarasvathy 2004). Penaluna and Penaluna (2009) point to characteristics such as experiential learning, non-linearity, unpredictability, ambiguity, the development of mindsets, and response to constraints to illustrate analogous experiences of designers and entrepreneurs. Stanford University has defined design thinking as "*a catalyst for innovation and bringing new things into the world*" (Plattner/Meinel/Leifer 2011), and Brown (2008:1) has called it *"a methodology that imbues the full spectrum of innovation activities with a human-centred design ethos."*

The rapid advancement of technology, particularly artificial intelligence (A.I.), has transformed various sectors, including education (Chiu/Xia/Zhou/Chai/Cheng 2023) and entrepreneurship (Shepherd/Majchrzak 2022). Integrating design thinking into entrepreneurship education is seen as a method to foster creativity and innovation and equip students with essential IT-related skills. As students engage in design thinking, they inherently develop prototyping and user research skills, both fundamental in the tech industry. Students can gain hands-on experience with data analysis, machine learning, and automation by incorporating A.I. tools and techniques in design thinking projects, enhancing their technical proficiency and entrepreneurial capabilities.

Integrating A.I. into design thinking projects can also foster more innovative and effective solutions. For instance, A.I. can assist in gathering and analysing user data, identifying patterns, and predicting trends, enabling more informed decision-making and solution development. This integration prepares students for the technological demands of the modern entrepreneurial landscape and fosters a mindset that embraces technology as a facilitator of innovation.

Various studies support the role of design thinking in equipping students with IT-related skills. For example, Lynch, Kamovich, Longva, and Steinert (2021) highlight how combining technology and entrepreneurial education through design thinking enhances students' learning experiences and innovation capabilities. Similarly, Linton and Klinton (2019) argue that a design thinking approach in university entrepreneurship education fosters a deeper understanding of technology's role in solving complex problems.

Despite the increasing popularity of design thinking in entrepreneurship education, there remains a gap in understanding the specific mechanisms through which design thinking can be effectively applied within entrepreneurship courses. To address this gap, we conducted a comprehensive study involving in-depth interviews with educators and students from four prestigious European and U.S. institutions. These institutions were selected for their extensive experience and innovative initiatives incorporating design thinking into their entrepreneurship curricula.

Our study intentionally included Slovenia to represent Central and Eastern European (CEE) countries. Entrepreneurial education across Eastern Europe, including Slovenia, has rapidly evolved, drawing inspiration from successful approaches in Western Europe and the United States. The post-socialist transition in these countries introduced new economic systems, fostering the need for entrepreneurial skills as they shifted from state-controlled economies to market-driven ones. As a result, entrepreneurial education developed with a unique focus on addressing the challenges of economic transformation. Recent trends in Eastern European countries, including Slovenia, underscore the importance of integrating entrepreneurship into university curricula, focusing on fostering transversal skills such as digital literacy, initiative, and cultural awareness. In Slovenia specifically, there is a concerted effort to cultivate an entrepreneurial mindset among university students, emphasising practical skills for innovation and venture creation (Zupan/Svetina Nabergoj/Drnovšek 2014).

In our study, we sought to gain insights into design thinking-based projects in the context of entrepreneurship courses and identify the key components contributing to their success. Our analysis revealed several common elements shared among all projects, categorized into nine critical components. These span environmental components, such as mentoring, tools and spaces, and external recognition, which create a supportive ecosystem, and process components, such as interdisciplinarity, fieldwork, experimentation, and user-centred research, which directly impact the practical execution of the project. The presence of these components is essential for creating a conducive environment for student-led entrepreneurial endeavours.

2. Design Thinking as a Teaching Method within Constructivist Learning Theory

Constructivist Learning Theory (CLT) suggests that learning is an active process. Learners build their understanding and knowledge through experience and reflection. Grounded in the theories of Vygotsky and Piaget (Piaget 1954; Vygotsky 1978), CLT emphasises that knowledge acquisition is profoundly personal and interactive with the environment. This approach is aligned with methodologies that engage learners in real-world projects, enhancing essential higher-order thinking skills such as analysis, synthesis, and evaluation in entrepreneurship education.

Problem-Based Learning (PBL) and Action-Based Learning (ABL) are prominent educational strategies embodying the constructivist approach. PBL involves students in solving real-world problems and achieving specific learning outcomes that mirror professional situations they might face as entrepreneurs (Barrows 1986). ABL extends this by having students engage in and reflect on real-life activities, thus deepening their understanding of the subject matter through

active participation (Kolb 2014). Both methodologies are designed to prepare students for the complexities of real-world entrepreneurial roles, enhancing their readiness and adaptability to the dynamic business environment.

Design thinking is another emerging educational methodology that complements the principles of both PBL and ABL in the context of entrepreneurship education. It incorporates a creative, iterative process of problem identification and solution development, emphasising human-centred design and innovation—traits essential for successful entrepreneurship (Brown 2008). Design thinking was adopted by entrepreneurship faculty because it was seen as one of the most promising new teaching methodologies in entrepreneurship education (Neck/Greene 2011) as well as linked to successful learning outcomes when used in teacher training settings (Şahin/Sarı/Şen 2024). Its combination of creative and analytical processes makes it particularly effective in fostering both innovative thinking and problem-solving skills. It provides a structure for educators to creatively address complex, multifaceted educational problems, promoting intellectual risk-taking and open-ended problem-solving (Henriksen/Richardson/Mehta 2017).

The process of design thinking unfolds through several stages:

– Understanding: This initial phase involves observation and empathy, techniques that are essential for gathering deep insights about users' needs and experiences (Plattner et al. 2011).
– Defining Problems: This phase starts with surprising observations and quotes and engaging in inference and interpretation. Using tools such as Venn diagrams, scenarios, or storyboards, students formulate precise problem statements, clarifying the challenges that need solutions (Liedtka 2018).
– Generating Ideas: Ideation stages involve individual and team brainstorming and other divergent creative processes to create many potential solutions. They foster a broad exploration of possibilities and then proceed through the selection process to narrow down the solutions entering the next phase (Kelley/Kelley 2013).
– Prototyping: Developing tangible representations of ideas allows students to visualise solutions and explore their practicality through simple methods like sketching or more complex techniques such as 3D modelling (Seidel/Fixson 2013). The goal of prototyping is to explore multiple realities and bring solutions to life as if they existed to test them with users in the next phase.
– Testing: Based on feedback from users and other stakeholders, prototypes are critically evaluated for desirability. The solutions are then refined, making necessary adjustments to better meet user needs (Brown 2008), and tested for viability and feasibility before proceeding into the next development cycle.

This iterative nature of design thinking aligns with CLT by emphasising ongoing learning through experience and reflection, thus enhancing students' critical

thinking and problem-solving abilities. Moreover, design thinking encourages collaboration and interdisciplinary thinking, reflecting the social constructivist view that knowledge is co-constructed through interaction with others (Johnson/Johnson 1999).

Additionally, studies have shown that design thinking might influence entrepreneurial intentions in some contexts (Woraphiphat/Roopsuwankun 2023) and design thinking has also been shown to boost both entrepreneurship and intrapreneurship, as highlighted in a comprehensive literature review by Rösch, Tiberius, and Kraus (2023). Their review demonstrates that implementing design thinking enhances creativity, improves problem-solving capabilities, and increases entrepreneurial activity. Moreover, design thinking has been successfully applied to business model innovation, further underscoring its versatility and impact in driving innovation (You 2022).

While design thinking is increasingly being integrated into entrepreneurship education across various educational settings, it is essential to recognise the distinct context of university-level education. Unlike primary school settings, which often focus on foundational skills and creativity development, university-level entrepreneurship education operates within a more complex ecosystem. At the university level, students typically have more advanced cognitive abilities and are preparing for professional careers or entrepreneurial endeavours. Investigating how design thinking enhances entrepreneurship education at the university level is essential for gaining insights specific to the unique needs and goals of higher education institutions and their stakeholders. This understanding will also facilitate the continued advancement of design thinking as an effective pedagogical approach in entrepreneurship education.

3. Methodology

The research aimed to identify the components contributing to the success of a design thinking-based entrepreneurship project within university-level entrepreneurship courses. For our study, we conducted research across four higher education institutions spanning three countries. We selected educators who had recently mentored at least one entrepreneurship course that utilized design thinking and could recall at least one successful project. Similarly, we identified students who had participated in an entrepreneurship course based on design thinking methodology and had completed a course project.

Table 1 below presents the relevant project details. This study focuses on the dynamics of design thinking-based entrepreneurship projects, examining the specific features and processes that define these initiatives. Our primary objective is identifying core components contributing to their success. By doing so, we ensure that our framework is both theoretically sound and practically appli-

cable, providing educators with actionable insights for effectively structuring and supporting entrepreneurship projects within a university setting.

Our sampling approach combined purposive sampling techniques, incorporating critical case sampling and snowball sampling, which are typically employed in preliminary investigations of novel topics and prevalent in exploratory qualitative studies (Noy 2008). We adjusted the interview count based on the incremental contribution of new codes to our research. Acknowledging that purposive sampling allows for flexibility in determining sample sizes, the selected sample size is deemed sufficient for this study, as affirmed by Onwuegbuzie and Leech (2007) and as evident from additional codes gathered from the last three interviews. The research institutions where we conducted interviews were The University of Wales Trinity Saint David with six participants; The University of Ljubljana with four participants; Stanford University with one participant; and Cornell University with one participant. Interviews were selected as the data acquisition method to capture insights from individuals deemed knowledgeable and experienced in the researched topic, enabling the collection of rich and in-depth data about critical aspects of the research project. Table 2 provides details about the interviewees.

Table 1. Project details

Project	Country	Course duration (weeks)	Class size	Project team size	Teaching team size	Project area (industry)
1	Slovenia	14	50	3	2	Wireless ordering device for restaurants
2	U.K.	6	12	6	4	Hi-tech plush toys
3	U.K.	12	100	3	2	Artwork from recycled materials
4	Slovenia	14	50	5	2	Video production
5	U.K.	10	26	1	2	Furniture for children with disabilities
6	U.K.	12	25	5	3	N.A. (participant asked not to disclose information)
7	U.K.	14	30	2	2	Software
8	U.K.	12	35	1	1	Setting up a retail store
9	USA	3	11	1	3	Education
10	USA	12	25	5	1	Helping refugees – a social enterprise
11	Slovenia	6	40	3	2	Event planning
12	Slovenia	12	30	2	1	Mobile application

In-depth interviews, a commonly employed data collection method in qualitative research, were utilised for this study (Bogle 2008). These in-depth interviews facilitate a deep understanding of the subject matter from the participant's perspective through storytelling (Seidman 2013). The interviewing process aimed to minimise interviewer and situational influence to ensure credibility and accuracy in describing, concluding, explaining, and interpreting findings. Utilising nVivo

software, relevant data segments were coded, facilitating data organisation and retrieval. The iterative data analysis process involved constant reorganisation, exploration, and integration of the data, with the researchers identifying patterns and making connections. This iterative process continued until sufficient components in the framework were established, achieving researcher consensus. Throughout, emerging components were informed by frequent literature consultations.

Table 2. Participant description

Interview n.	Gender	Position	Background	Location	Interview Type	Interview length
1	Male	Student/ mentor	Business	Slovenia	In-person	65 min
2	Male	Student/ Mentor	Design	U.K.	In-person	34 min
3	Male	Senior faculty	Design	U.K.	In-person	41 min
4	Female	Student	Business	Slovenia	In-person	61 min
5	Male	Senior faculty	Design	U.K.	In-person	37 min
6	Male	Junior faculty	Industrial Design	U.K.	In-person	38 min
7	Male	Senior faculty	Arts	U.K.	In-person	56 min
8	Female	Student/Industry mentor	Arts	U.K.	In-person	44 min
9	Male	Junior faculty	Education	USA	Online	39 min
10	Female	Junior faculty	Anthropology	USA	Online	45 min
11	Male	Student	Business	Slovenia	In-person	61 min
12	Male	Senior faculty	Business	Slovenia	In-person	55 min

Inductive codes were assigned during the coding process, guided by insights from the transcribed text, resulting in two rounds of coding. Initially, we conducted an "as you go" coding approach while reviewing the interviews. Subsequently, all interviews underwent deductive coding based on the initial codes. During the secondary coding, three additional insights emerged, prompting a final analysis of the interviews and the coding of these insights. In the first coding round, 35 codes were identified and colour-coded based on shared characteristics. For example, phases and characteristics of the design thinking process were assigned one colour, while connections with the community and project outreach were assigned another. A total of 46 codes were assigned, with 12 excluded from the analysis due to limited sources. The remaining 34 codes were then logically integrated into nine components of the framework. Table 3 below is an example of one of these components, where six codes were combined to form a higher-level concept named the "Mentoring" component of the framework.

Table 3. Examples of codes which constitute the "Mentoring" component

Codes (inductive)	Number of sources	Number of references
External mentors at classes	5	6
External mentors – advisers	9	24
Guests	3	3
Professional collaborators	5	11
Role of mentors	12	48
Role of mentors after the course	4	6

The study adopts an integrated approach to analysing insights from both students and teachers to provide a holistic understanding of the factors contributing to the success of design thinking-based entrepreneurship projects. This approach allows us to capture the dynamic interchange between the educators' mentorship roles and the students' experiential learning. Combining these perspectives offers a more nuanced and comprehensive picture of the factors that drive project success. This integration ensures consistency and coherence throughout the analysis, maintaining the narrative flow while highlighting the interconnected associations between the various components of the educational environment. This technique not only preserves the integrity of the data but also enhances the depth of the findings, offering a more complete understanding of how design thinking impacts entrepreneurial education.

4. Results

The courses examined in this study were based on the design thinking teaching methodology with student-led projects following the five steps presented above. In all of them, the learning process unfolded dynamically and iteratively. Initially, professors introduced a problem field for exploration, or students presented problem fields of their interest, initiating the research process to deepen the understanding of the selected challenges. Through various methods, such as interviews and desktop research, students discerned which problems were worth addressing and for whom. Subsequently, armed with insights from their research, students refined existing ideas or generated novel solutions to tackle these identified challenges. The latter half of the analysed courses was dedicated to prototyping and testing these solutions, enabling students to gather constructive feedback from users. This feedback loop informed iterative improvements to their solutions, ensuring they were refined before final implementation. This structured approach fosters creativity and innovation and equips students with the practical skills needed to navigate the complexities of real-world entrepreneurial endeavours.

Each of the twelve projects uniquely combined design thinking and entrepreneurship education elements. However, we have identified several shared

commonalities among all projects, detailed in Table 4 and referred to as project components throughout this paper.

Table 4. Project components

Components		Number of specific examples (references)
1.	Meaningfulness of the project	70
Process components		
2.	Experimentation	59
3.	User-centred research	57
4.	Fieldwork	15
5.	Interdisciplinarity	17
Environmental components		
6.	Mentoring	89
7.	Tools and spaces	20
8.	External recognition	49
9.	Continuity	30

These interconnected components form the broad context in which learning takes place. However, these components manifested differently in each of the courses; for example, the tools and spaces used during the project work varied significantly based on the characteristics of each project. Some projects necessitated only basic prototyping materials like Post-it notes and a computer, while others demanded advanced machinery such as CNC machines. In subsequent chapters, we delve deeper into these components and aim to elucidate their roles with supporting literature.

4.1 Meaningfulness

Pursuing meaningful learning experiences is a cornerstone of student engagement and achievement (Assor/Kaplan/Roth 2022). In our study, we define "meaningfulness" as the extent to which students perceive their entrepreneurship projects as significant, relevant, and personally valuable. This concept encompasses several dimensions:

- Personal Relevance: Aligning the project with students' interests, values, and goals enhances their engagement and investment in the project.
- Impact and Purpose: The belief that the project will have a real-world effect, addressing genuine problems and contributing to meaningful change, thereby motivating students.
- Emotional Connection: The emotional investment students feel towards the project, including the satisfaction from tangible results and positive stakeholder feedback.
- Autonomy and Ownership: Students' sense of ownership and control over their projects fosters greater commitment and engagement.

The term "meaningfulness" was derived through in-depth interviews with students and educators, where participants frequently highlighted the importance of these dimensions in their descriptions of successful projects. The recurring themes of personal relevance, impact, emotional connection, and autonomy were identified as key factors contributing to the perceived meaningfulness of the projects.

As our investigation delves into diverse student projects, ranging from business endeavours to community initiatives, a central theme emerges -the profound sense of purpose guiding them. Beyond the confines of academic obligation or instructor directives, these students navigate their educational journey propelled by a deeper connection to their projects. In one of the projects, students were designing solutions for immigrants from Congo, and it resulted in a very personal and emotional experience with their users, as one of the participants observed concerning the interaction between students and their “customers”:

> *“… it was an emotional moment when they witnessed Congolese women hugging them [the students].” (Project number 10)*

This connection transcends mere academic pursuits, resonating with the principles of humanistic education theory, which emphasises the importance of personal relevance and intrinsic motivation in learning (Nehari/Bender 1978). In our exploration, we uncover a departure from the traditional educational paradigm, where educators dictate project choices, as students actively seek out and champion causes that hold personal significance. Through their autonomy and agency, students forge meaningful connections with their projects, fostering academic growth and emotional and empathetic bonds with the communities they serve. As exemplified by one educator's encouragement for students to identify and tackle real-world problems, our findings underscore the transformative potential of meaningful learning experiences in shaping the educational landscape. He stated:

> *“We encourage the students to just go out and identify problems.” (5)*

In certain instances, the lecturer provided the initial theme for the project challenge, although students were consistently encouraged to devise their solutions. One educator elucidated their approach to supporting students' ideas:

> *"It was just [an] idea, we said to them "take a risk", and we kind of told them what they could do originally with the tweeting, but then they started coming up with ideas.” (2)*

By empowering students to navigate their educational journey with purpose and autonomy, we not only align with the principles of humanistic education theory but also help change the educational paradigm. Through their active involvement in projects that hold personal significance, students make deeper connections with their learning, surpassing conventional academic restrictions to create meaningful impacts within their local or wider communities. It becomes

evident that supporting meaningful learning experiences is not only an educational aspiration but an important catalyst for empowering students to become active agents of change.

4.2 Process Factors

4.2.1 Experimentation Enhances Learning

Creative experimentation, which included iterative prototyping and testing, was used in all the projects, and all participants indicated that this was a vital part of the design process. Building and testing models through experimentation or prototyping have already received attention as an instructional approach to developing creativity. Schrage (1999) argues that creating models is essential to innovation and that creative improvisation, or 'serious play', is at the core of creative thinking. Experimentation through prototyping has been recognised as an effective creativity-based product development tool that encourages learning from failures (Thomke 1998).

With the use of simple yet concrete physical models, people quickly and in a much richer way communicate, give meaning, and create stories around what were previously intangible thoughts (Hadida 2013), as one student explained:

> *"Actually, the cardboard box, which you have in your hand, gives you the information and motivation to do something more advanced. The possibility of creativity increases." (1)*

Learning through failed tests is a planned way of lowering the risk of projects: experiencing setbacks early in the design process is relatively inexpensive, and designers become better at risk-taking (McGrath 2011). In entrepreneurial ventures, entrepreneurs, from failing, learn about themselves, their ventures, and the environment (Cope 2011). As one educator noted:

> *"They can actually do it, and if it fails, it does not really matter, so they are learning on the job." (8)*

Experimentation was necessary for other reasons as well. One reason was to motivate students to continue with their projects: "*Each prototype that we did was for me the motivation to continue*." (1) They often put in extra hours and developed the projects in their free time. Another reason is the use of prototyping tools. As several participants described, students became proficient in several contextually important skills: for instance, the use of prototyping software, machinery, photography, videography, and drawing. They also embraced risk-taking as a way of learning.

4.2.2 User-centred Research Builds Emotional Connections with the Users

As designing solutions to meaningful problems includes satisfying the individual needs of potential users, the design practice must be user- or human-centred.

To understand users, students used empathy, which "is the art of stepping imaginatively into the shoes of another person, understanding their feelings and perspectives, and using that understanding to guide your actions" (Krznaric 2014). This meant finding and engaging with users to understand them better, as one student noted:

> *"We talked to all of my friends who own bars or know someone who owns a bar." (1)*

Moreover, one senior professor said:

> *"There was a lot of observational studies, questionnaires, and just kind of fundamental sort of research." (5)*

Researchers have correlated empathy with cooperation, sharing, academic achievement, emotional intelligence, and educational outcomes (Salovey/Grewal 2005; Feshbach/Feshbach 2011). Empathy training through user-centred research, therefore, serves two goals. It enhances the quality of solutions and increases students' potential for academic achievement, emotional intelligence, and cooperation-based results.

4.2.3 Fieldwork Drives Authentic Learning

Fieldwork increases student engagement (Walsh/Larsen/Parry 2014), adds to students' personal and social development, and allows students to be socialised into their professions and careers (Nolinske 1995). Fieldwork is a common element of all projects, as one educator explained:

> *"We take a bus to their city, and we spend a day in their lives, in their homes, seeing their neighbourhood." (10)*

Students need to be moved into the field-based exploration mode because they can experience first-hand the role of the entrepreneur in an authentic context. By acting in a business context, students might also enhance their entrepreneurial intentions (Teixeira/Forte 2009). Fieldwork mainly was centred around user observation and testing the prototypes, using observation to collect data, as one student explained:

> *"We worked a lot outside of the university; the prototype was assembled from cardboard at home, the second prototype, a video, we filmed with a colleague in a restaurant." (1)*

Experimental fieldwork improves the quality of findings and the generalisability of results obtained by experimenting on a random population (List, 2011). As a result, the developed solution to a researched problem tested via fieldwork in an authentic environment might be commercially more successful.

4.2.4 Interdisciplinarity Boosts Creativity

Being an entrepreneur transcends several disciplines, and an educational environment connecting several disciplines is needed to successfully foster en-

trepreneurial competencies among students (Ochs/Watkins/Boothe 2001). One educator described the multidisciplinary composition of his class:

> *"I have engineers, computer scientists, and business students." (10)*

All projects employed an interdisciplinary team, directly through team members or indirectly through ad-hoc activities. According to the model of learning communities, enrolling students from different backgrounds to work on common assignments strengthens the social and intellectual connections between students (Zhao/Kuh 2004). Educators commented on the collaborative nature of work:

> *"There is a lot of peer-to-peer learning in a studio environment." (6) and "They even had the other teams use the product they created." (9)*

Interdisciplinarity played a significant role, as predicted by design thinking literature (Anderson 2012) and emphasised by research on the role of cultural and gender diversity in team success (Rock/Grant 2016).

4.3 Environmental Factors

4.3.1 Mentoring Enhances Entrepreneurial Learning

Mentors are essential in an entrepreneur's professional development as they influence their decision-making and identity development (Yitshaki 2024). The student respondents recognised this, and as one student explained:

> *"Without mentors, the project would not have even started in the first place. He gave us financial support and motivated us." (4)*

Mentors fluctuated in their level of involvement throughout the projects, sometimes highly engaged and at other times less active but still supportive. One mentor explained his role:

> *"Students are being proactive, and we react to what they need and adapt and change." (6)*

Mentors can be one-time guests, ongoing guides, or professionals brought in by the lecturer or the group. One group included mentors who acted as facilitators and were proficient in the process, though often outside the project's specific challenges. These mentors can be educators, lecturers, faculty members employed by the university, or guest mentors with a general knowledge of the process, such as entrepreneurs. One educator explained how the project was passed over to his colleagues at the university:

> *"So, my role here is to help start the project, which is then passed on to other people the university employs to help with more specific steps. I would set up meetings and bring relevant people who can help the most." (3)*

On the other hand, some mentors had project-specific knowledge and helped one or more groups, depending on the projects these groups were tackling.

Often, these mentors would come from partner companies or the school's alumni network, as one educator explained:

> *"We have a set of companies who come in and advise students, mainly through past student networks." (7)*

Mentoring contributes to the projects' success and the development of the protégé's careers by increasing their knowledge, prospects of high-paying positions, and job satisfaction.

4.3.2 Tools and Spaces Spark Innovation

Studies show that more playful approaches and environments in the classroom support the development of cognitive, social, emotional, creative and physical skills (Parker/Thomsen/Berry 2022). Furthermore, technologically enhanced learning environments significantly and positively affect student learning (Brooks 2011). In some cases, schools did not have sufficiently adaptable tools and spaces, so they had to blend different environments:

> *"We started the workshops in the computer science room, so we would always do the group sessions in the computer science room, but then the art stuff took place in the art department." (2)*

Numerous local communities have recognized the effectiveness of providing access to prototyping tools and spaces, often establishing 'maker spaces' or 'hacking spaces' in academic institutions and libraries. One educator described the space students can use:

> *"We have wood, metal, plastics, fibreglass, and plaster moulding facilities, glass processing facilities; we got access to 3D printing facilities as well and kind of general model making, Styrofoam, automotive styling bay." (5)*

Bringing together people from different backgrounds and diverse ways of thinking is highly encouraged to unlock creativity. To develop a novel synthesis, groups should consist of members with different specialities, which should be as loosely connected as possible. Also, an environment that provides feedback challenges novel solutions.

4.3.3 External Recognition Drives Motivation

One aspect of external recognition is creating an impact, where students' products are used in contexts outside their classroom, usually tied to the community's or industry's needs. This is an element of authentic learning environments, which, in the long term, also motivates students to pursue a particular activity later in their careers (Strobel/Wang/Weber/Dyehouse 2013). Looking for external recognition in an entrepreneurship class supports increasing entrepreneurial intentions and students' probability of becoming entrepreneurs. One student noted the reach of an event he developed as part of the course:

"The main confirmation was 130 visitors. This means that someone is willing to invest their time to come." (11)

Analysed projects exhibited high levels of faculty involvement; students would get a chance to present their work and receive comments from numerous faculty members, including those with no direct connection to the course. As one educator explained:

"They get a critique from a panel of staff, and it is not just product designers; there are normally at least two product designers, two automotive designers, and other staff would contribute as well." (5)

Several projects, especially those in which students were cooperating with an outside company, exhibited intensive cooperation efforts between the students and their industry partners, as one educator explained:

"At one point, we [students and the teaching team] went to Germany, where they presented their concepts to the whole industry team." (6)

Additionally, students had a chance to show their work at various local and national events and to the media, as these examples show:

"We have a public exhibition, which is held at the Waterfront museum. We also take that work up to New Designers in London." (5)

"We get really good coverage by the local media, local press. Sometimes even in the national press." (8)

External recognition manifested itself in various ways and was a persistent element of all analysed projects. It could be through media exposure, interest from industry peers, interest from users of their developed solution, attending public exhibitions, and the like.

4.4 Continuity Builds Real-World Impact

All projects described by participants continued beyond the class duration, individually or within a group, sometimes in the original class group or with a new team. One student recounted:

"After the course was finished, we decided to continue with the project." (4)

As they lost access to the university tools, spaces, and mentors, some students connected with companies to develop their projects further. One educator explained how his student cooperated with a company after the course was over and lost access to the product development tools and spaces she needed:

"...looking at how she can, in collaboration with that company, develop the product for commercial launch." (5)

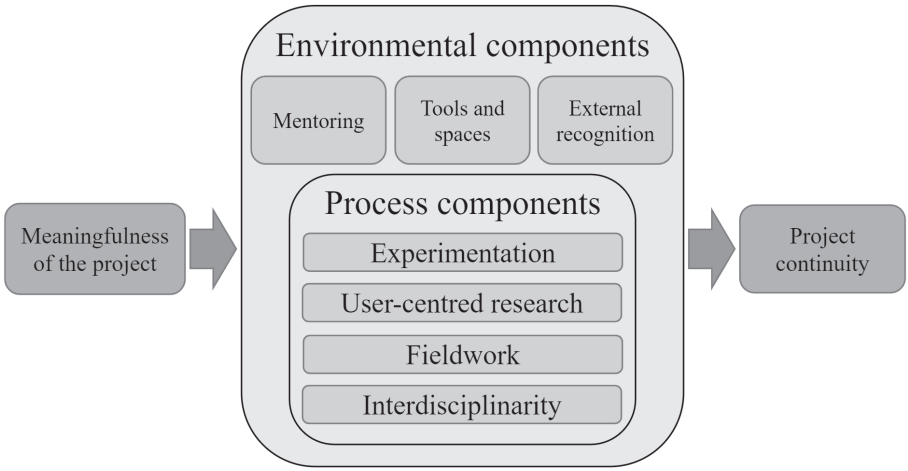
Continuity and meaningfulness are inherently linked, as projects imbued with meaning are more likely to persist beyond the class. In contrast, continuity in out-of-school settings enhances authenticity and deepens learning experiences.

Moreover, the ultimate validation for students in real-world settings lies in attracting paying customers to their projects. Many of the analysed projects acquired paying customers, which added additional motivation to continue the project after completing the course.

5. Discussion of results

Our research identified vital elements for the success of design thinking-based entrepreneurship projects. From these insights, we developed a framework of nine components that significantly enhance entrepreneurship education. Our framework suggests that successful projects share a specific trait, notably continuity. This ongoing nature is influenced by the project's inherent meaningfulness and a combination of nine components, categorized into environmental components and process components. The environmental components include mentoring, tools and spaces, and external recognition, while the process components include interdisciplinarity, fieldwork, experimentation, and user-centred research. As illustrated in Figure 1, these components together provide a comprehensive framework to support the success of an entrepreneurial project.

Figure 1. Framework for Design thinking-based entrepreneurship education



Environmental components, such as mentoring, access to resources, and external recognition, create a supportive ecosystem that boosts project quality and impact. Mentoring, for instance, offers not just guidance but crucial support in navigating the complexities of entrepreneurial endeavours, underscoring the vital role of mentors in entrepreneurship. Process components like interdisciplinarity, experimentation, and user-centred research impact the practical aspects of project execution. Interdisciplinarity encourages a creative and comprehensive

approach by incorporating diverse viewpoints, which is crucial for innovative solutions.

Meaningfulness is considered an input force or predictor variable. It is a fundamental component that drives students' engagement and motivation throughout the project. The design thinking methodology inherently fosters meaningfulness by emphasising empathy, real-world problem-solving, and user-centred research. These elements help students connect personally and purposefully with their projects, enhancing their commitment and the overall quality of their work. We, therefore, hypothesise that the design thinking process is instrumental in generating this sense of meaningfulness, making it a critical input variable in our model.

One significant finding from our study is that continuity could be an important indicator of a course's effectiveness. Projects beyond the classroom suggest greater engagement and commitment, which are keys to authentic entrepreneurial success. This observation supports educational theories which argue that meaningful learning extends outside academic settings into practical applications, thereby improving academic achievements and real-world outcomes.

We propose that specific process and environmental components—particularly experimentation, mentoring, user-centred research, external recognition, and project continuity—enhance a project's meaningfulness throughout its duration. Project continuity indicates a project's success and reflects the continuing influence of the educational experience on students. It shows that students are motivated and equipped with the necessary skills to continue their entrepreneurial projects. Thus, project continuity is a direct outcome of the effective integration of design thinking in entrepreneurship education.

By delineating meaningfulness as an input force driven by the design thinking methodology and project continuity as a key output factor, we provide a clearer understanding of their roles within our proposed framework. This distinction underscores the dynamic nature of our model, highlighting how design thinking not only initiates engagement and meaningfulness but also leads to sustained entrepreneurial efforts.

The confidence built through active, iterative learning processes typical of design thinking may lead to higher entrepreneurial intentions, demonstrating the method's potential to shape future entrepreneurs.

6. Implications

The proposed framework illustrates the connections among the project's nine components, suggesting that a project's continuity depends on both its process components—interdisciplinarity, fieldwork, experimentation, and user-centred research—and its environmental components—mentoring, tools and spaces, and

external recognition—as well as its inherent meaningfulness. Therefore, it is argued that this framework describes and, when implemented in project-based university-level entrepreneurship education, can significantly enhance the design of an effective design thinking-based learning experience. It methodically presents how effective project work can be structured, acknowledging that these findings are limited to the context of the empirical analysis conducted.

The primary practical implication is that integrating design thinking into course content and curriculum enhances entrepreneurship education. Our findings suggest that learning is enhanced under this model, and projects tend to continue beyond the formal course duration. This persistence may increase the likelihood that students will develop marketable products, making this framework a valuable addition to entrepreneurship courses aimed at producing actionable entrepreneurs.

Moreover, design thinking influences entrepreneurial intentions, which are crucial in the entrepreneurial process. Entrepreneurial intentions shape the initial conceptualisation of a business and influence its growth and success. Understanding the drivers that transform these intentions into actions can guide the creation of better support systems and educational offerings for aspiring entrepreneurs. Thus, improving design thinking pedagogy could better prepare students with the skills needed to launch successful ventures.

The findings of this study have significant implications for entrepreneurship educational policy, particularly in advocating for a greater emphasis on non-classroom-based learning. The demonstrated success of design thinking-based projects in fostering practical entrepreneurial skills suggests that traditional, classroom-focused methodologies may be less effective in preparing students for real-world entrepreneurial challenges. By highlighting the importance of process components such as fieldwork, user-centred research, and interdisciplinary collaboration, our study provides a compelling argument for entrepreneurship educational policies to shift towards more hands-on, project-based learning environments. This approach aligns with the dynamic nature of entrepreneurship and enhances student engagement and retention by making learning more meaningful and relevant. Therefore, policymakers should consider integrating and expanding non-class-based learning opportunities within entrepreneurship curricula to better equip students with the skills and mindsets necessary for successful venture creation and innovation in today's rapidly evolving business landscape.

7. Limitations and Future Research

The research is subject to biases and limitations inherent in the data collection instruments, analysis processes, and qualitative methodology. The absence of extensive prior research does not provide a standard template for framing the

research questions, methodologies, or analytical processes. Additionally, the sample included only university students and professors from four institutions whose unique jargon, working protocols, and specificities in utilising design thinking as a teaching methodology may affect data analysis and interpretation. This study does not aim to evaluate the quality of the analysed projects or courses or to assess their impacts on students. Nonetheless, researchers and readers must understand that multiple interpretations may arise in relativist inquiry.

The entrepreneurial culture in the USA, U.K., and Slovenia, which are part of this study, inherently influences the findings and their applicability. According to Hofstede's cultural dimensions, these countries exhibit specific traits. Slovenia is a highly individualistic society with much greater uncertainty avoidance than the U.K. or the USA, which can impact entrepreneurial behaviours and educational outcomes. Furthermore, Global Entrepreneurship Monitor (GEM) data highlights regional differences in entrepreneurial activities and education frameworks. As we present our concluding model, it is important to consider its transferability and recognise that it may not be universally applicable. The model's effectiveness could vary significantly in contexts where cultural dimensions and entrepreneurial ecosystems differ. Therefore, while our findings contribute valuable insights into integrating design thinking in entrepreneurship education, they should be adapted cautiously to fit diverse cultural and educational landscapes.

Acknowledging that the framework is a proposal and may be influenced by other unidentified variables is important. However, the constructivist learning approach and the relevant literature tentatively support the usefulness of the components outlined in our study. Still, further research is necessary to confirm their critical role in delivering quality entrepreneurial education. This research should extend to diverse cultural, organisational, and geographical contexts to assess the framework's generalizability and adaptability. Such studies will determine the robustness and broader applicability of the framework, ensuring it can be implemented beyond the initial study environment.

Developing standardised measures for the framework's components would greatly benefit course designers and educators. These metrics would enable detailed assessment and comparison of the components' contributions to the framework, facilitate empirical studies, and enhance the framework's practical utility.

Further testing of the propositions through qualitative and quantitative research is necessary to reaffirm the framework's validity. Future phases might include structural equation modelling to understand better which components effectively indicate project continuity. Moreover, incorporating the process and environmental components presented in our framework, such as teamwork, external recognition, experimentation, mentoring, and user-centred research, into entrepreneurship courses could enhance the meaningfulness of the educational

experience. Evaluating the relative importance of these components, among others, could provide valuable insights into enhancing course meaningfulness.

References

Anderson, N. (2012): Design thinking: Employing an effective multidisciplinary pedagogical framework to foster creativity and innovation in rural and remote education, in: Australian and International Journal of Rural Education, 22, 2, 43. https://doi.org/10.47381/aijre.v22i2.611

Assor, A./Kaplan, H./Roth, G. (2002): Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviours predicting students' engagement in schoolwork, in: British Journal of Educational Psychology, 72, 2, 261–278. https://doi.org/10.1348/000709902158883

Barrows, H.S. (1986): A taxonomy of problem-based learning methods, in: Medical education, 20, 6, 481–486. https://doi.org/10.1111/j.1365-2923.1986.tb01386.x

Bogle, K.A. (2008): Hooking up: sex, Dating, and Relationships on Campus. New York: NYU Press.

Brooks, D.C. (2011): Space matters: The impact of formal learning environments on student learning, in: British Journal of Educational Technology, 42, 5, 719–726. https://doi.org/10.1111/j.1467-8535.2010.01098.x

Brown, T. (2008): Design Thinking, in: Harvard Business Review, 86, 6, 84–92.

Chiu, T.K./Xia, Q./Zhou, X./Chai, C.S./Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. Computers and Education, in: Artificial Intelligence, 4, 100118. https://doi.org/10.1016/j.caeai.2022.100118

Cope, J. (2011): Entrepreneurial learning from failure: An interpretative phenomenological analysis, in: Journal of Business Venturing, 26, 6, 604–623. https://doi.org/10.1016/j.jbusvent.2010.06.002

Daniel, A. (2016): Fostering an entrepreneurial mindset by using a Design thinking approach in entrepreneurship education, in: Industry and Higher Education, 30, 215–223. https://doi.org/10.1177/0950422216653195

Feshbach, N.D./Feshbach, S. (2011): Empathy and Education, in: J. Decety & W. Ickes (ed.): The social neuroscience of empathy, Boston: MIT Press, 85-97. https://doi.org/10.7551/mitpress/9780262012973.003.0008

Hadida, A.L. (2013): Let your hands do the thinking! Lego bricks, strategic thinking and ideas generation within organisations, in: Strategic Direction, 29, 2, 3–5. https://doi.org/10.1108/02580541311297976

Henriksen, D./Richardson, C./Mehta, R. (2017): Design thinking: A creative approach to educational problems of practice, in: Thinking Skills and Creativity, 26, 140–153. https://doi.org/10.1016/J.TSC.2017.10.001

Johnson, D.W./Johnson, R.T. (1999): Making cooperative learning work, in: Theory into Practice, 38, 2, 67–73. https://doi.org/10.1080/00405849909543834

Kelley, T./Kelley, D. (2013): Creative confidence: Unleashing the creative potential within us all. New York: Crown Business.

Kolb, D.A. (2014): Experiential learning: Experience as the source of learning and development. Upper Saddle River: Pearson Education.

Krznaric, R. (2014): Empathy: Why it matters, and how to get it. New York: Perigee.

Liedtka, J. (2018): Why Design thinking works, in: Harvard Business Review, 96, 5, 72–79.

Linton, G./Klinton, M. (2019): University entrepreneurship education: a Design thinking approach to learning, in: Journal of Innovation and Entrepreneurship, 8. https://doi.org/10.1186/s13731-018-0098-z

List, J.A. (2011): Why economists should conduct field experiments and 14 tips for pulling one off, in: The Journal of Economic Perspectives, 25, 3, 3–15. https://doi.org/10.2139/ssrn.1915216

Lynch, M./Kamovich, U./Longva, K./Steinert, M. (2021): Combining technology and entrepreneurial education through Design thinking: Students' reflections on the learning process, in: Technological Forecasting and Social Change, 164, 119689. https://doi.org/10.1016/J.TECHFORE.2019.06.015

McGrath, R.G. (2011): Failing by design, in: Harvard Business Review, 89, 4, 76–83.

Neck, H.M./Greene, P.G. (2011): Entrepreneurship education: Known worlds and new frontiers, in: Journal of Small Business Management, 49, 1, 55–70. https://doi.org/10.1111/j.1540-627X.2010.00314.x

Nehari, M./Bender, H. (1978): Meaningfulness of a Learning Experience: A measure for educational outcomes in higher education, in: Higher Education, 7, 1, 1–11. https://doi.org/10.1007/BF00129786

Nolinske, T. (1995): Multiple mentoring relationships facilitate learning during fieldwork, in: American Journal of Occupational Therapy, 49, 1, 39–43. https://doi.org/10.5014/ajot.49.1.39

Noy, C. (2008): Sampling Knowledge: The hermeneutics of snowball sampling In qualitative research, in: International Journal of Social Research Methodology, 11, 4, 327–344. https://doi.org/10.1080/13645570701401305

Ochs, J.B./Watkins, T.A./Boothe, B.W. (2001): Creating a truly multidisciplinary entrepreneurial educational environment, in: Journal of Engineering Education, 90, 4, 577–583. https://doi.org/10.1002/j.2168-9830.2001.tb00642.x

Onwuegbuzie, A.J./Leech, N.L. (2007): Sampling designs in qualitative research: Making the sampling process more public, in: Qualitative Report, 12, 2, 238–254. https://doi.org/10.46743/2160-3715/2007.1636

Parker, R./Thomsen, B.S./ Berry, A. (2022): Learning through play at school – A framework for policy and practice, in: Frontiers in Education, 7. https://doi.org/10.3389/feduc.2022.751801

Penaluna, A./Penaluna, K. (2009): Creativity in business/business in creativity: Transdisciplinary curricula as an enabling strategy in enterprise education, in: Industry and Higher Education, 23, 3, 209–219. https://doi.org/10.5367/000000009788640314

Piaget, J. (1954): The construction of reality in the child. New York: Basic Books. https://doi.org/10.1037/11168-000

Plattner, H./Meinel, C./Leifer, L. (2011): Design thinking: Understand – Improve – Apply. Berlin: Springer Verlag. https://doi.org/10.1007/978-3-642-13757-0

Rasmussen, E./Sørheim, R. (2006): Action-based entrepreneurship education, in: Technovation, 26, 185–194. https://doi.org/10.1016/J.TECHNOVATION.2005.06.012

Rock, D./Grant, H. (2016): Why diverse teams are smarter, in: Harvard Business Review, 4, 4, 2–5.

Rösch, N./Tiberius, V./Kraus, S. (2023): Design thinking for innovation: context factors, process, and outcomes, in European Journal of Innovation Management, 26, 7, 160–176. http://dx.doi.org/10.1108/EJIM-03-2022-0164

Şahin, E./ Sarı, U./ Şen, Ö.F. (2024). STEM professional development program for gifted education teachers: STEM lesson plan Design competence, self-efficacy, computational thinking and entrepreneurial skills, in: Thinking Skills and Creativity, 51, 101439. https://doi.org/10.1016/j.tsc.2023.101439.

Salovey, P./Grewal, D. (2005): The science of emotional intelligence, in: Current Directions in Psychological Science, 14, 6, 281–285. https://doi.org/10.1111/j.0963-7214.2005.00381.x

Sarasvathy, S.D. (2004): Making it happen: Beyond theories of the firm to theories of firm design, in: Entrepreneurship Theory and Practice, 28, 6, 519–531. https://doi.org/10.1111/j.1540-6520.2004.00062.x

Schrage, M. (1999): Serious play: how the world's best companies simulate to innovate. Boston: Harvard Business Press.

Seidel, V.P./Fixson, S.K. (2013): Adopting Design thinking in novice multidisciplinary teams: The application and limits of Design methods and reflexive practices, in: Journal of Product Innovation Management, 30, 19–33. https://doi.org/10.1111/jpim.12061

Seidman, I. (2013): Interviewing as qualitative research: A guide for researchers in education and the social sciences. New York: Teachers College Press.

Shepherd, D.A/Majchrzak, A. (2022): Machines augmenting entrepreneurs: Opportunities (and threats) at the Nexus of artificial intelligence and entrepreneurship, in: Journal of Business Venturing, 37(4), 106227. https://doi.org/10.1016/j.jbusvent.2022.106227

Strobel, J./Wang, J./Weber, N.R./Dyehouse, M. (2013): The role of authenticity in design-based learning environments: The case of engineering education, in: Computers & Education, 64, 143–152. https://doi.org/10.1016/j.compedu.2012.11.026

Teixeira, A.A./Forte, R.P. (2009): Unbounding entrepreneurial intents of university students: a multidisciplinary perspective. Porto: Universidade do Porto, Faculdade de Economia.

Thomke, S.H. (1998): Managing experimentation in the design of new products, in: Management Science, 44, 6, 743–762. https://doi.org/10.1287/mnsc.44.6.743

Vygotsky, L.S. (1978): Mind in society: The development of higher psychological processes, Harvard University Press, Massachusetts.

Walsh, C./Larsen, C./Parry, D. (2014): Building a community of learning through early residential fieldwork, in: Journal of Geography in Higher Education, 38, 3, 373–382. https://doi.org/10.1080/03098265.2014.933402

Woraphiphat, I./Roopsuwankun, P. (2023): The impact of online Design thinking-based learning on entrepreneurial intention: The case of vocational college, in: Journal of Innovation and Entrepreneurship, 12, 1, 10. https://doi.org/10.1186/s13731-023-00278-z

Yitshaki, R. (2024). Advice seeking and mentors' influence on entrepreneurs' role identity and business-model change, in: Journal of Small Business Management, 1–41. https://doi.org/10.1080/00472778.2024.2307494

You, X. (2022): Applying Design thinking for business model innovation, in Journal of Innovation and Entrepreneurship, 11, 59. https://doi.org/10.1186/s13731-022-00251-2

Zhao, C.M./Kuh, G.D. (2004): Adding value: Learning communities and student engagement, in: Research in Higher Education, 45, 2, 115–138. https://doi.org/10.1023/B:RIHE.0000015692.88534.de

Zupan, B./Svetina Nabergoj, A./Drnovšek, M. (2014): Action-based learning for millennials: Using Design thinking to improve entrepreneurship education, in: Innovative Business School Teaching, Routledge, 128–138. https://doi.org/10.4324/9780203113684