

# The Role of Challenge Based Learning in Improving the Entrepreneurial Mindset of Students: A Case Study

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The article highlights the influence of various elements of entrepreneurial education on students' entrepreneurial mindset. A case study of teaching entrepreneurship at GEA College – Faculty of Entrepreneurship (Entrepreneurship Programme), Slovenia, which has been investing for years in innovative forms of teaching entrepreneurship with an emphasis on challenge-based learning, is presented. We used a longitudinal qualitative research approach to analyse challenge-based learning interventions and progress of the students' entrepreneurial mindset. A longitudinal analysis was conducted between 2017 and 2020. The results showed that the third-year students provided more solution proposals compared to first- and second-year study students. Their solutions to the problems the company faced in the case study were more multidisciplinary, interconnected and they showed more maturity and comprehensiveness of the overview of the situation. Students in the third year also showed a higher degree of entrepreneurial mindset. Our results confirmed existing studies that challenge-based learning activities positively impact the entrepreneurial mindset and opens a new area of research on the connection between the study curriculum, challenge-based learning interventions, and the entrepreneurial mindset of students. We cannot generalize the results more widely, but they can represent good practice for entrepreneurship faculties in planning their curriculum.

[12]

## INTRODUCTION

Currently, entrepreneurship is a priority for economic, social, and technological growth. Therefore, the interest in understanding entrepreneurship processes has increased significantly (López-Núñez et al. 2022). An important part of developing entrepreneurial competencies is an entrepreneurial mindset. The entrepreneurial mindset is seen as a way of adaptable thinking and decision-making in complex, uncertain and dynamic environments (Naumann 2017), as the ‘ability to rapidly sense, act, and mobilize, even under highly uncertain conditions’ (McGrath and MacMillan 2000, 15) and a way of thinking or the ability to utilize opportunities under uncertain conditions (Cui, Sun, and Bell 2021).

For a deeper understanding of the construct of the entrepreneurial mindset, we need to understand the factors that influence it. An overview of the state-of-the-art in research on entrepreneurial mindset has shown seven attributes and associated qualities influencing entrepreneurial mindset: cognitive tuning and goal orientation, heuristic-based decision logic, alertness, prior knowledge, social interaction, meta-cognition, and cognitive adaptability (Naumann 2017). Within these attributes, we are mainly interested in the prior knowledge attribute, which focuses on the quality of using abstract knowledge in different situations and for different purposes and is influenced by experience, education and knowledge (Naumann 2017). Out of these, we will especially focus on education and knowledge.

Studies in this field have shown that education has a positive effect on the entrepreneurial mindset (Saadat et al. 2021). Here, the quality of education and the added value that students take away from education are important. The research in this area confirms that learning based on different challenges, connected with practice, has a positive effect on the perception of knowledge and the building



of students' competencies (Salomon 2008; Rutkienė and Tandzegolskiene 2015; Pech, Řehoř, and Slabová 2021).

GEA College – Faculty of Entrepreneurship (Slovenia) can be an example of good practice in developing the entrepreneurial mindset of students through an adapted study process, which is largely based on challenge-based learning (Nichols, Cator, and Torres 2016). Moreover, it is also the key reason the faculty has exhibited good practice in teaching entrepreneurship within the HEInnovate initiative. In addition to practically oriented lectures and exercises, the study process includes case studies, presentations of business ideas, guests from practice, excursions to companies, student competitions and many other activities that help to strengthen the entrepreneurial mindset among students (OECD 2021).

[13]

The purpose of this paper is to check the progress of students in the context of an entrepreneurial mindset regarding different interventions connected with challenge-based learning, as well to highlight the importance of education in building the entrepreneurial mindset of students – especially the various interventions (challenge-based learning) that are carried out during the study, and to highlight those interventions that have the most significant impact on the progress of the entrepreneurial mindset of students.

## LITERATURE REVIEW

### *Entrepreneurial Mindset*

Entrepreneurs think differently from non-entrepreneurs, and when making different decisions in an uncertain environment, they use an approach that is recognized as an entrepreneurial way of thinking – entrepreneurial mindset (Hisrich, Peters, and Shepherd 2017). The entrepreneurial mindset is seen as a way of adaptable thinking and decision-making in complex, uncertain and dynamic environments (Naumann 2017), the ability to rapidly sense, act, and mobilize, even under highly uncertain conditions (McGrath and MacMillan 2000) and a way of thinking or the ability to use opportunities under uncertain conditions (Cui, Sun, and Bell 2021).

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[14] fluencing entrepreneurial mindset: cognitive tuning and goal orientation, heuristic-based decision logic, alertness, prior knowledge, social interaction, meta-cognition and cognitive adaptability (Naumann 2017). If we simplify the model, we can say that an individual with a high level of entrepreneurial mindset must be goal-oriented, determined, flexible, trained and involved in the social network. These attributes are more visible from the outside, and they can also be measured. Less visible attributes are metacognition and cognitive adaptability, which are more difficult to measure, as Naumann (2017) also points out.

Another piece of research that included a review of the literature on entrepreneurial mindset found that three distinct aspects have arisen through the years: the entrepreneurial cognitive aspect-how entrepreneurs use mental models to think; the entrepreneurial behavioural aspect-how entrepreneurs engage or act for opportunities; and the entrepreneurial emotional aspects-what entrepreneurs feel in entrepreneurship (Kuratko, Fisher, and Audretsch 2021). According to this model, we could say that an individual with a high level of entrepreneurial mindset has a high level of cognitive ability, is adaptable and is also emotionally mature. It is always a combination of all three attributes, some of which prevail more, some less while it is important that the individual tries as best as possible to make use of those attributes that characterize them the most.

The background idea of the entrepreneurial mindset is that everyone, not just entrepreneurs, can act entrepreneurially. It is as much a state of mind as competence or skill. It is a form of proactive, flexible, innovative and multidisciplinary action in all areas, not just in business. An entrepreneurially oriented student has greater chances of getting a job; an entrepreneurially oriented employee will be more productive at work; and an organization with entrepreneurially oriented employees will be more successful and efficient.

### *Entrepreneurial Education*

Various studies have found that entrepreneurial education, which promotes an entrepreneurial mindset, plays a significant role in



the economy and in increasing economic growth. Entrepreneurship graduates are the main players in the dynamism and flexibility of business environments (O'Connor 2013). Entrepreneurial skills and competencies are increasingly essential elements of entrepreneurial economics (Muñoz, Mosey, and Binks 2011).

[15]

Suppose we draw an analogy with the entrepreneurial mindset and the thesis that the entrepreneurial mindset is not reserved only for entrepreneurs, but for all entrepreneurially oriented individuals. Moreover, we can say that entrepreneurial education is not only intended for entrepreneurs, but also for all entrepreneurially oriented individuals. Research also supports the latter. Entrepreneurship education is increasingly being seen not only as the preserve of the selected few with entrepreneurial ideas, but also relevant to a wider range of students in higher education (O'Brien, Cooney, and Blenker 2019).

The research found that entrepreneurship education had a positive impact on the entrepreneurial mindset (Ssadat et al. 2021) and on stimulating students' entrepreneurial inspirations (Cui, Sun, and Bell 2021). Furthermore, Pirhadi, Soleimanof, and Feyzbakhsh (2021) proposed that developing entrepreneurial skills and character in students can help to effectively develop the ability to assess the desirability and feasibility of entrepreneurial opportunities, thus developing their entrepreneurial mindset. Entrepreneurship education positively affects the development of students' creativity by solving problems, communication skills, and opportunity identification (Muñoz, Mosey, and Binks 2011).

The study of cognitive mechanisms, such as learning and education and their interactions with the individual's existing knowledge, constitute one of the most important pieces of the opportunity identification puzzle (Corbett 2007), which can also be applied to entrepreneurship education. Entrepreneurship education increases the performance level of dimensions such as attitude, knowledge, and skills and therefore, entrepreneurship is chosen as a career path (Kozlinska 2012).

Various studies emphasize that the entrepreneurial approach must also find its place in education. Modern universities should

[16] take an entrepreneurial approach to become a place where entrepreneurship education plays the main role (Gibb 2007). Other research highlights the importance of developing an entrepreneurial ecosystem tailored to the needs of the students to complement entrepreneurship education (Olutuase et al. 2018). Universities provide entrepreneurship-specific education to equip students with the entrepreneurial alertness and risk-taking assets required to pursue entrepreneurial careers (Solesvik et al. 2013). A systematic literature review of curricula contents and teaching methods has shown that entrepreneurship education is widely supported to produce opportunities for developing young and emerging entrepreneurs (Sierlkhatim and Gangi 2015).

Successful universities combine theory and practice in their curricula. A good theory is a basis for practical engagement, and testing the theory in practice and its constant addition enables the construction of a better theory. The research points out that effective entrepreneurship education should provide students with the theoretical grounding and knowledge about entrepreneurship and should enable students to engage with practical experiences where this knowledge can be critically applied to develop practical entrepreneurial skills (Bell and Bell 2020).

Research shows that practical education in entrepreneurship is becoming more and more relevant. Engaging with practical projects can lead students to develop their self-efficacy under the tangible achievements of this type of practical activity (Nowinsky et al. 2019). Practical entrepreneurship education activities focusing on creating value can support students in identifying entrepreneurial opportunities (Lackéus 2020).

### *Challenge-Based Learning*

The quality of education largely depends on the methods universities use to learn entrepreneurship. Many methods have varying degrees of success in building entrepreneurial competencies and entrepreneurial mindset.

Studies have shown that studying helps in the development of an entrepreneurial mindset (Nauman 2017; Saadat et al. 2021), but



different interventions within the study contribute differently to its development. The research highlights that engagement with business simulations and entrepreneurial scenarios (Avramenko 2012; Solomon 2008), presenting and pitching entrepreneurial ideas (Bliemel 2013), studying entrepreneurship case studies (Chang et al. 2014), and learning from role models and guest speakers can all have a positive impact on the entrepreneurial mindset of students (Saadat et al. 2021). We can further connect all the mentioned interventions into a single concept known as challenge-based learning.

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Challenge-based learning can be defined as a growing approach in education and has been promoted as a means for students to align the acquisition of disciplinary knowledge with the development of transversal competencies while working on authentic and sociotechnical societal problems (Nichols and Cator 2008; Nichols, Cator, and Torres 2016). Further, this flexible approach frames learning with challenges using multidisciplinary actors, technology-enhanced learning, multi-stakeholder collaboration and an authentic, real-world focus (Gallagher and Savage 2020). In particular, the real-world focus has a special added value in this approach, as students can face problems from real (business) life during their studies.

The systematic review of challenge-based learning literature (Gallagher and Savage 2020) has underlined that the most common eight emerging themes arising from the exploration of challenge-based learning research definitions were the following: global themes, real-world challenges, collaboration, technology, flexibility, multidisciplinary and discipline specificity, challenge definition, creativity and innovation (Gallagher and Savage 2020).

According to Rutkienė and Tandzegolskiene (2015), knowledge and skill acquisition varies considerably depending on the teaching method. Students achieve the lowest knowledge and skill acquisition in the traditional lecture, namely only 5%. This is followed by reading (10%), followed by video and audio content (20%), project presentations (30%) and group discussions (40–50%). Students achieve the greatest knowledge and skill acquisition in practical activities and case studies (75%) and learning through consul-

tations and personal experiences (90%) (Rutkienė and Tandzegolskiene 2015).

[18] The study, conducted among master's degree students at the University Politecnico di Torino, Italy, and involving 127 students who answered the questionnaires administered before and after participation in the challenge-based program, has demonstrated a positive and significant effect of challenge-based learning programmes on the entrepreneurial mindset and skills of students, especially in financial literacy, creativity, and planning (Colombelli et al. 2022).

Other studies in this area focused on specific aspects of challenge-based learning. A survey of entrepreneurship education at George Washington University (USA), conducted among 279 respondents, has shown that the most popular type of teaching method in entrepreneurship courses offered by colleges and universities was the creation of the business plan, followed by class discussions, guest speakers, case studies and lectures by business owners (Solomon 2008).

Furthermore, a survey among 214 students from the University of South Bohemia in České Budějovice, aimed to find out what teaching methods related to entrepreneurship would be welcomed by management students. The results demonstrated that traditional teaching methods were ranked last, such as essays and seminars, focusing on theoretical knowledge. Active teaching methods, which included business simulators, role-playing, and special projects where students can connect their knowledge to practice, were ranked best. These methods can also support students in running their businesses and eliminate the fear of failure. A modern approach to teaching and using new methods is exciting and stimulating for students (Pech, Řehoř, and Slabová 2021). Hence, a study conducted in Switzerland showed that active approaches to education (games, simulations) are suitable for developing critical thinking and motivation (Gatti, Ulrich, and Seele 2019).

GEA COLLEGE – FACULTY OF ENTREPRENEURSHIP  
GEA College – Faculty of Entrepreneurship (from Slovenia) can be an example of good practice in developing students' entrepreneurial



mindset through an adapted study process and different challenge-based learning interventions. Besides practically oriented lectures and exercises, the study process includes case studies, presentations of business ideas, guests from practice, excursions to companies, competitions and many other activities that help strengthen students' entrepreneurial mindset. GEA College – Faculty of Entrepreneurship is a part of HEInnovate (a self-reflection tool for Higher Education Institution), an initiative of the European Commission in partnership with the OECD. It works as a self-reflection tool for Higher Education Institutions that wish to explore their innovative potential. The project aims to help governments and higher education institutions (HEIS) enhance the employment outcomes of graduates by better aligning higher education provision and labour markets. GEA College – Faculty of Entrepreneurship is actively participating in the project to display good examples and learn about the innovation of other HEIS to inspire innovation potential. In 2021, GC was invited and participated in providing good practices in the HEInnovate Country Review (OECD 2021).

[19]

The mentioned report, in connection with GEA College – Faculty of Entrepreneurship, in particular focused on delivering market-oriented skills and the necessity of cooperation with a network of public and private partners, practically oriented education, collaboration with external stakeholders, activities of the Career Centre, and providing entrepreneurship support through business incubator and collaboration with companies (e.g., Student challenge competition). GEA College – Faculty of Entrepreneurship has a long tradition of promoting an entrepreneurial mindset in Slovenia, both among young people (through entrepreneurial workshops in high schools, the Young Entrepreneur competition, and so on) and among adults. Students learn entrepreneurial skills through various practical activities, such as elective courses dedicated to entrepreneurship, but also from lectures delivered by entrepreneurial guest speakers, visits to companies, problem-solving challenges and teaching methods intended to encourage an entrepreneurial mindset. The GEA College focuses on entrepreneurial teaching and learning in various programmes, including lifelong learning activ-

[20] ities, a MSc, a new and dedicated MBA, as well as an undergraduate BSc Entrepreneurship degree. Offered by its Faculty of Entrepreneurship, this three-year BSc Entrepreneurship programme uses a variety of teaching approaches, including seminars, case studies, workshops, presentations, group discussions and project work. It offers both mandatory and elective courses that provide comprehensive coverage of entrepreneurship and can be completed by presenting a diploma thesis or a degree examination on solving an entrepreneurial challenge (OECD 2021).

#### RESEARCH PROBLEM AND METHODOLOGY

With the research, we wanted to find out which elements of entrepreneurial education have the most positive effect on the entrepreneurial mindset of students of Entrepreneurship at GEA College – Faculty of Entrepreneurship. We formulated the following research question: To what extent do different interventions in challenge-based learning influence the students' entrepreneurial mindset?

We used a longitudinal qualitative research approach to gather the data for answering the research question:

- 1 We prepared the curricula and designed challenge-based learning interventions students encountered during their studies. To test the challenge-based learning interventions, we used the curriculum of core and elective courses of the Entrepreneurship programme (table 2).
- 2 To test progress in the students' entrepreneurial mindset, we used the method of solving a case study. We created a longitudinal analysis tracking progress in solving the case study in all three years of study (table 3).
- 3 We analysed the qualitative data – the open coding method (Creswell, Hanson, and Morales 2007)

Using the open coding method, we performed a complex content analysis (Krippendorff 2021) of all solved case studies. The first step in the process was an overview of all case studies done by students and counting the number of all given solutions (table 3). The sec-



## The Role of Challenge Based Learning

TABLE 1 Presentation of Codes and Code Groups

Codes	Code groups
Cost reduction	Finance
Acquisition of new capital	
Credit reprogramming	
Obtaining new credit	
Retention of existing customers	Marketing
Diversification into other industries	
Additional marketing activities	
Social networking	
Analysis and control of operations	Management
Delegation of decision-making	
Business reorganization	
Outsourcing of external consultants	
Sale, relocation or liquidation of the company	Strategy
Creating a business plan and long-term strategy	
Reducing the volume of business	
Search for strategic partners	
Reorganisation of production	Production
Relocation of production abroad	
Outsourcing of production	
Reduction in production volume	
Agreement with existing suppliers	Supply chain
Expanding the range of suppliers	
Reorganisation of the supply chain	
Optimisation of inventory management	

[21]

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ond step was coding. We created codes based on the substantive proposals that the students provided as solutions to the problems and challenges faced by the company. We identified 40 codes, which we segmented into 10 groups. The codes and groups are presented in table 1.

Through a combination of theory in the field of entrepreneurial mindset (Hisrich, Peters, and Shepherd 2017; Naumann 2017; Cui, Sun, and Bell 2021; Kuratko, Fisher, and Audretsch 2021) and our own analysis, we identified three indicators with which we evaluated the solutions of the case studies for each class and for each academic year: the multidisciplinary of the proposals, the connectivity of

TABLE 1 *Continued from the previous page*

Codes	Code groups
Agreement with existing customers	Sales
Reducing product prices	
Introducing additional discounts	
Sale through advance payment	
Legal protection of company interests (patents, models, brands)	Law
Study of legal possibilities of strategic alliances	
Study of the possibility of status trans. of the company	
Examination of the possibility of liquidation of the company	
Staff reorganisation	Human resources
Additional employment of competent personnel	
Reducing the number of employees	
Establishing incentive rewards	
Preparation of a digital strategy	Informatics (digitalisation)
Raising digital competences	
Digitization of basic business processes	
Digitization of marketing	

the proposals and the comprehensiveness of the overview of the situation. All indicators are directly or indirectly related to all key characteristics of an entrepreneurial mindset (Naumann 2017): cognitive tuning and goal orientation, heuristic-based decision logic, alertness, prior knowledge, social interaction, meta-cognition and cognitive adaptability. They can also be linked to three aspects of entrepreneurial mindset (Kuratko, Fisher, and Audretsch 2021), whereby the multidisciplinary indicator is more analogous to the entrepreneurial cognitive aspect, the connection indicator is more analogous to the entrepreneurial behaviouristic aspect, and the integrity indicator is more analogous to the entrepreneurial emotional aspect.

The quality of the proposals was evaluated with a qualitative method by three different evaluators. We rated the indicators on a scale from 1 to 5, where 1 means low, 2 sufficient, 3 average, 4 good and 5 excellent. An evaluator read each solved case study of every student and rated it against the three indicators: the multidisciplinaryity of the proposals, the connectivity of the proposals and the



TABLE 2 Review of Curricula and Challenge-Based Interventions in all Three Years of Study

Item	1st year	2nd year	3rd year
Number of core courses in which students (individually or in a team) create and present practical project work	In 5 out of 8 compulsory courses, besides homework, exercises and case studies, there is also practical project work.	In 5 out of 8 compulsory courses, besides homework, exercises and case studies, there is also practical project work.	In both compulsory courses, besides homework, exercises and case studies, there is also practical project work.
Number of elective courses in which students (individually or in a team) create and present practical project work	Of the elective courses offered in the studied years (8 in 2017–2018, 7 in 2018–2019, and 11 in 2019–2020), all included practical project work that students had to prepare and present, either individually or in a team.		
Number of guests (managers, entrepreneurs, scientists) from practice	10	15	15
Number of company excursions	2	2	3

[23]

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comprehensiveness of the overview of the situation. Finally, we calculated the average of all three indicators for each year of study for every academic year (table 4).

### *Curricula and Interventions*

We analysed the curricula of the core and elective courses of the Entrepreneurship program (1st Bologna level, bachelor’s degree), in all three years of study. Through lesson plans and other supporting information, we designed challenge-based learning interventions that students encounter during their studies.

### *Testing Progress through Solving a Case Study*

In order to test the impact of various interventions on the progress of students’ entrepreneurial mindsets, we conducted a longitudi-

TABLE 2 *Continued from the previous page*

Item	1st year	2nd year	3rd year
[24] Challenge-based interventions according to year of study	(1) Introductory course: ABC of entrepreneurship. (2) A test of measuring entrepreneurial competences.	(1) Student challenge project (practical business case: team preparation and presentation). (2) Planning Company Growths – practical business case for growing company: team preparation and presentation. (3) Solving Entrepreneurial Challenges (for students who choose diploma exams instead of a diploma). (4) Mandatory internship in the company.	(1) Business Plan (practical business case for the startup: team preparation and presentation). (2) Planning Company Growths – practical business case for growing company: team preparation and presentation. (3) Solving Entrepreneurial Challenges (for students who choose diploma exams instead of a diploma). (4) Mandatory internship in the company.
Common interventions	(1) Participation in the activities of GEA Top Talents (tailored programme for gifted students). (2) The possibility of inclusion in a business incubator (development and realisation of a business idea with the help of mentors and expert consultants). (3) Participation in career centre activities. (4) Participation in the activities of the International Office (Erasmus mobility).		

nal analysis of solving the case study in all three years of study (1st Bologna level, Entrepreneurship programme). Students solved the same case study at the beginning of the 1st year, at the end of the 2nd year and at the end of the 3rd year. We analysed three academic years studied: 2017–2018, 2018–2019 and 2018–2020. From the differences in their answers at certain points in time, we determine their progress in the development of an entrepreneurial mindset and which interventions in each year had the most impact on said progress. The aim of the examination is to determine whether students show newly gained knowledge when advancing to a higher year. The successful solution of a business case requires the acquisition of competencies that are defined in the curricula of the Entrepreneurship programme,

The results of the measurement analysis show a student’s progress in entrepreneurship skills, understanding of the financial as-



TABLE 3 Number of Case Study Participants and Number of Proposals per Student by Year of Study and Academic Year

Academic year	Case study participants				Proposals per student		
	1st	2nd	3rd	Total	1st	2nd	3rd
2017–2018	19	19	11	49	4.4	6.1	8.9
2018–2019	14	14	26	54	5.1	7.6	8.4
2019–2020	52	13	20	85	4.2	7.5	9.9

[25]

pects of business and business growth, management and understanding of business strategies, and also the student’s ability to connect knowledge from different subjects and thus, also their analytical skills.

The case study referred to a real case of a transport family-owned company from Slovenia, facing various problems: from financial, marketing, human resources issues to managerial and more. The students had to put themselves in the role of consultants and propose various solutions, with the help of which they would restore the company to stability, first in the short term, then in the long term. The students had 1 hour to solve the problem. The research has these limitations: we did not measure each student’s progress individually, but through cumulative responses from all the students together.

In table 3, we present the number of students who participated in solving the case study and the number of proposed solutions per student by year of study and academic year.

In the 2019–2020 academic year, we managed to significantly increase the number of case study participants, especially among first-year students. The reason is partly due to larger enrolment, and partly because of the more focused promotion of participation in the research. The results of the analysis showed that with the years of study across all three years, the number of proposed solutions per student grows.

It can be seen from the results that the lowest level of multidisciplinary and connectivity of proposals, and overview of the situation, is achieved by first-year students, while the highest level is by third-year students, across all three studied years.

TABLE 4 Assessment of the Quality of the Proposals According to the Three Indicators

Year of study	Indicators	Academic year		
		2017–2018	2018–2019	2019–2020
[26] 1st year of study	Multidisciplinarity	3.1	3.4	3.2
	Connectivity	3.7	3.8	3.6
	Comprehensiveness	3.6	3.9	3.7
	Average	3.5	3.7	3.5
2nd year of study	Multidisciplinarity	3.3	3.9	4.1
	Connectivity	3.9	4.3	3.9
	Comprehensiveness	4.4	4.3	4.2
	Average	3.9	4.2	4.1
3rd year of study	Multidisciplinarity	4.1	4.4	4.3
	Connectivity	4.3	4.6	4.4
	Comprehensiveness	4.5	4.7	4.8
	Average	4.3	4.6	4.5

RESEARCH FINDINGS

The longitudinal analysis of the results of the case study actually showed noticeable progress in the students’ entrepreneurial mindset during the years of study, and it is also possible to assess which challenge-based learning interventions had the most impact on their progress in a specific year. The research confirmed and supplemented many studies in this field that had already focused on the impact of challenge-based learning interventions on the entrepreneurial mindset of students (Solomon 2008; Avramenko 2012; Bliemel 2013; Rutkienė and Tandzegolskiene 2015; Gatti, Ulrich, and Seele 2019; Pech, Řehoř, and Slabová 2021).

The analysis findings highlighted that in each year, students made progress in solving the case study, both quantitatively and qualitatively. Students in the second year gave more proposed solutions than students in the first year and students in the third year gave more proposed solutions than those in the second (table 3). From the point of view of the quality of the proposals (the multidisciplinarity of the proposals, the connectivity of the proposals and the comprehensiveness of the overview of the situation), as mea-



sured by the evaluators, the proposals of students in the second year were of better quality compared to those of the first and the proposals of students in the third year of better quality compared to those of the second (table 4). In short, the third-year students provided more solution proposals, and their solutions were more multidisciplinary and connected, while at the same time, they provided a more mature and comprehensive overview of the situation in the company and possible solutions to the problems the company faced in the case study. Therefore, students in the third year exhibited a higher degree of entrepreneurial mindset (Naumann 2017; Kuratko, Fisher, and Audretsch 2021).

[27]

If we go into a more detailed analysis, we can see that at the beginning of the study, students were more focused on quick partial solutions and showed fewer solutions. The results underline that they need a more comprehensive overview of the situation and take a multidisciplinary approach to a lesser extent.

At the end of the second year, students already start looking for more long-term solutions. They also provide several solutions related to finance and marketing. Their progress is largely the result of the three finance and two marketing courses they take in the second year and participating in the student challenge (practical team project work), which is also carried out in the second year.

Students in the third year of the Entrepreneurship programme show a more balanced selection of measures. It is a combination of quick solutions, as well as more strategically oriented solutions (business plan creation), where the difference from the answers given by students in the first and second years is clear. In addition, the analysis shows that the first and second-year students mention far fewer solutions than their third-year cohorts, and the frequencies of solutions are much more balanced among the third-year students. It could be said that third-year students look at the problem more comprehensively (a combination of human resource, financial, marketing and management solutions) and have a better overview of the situation than the first and second years, which certainly shows great progress in the students' competencies and multidisciplinary knowledge, as well in the ability to give a more compre-

[28] hensive overview of the situation. We estimate that their progress compared to the second year is largely the result of two mandatory courses that are strategically and interdisciplinary oriented (Business Plan and Planning Company Growth), as well as the internship in the company that they carry out in the third year of study. Our results can thus confirm the study's results that have shown a positive and significant effect of challenge-based learning programmes on students' entrepreneurial mindsets and skills, especially in financial literacy, creativity and planning (Colombelli et al. 2022). In addition, creating a business plan is, in some studies, the most popular type of teaching method in entrepreneurship courses offered by colleges and universities (Salomon 2008). We can also confirm the findings of studies that engagement with business simulations and entrepreneurial scenarios (Avramenko 2012; Solomon 2008) as well as presenting and pitching entrepreneurial ideas (Bliemel 2013; Rutkienė and Tandzegolskiene 2015), have a positive impact on the entrepreneurial mindset of students. Our findings also confirm the studies that demonstrated the great importance of active teaching methods, such as business simulators, role-playing, and special projects where students can connect their knowledge to practice (Pech, Řehoř, and Slabová 2021), as well as the importance of the active approach to education for developing critical thinking and motivation (Gatti, Ulrich, and Seele 2019). Furthermore, the right combination of these methods can support students in running their businesses and eliminate the fear of failure (Pech, Řehoř, and Slabová 2021).

We also evaluate the significant impact of some challenge-based learning activities that take place every study year. The analysis of the curricula showed that in 12 core courses (out of 18), besides other regular subject activities (homework, exercises, case studies, etc.), students also had to create and present a project, either individually or in a team. The latter also applies to all elective courses, the years of which were analysed.

Here, we emphasize solving various case studies in all courses of the Entrepreneurship programme. Students mostly solve thematic case studies between lectures and in a team, which also develops



team competencies. Each group presents the results of the solution, followed by a group discussion. Existing research (Salomon 2008; Chang et al. 2014; Rutkienė and Tandzegolskiene 2015) also supported case studies as a popular and effective type of teaching method in university entrepreneurship programmes.

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We see the high added value of challenge-based learning at the GEA College – Faculty of Entrepreneurship mainly in the mix of multidisciplinary approaches, cooperation with various stakeholders of the faculty (especially companies and successful entrepreneurs), and above all, in an authentic, real-world, which is also strongly highlighted in existing research in challenge-based learning (Gallagher and Savage 2020).

Visits by guests in the lecture hall (managers and entrepreneurs) are also considered important interventions that have been carried out throughout the years. Guests can open up new horizons for students, inspire them in their career path and provide role models from whom students can learn. Existing studies, which emphasize the importance of including guest speakers and lectures by business owners in the study process (Salomon 2008; Saadat et al. 2021), also confirmed this. Excursions to companies also represent a similar added value. Students need direct contact with companies, to view the work process, and talk with the founder.

Activities that occur continuously provide essential additional impact on students' progress. Students can, therefore, take part in them in different years of study. Let us highlight here the possibility of participating in the GEA Top Talents programme (tailored programme for gifted students), in the faculty's business incubator and Career Centre as well as International Office activities. Students who are more active and, to a greater extent, involved in the aforementioned activities progress faster in developing their skills, competencies and entrepreneurial mindset.

We should especially highlight the importance of students joining the faculty's business incubator, where they can develop and realise their business idea with the help of mentors and consultants. Existing studies confirm that, the greatest knowledge and skill acquisition is achieved through consultations and personal experi-

ences (90% of gained knowledge) (Rutkienė and Tandzegolskiene 2015).

[30] Finally, the professors also have an important influence on the progress of the entrepreneurial mindset of students. The vast majority of professors at GEA College – Faculty of Entrepreneurship have practical experience. This means that they can share their own experiences from practice with students and can also prepare the curriculum for their courses in a very practical way. Experience from practice also means an active network of acquaintances, which helps them to integrate guests from practice into the study process and organise excursions to companies and similar challenge-based learning activities.

#### CONCLUSION

The research demonstrated that challenge-based learning activities have a significant added value in teaching entrepreneurship and have a positive effect on the progress of the entrepreneurial mindset of students, which confirms existing research in this field (Colombelli et al. 2022). Our results also confirmed several other studies that challenge-based learning activities positively impact the entrepreneurial mindset and open up a new area of research on the connection between the study curriculum, challenge-based learning interventions, and the entrepreneurial mindset of students.

Through various challenge-based learning activities, students make great progress in their entrepreneurial mindset. How much added value they will actually implement in their (entrepreneurial) career largely depends on their engagement. This is also the answer to our research question, which we formulated at the beginning: different interventions in challenge-based learning can influence the entrepreneurial mindset of students to a great extent if they take advantage of all the opportunities that the faculty offers. We believe that challenge-based learning interventions, besides the programme and professors, are in themselves a great motivator and engager for students to contribute their maximum and get the most out of this cooperation.



It is very useful for entrepreneurship universities to encourage and develop new, innovative approaches to entrepreneurship learning that have a connection to practice, i.e., companies. Such activities improve the positioning and competitiveness of universities in the economic space and have a positive effect on the economy itself and economic entities. Companies also require cooperation with pedagogical and research institutions, since they need new knowledge and good workers, while universities can be the generators of good workers. Challenge-based learning can thus represent a suitable approach of cooperation between faculties and the economy, in which everyone gains: faculties, the economy and students. As a result, based on the faster circulation of know-how, this is also reflected in the quality of competitiveness of countries and regions using this approach, which also has positive macroeconomic consequences.

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The key limitation of the research is that it is a case study analysis, so we cannot generalise the results for the wider population of entrepreneurial universities. From this point of view, we recommend creating more case studies on the influence of challenge-based learning on the entrepreneurial mindset of students. Quantitative research in this area would also be welcome, covering a larger sample of entrepreneurship faculties, testing the hypotheses put forward on them, and looking for differences between faculties.

With more research into the effectiveness and efficiency of challenge-based learning methods, faculties could improve their curricula, and as a result, students would gain more entrepreneurial competences and, in this way, further enhance their entrepreneurial mindsets.

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