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**ENTREPRENEURIAL LEARNING AMONG BULGARIAN STEM STUDENTS**

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**Abstract**

There is a need for greater understanding of entrepreneurial learning in the context of entrepreneurial education. This study investigates the role of content and teaching methods used in entrepreneurship education for enhancing entrepreneurial learning in a sample of 254 Bulgarian students in the fields of science, technology, engineering and mathematics (STEM) using a binary logistic regression. The respondents included in our sample report that active teaching methods such as simulations, games, competitions, study visits, real venture setting up, etc. are not used extensively, while the topics of business idea generation, discovery of entrepreneurial opportunities, creation and development of a new enterprise are not covered extensively in entrepreneurship courses in which they participated. Our empirical findings reveal that content and teaching methods used in entrepreneurship education have significant positive effect on the likelihood of high entrepreneurial learning. Our findings may help educators in the field of entrepreneurship in the choice of content and teaching methods for their entrepreneurship courses to achieve better entrepreneurial learning of their students. The paper presents a discussion of the research limitations and directions for future research.

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*Keywords:* Technology entrepreneurship, entrepreneurial learning, university, STEM students



## 1. Introduction

Entrepreneurship education may play an important role for economic development, employment, innovation, economic diversification, dynamism, market expansion and technological progress (Hameed & Irfan, 2019; Wee, 2004). Therefore, it is not surprising that entrepreneurship education at university level has attracted growing research attention during the last decades (Landström et al., 2021; Maresch et al., 2016). Entrepreneurship education is increasingly offered to students not only in business and management fields of study but also to students in science fields (Henry & Lewis, 2018) and arts (Toscher, 2019). Entrepreneurship education involves “learning to recognize and act on opportunities and interacting socially to initiate, organize and manage new ventures” (Rae, 2005, p. 324). Neck and Corbett emphasize that “the very essence of entrepreneurship education is the teaching and learning of entrepreneurship” (Neck & Corbett, 2018, p. 9).

Entrepreneurial learning is associated with development of entrepreneurial competences (Toscher, 2019). Bacigalupo et al. suggest that the progression of entrepreneurial learning in the context of entrepreneurship education involves two aspects. The first aspect refers to “developing increasing autonomy and responsibility in acting upon ideas and opportunities to create value” (Bacigalupo et al., 2016, p. 14). The second aspect involves “developing the capacity to generate value from simple and predictable contexts up to complex, constantly changing environments” (Bacigalupo et al., 2016, p. 14).

Various actors such as the educators, the students, and the external stakeholders are involved in the learning process (Thomassen et al., 2019). Neck and Corbett argue that “students experience and learn entrepreneurial skills only through engagement and practicing the various aspects of new venture creation” (Neck & Corbett, 2018, p. 30). Entrepreneurial learning can be activated through entrepreneurship education because it is experiential in nature (Toscher, 2019). It was acknowledged that entrepreneurship education can be conducive to developing entrepreneurial competencies in the areas of knowledge, skills, and attitudes (Toscher, 2019, p. 11).

## 2. Problem Statement

Traditional entrepreneurship education is education ‘about’ entrepreneurship which is focused on topics related to writing a business plan, entrepreneurial decision-making, acquiring financing from various financial sources, and management of the new business (Wee, 2004). The preparation of business plan represents the main content of entrepreneurship education (Honig, 2004). Maritz and Brown (2013) underline that although writing a business plan seems to be the key curricula of many entrepreneurship programs, researchers are sceptical about the impact of this content on skills, abilities or business success. Similarly Honig emphasizes that “neither the teaching of business plans, nor the plans themselves, are sufficiently justified on the basis of theoretical or empirical literature” (Honig, 2004, p. 258).

Johannisson (2016) suggests that entrepreneurship education must adopt *mētis* and *phronesis* as knowledge bases. He emphasizes that collaboration with external parties and personal networking in the context of entrepreneurship education are important for developing students’ social skill and human and social capital.

A great variety of pedagogical approaches have been employed in entrepreneurship education such as lectures, presentations, handouts, case-studies, role plays, simulations, group discussions, action learning, experiential learning, etc. (Henry & Lewis, 2018; Maritz & Brown, 2013) Pedagogical methods may vary significantly based on content (Maritz & Brown, 2013). Maritz and Brown (2013) classify pedagogical methods in entrepreneurship education as follows: traditional methods (lectures, seminars, workshops, and case studies), less traditional pedagogy (guest speakers, interviews with real entrepreneurs) and non-traditional methods (action learning, project-based learning).

It was acknowledged that traditional pedagogical approaches are not appropriate for use in entrepreneurship education (Henry & Lewis, 2018), because they adopt formal teaching methods such as direct instruction and are teacher-centered (O'Brien & Hamburg, 2019). Given the conceptualization of entrepreneurship as a competence (Bacigalupo et al., 2016), new pedagogical approaches are required to enhance entrepreneurial learning (Neck & Corbett, 2018; O'Brien & Hamburg, 2019).

There is a need for greater understanding of entrepreneurial learning in entrepreneurship literature (Rae, 2005) and particularly in education setting (Toscher, 2019). It was acknowledged that there is little uniformity among the content and pedagogical methods used in different entrepreneurship courses and programs offered in different universities (Maritz & Brown, 2013). The available literature is highly controversial about what content and pedagogical techniques in entrepreneurship education are the most appropriate for stimulating entrepreneurial learning.

Honig (2004) highlights the lack of research evaluating the impact of contemporary entrepreneurship education approaches. It is important to determine the design of entrepreneurship education to maximize learning outcome for students (Nabi et al., 2017; Thomassen et al., 2019). Most research in the field of entrepreneurship education was conducted among students in business or economics.

Little research has addressed the entrepreneurship education provided to students in the fields of science, technology, engineering and mathematics (STEM) (Maresch et al., 2016). Wee (2004) argue that students should be prepared better for entrepreneurship. The author suggests that authentic entrepreneurial learning by students can be achieved only by introducing new content and methods in entrepreneurship education. Maresch et al. (2016) stress the need for future research exploring effective didactics in entrepreneurship education particularly for STEM students.

### **3. Research Questions**

The research questions of the present study are the following:

- What teaching methods used in entrepreneurship education are related to the odds of high entrepreneurial learning among Bulgarian STEM students?
- What content of entrepreneurship education is related to the odds of high entrepreneurial learning among Bulgarian STEM students?

### **4. Purpose of the Study**

The purpose of the present study is to identify content and teaching methods which are associated with the likelihood of high entrepreneurial learning among Bulgarian STEM students.

## 5. Research Methods

This study is based on a survey with a structured questionnaire among Bulgarian STEM students conducted in 2015 and 2016. The sample includes 254 STEM students who participated in an elective or compulsory entrepreneurship course in their university. About 59% of the respondents are less than 22 years old. Most of the respondents are undergraduate students (78%). Only 22% of the respondents are master students. Female students represent 48% of the sample, while male students are 52% of the sample. Approximately one third of the respondents have previous working experience in a technology company.

Drawing upon previous research of entrepreneurial learning, Souitaris et al. (2007) suggest that entrepreneurial learning refers to:

- attitudes, values and motivation (why do entrepreneurs act?);
- knowledge of actions that have to be taken to start a business (what needs to be done?);
- practical management skill (how to start a venture?);
- ability to develop and use networks (who does one need to know?);
- ability to identify an opportunity (when to take action?).

The dependent variable entrepreneurial learning indicates the level of learning from an entrepreneurship course and is measured with an index composed by 5 items on a 7-point Likert scale (Souitaris et al., 2007) (Cronbach’s alpha = 0.864). The dependent variable ENT\_LEARN is binary and takes value 1 if the level of respondent’s entrepreneurial learning is above the median and value 0 otherwise. The variable active teaching methods (ACTIVE) is binary and takes value 1 if the respondent thinks that active teaching methods such as simulations, games, competitions, study visits, real venture setting up, etc. are utilized extensively in the entrepreneurship course and value 0 otherwise. The variable content of the entrepreneurship course (CONTENT) is binary and takes value 1 if the respondent thinks that the entrepreneurship course covered extensively the topics of business idea generation, discovery of entrepreneurial opportunities, creation and development of a new enterprise and value 0 otherwise. The study uses several control variables. The variable age (AGE) indicates the age of the respondent in a number of years. The variable gender (GENDER) takes value 1 if the respondent is male and value 0 otherwise. The variable previous working experience in a technology company (TECH) takes value 1 if the respondent possesses such experience and value 0 otherwise. Binary logistic regression is employed in the analysis.

**Table 1.** Characteristics of the sample

Variable	%
AGE	
Less than 22 years	59.1%
22 years or more	40.9%
GENDER	
Male	52%
Female	48%
EDUCATION LEVEL	
Bachelor	78%

Master	22%
PREVIOUS EXPERIENCE IN A TECHNOLOGY COMPANY	
Yes	35%
No	65%
ENTREPRENEURIAL LEARNING	
High	56.7%
Low	43.3%

## 6. Findings

Almost 57% of the respondents in our sample exhibit high entrepreneurial learning from the entrepreneurship education in their university (Table 1). Less than 32% of the studied students report that that active teaching methods are utilized extensively in the entrepreneurship course they take/took at their university. Only approximately 46% of the respondents declare that the entrepreneurship course covered extensively the topics of business idea generation and discovery of entrepreneurial opportunities. The results from the binary logistic regression in Table 2 demonstrate that the estimated model is significant at 99% confidence level as indicated by the Chi-square statistics. The multicollinearity diagnostics based on VIF values demonstrates a lack of multicollinearity among the variables used in the regression model. The model can correctly classify 74% of students exhibiting low or high entrepreneurial learning. The variables ACTIVE and CONTENT influence positively and significantly the odds of high entrepreneurial learning ( $p < 0.01$ ). The control variables AGE, GENDER, and TECH do not affect the likelihood of high entrepreneurial learning as indicated by the significance level of their coefficients ( $p > 0.05$ ).

**Table 2.** The results of a binary logistic regression.

Variable	B	S.E.	Sig.
ACTIVE	1.569	0.348	0.000
CONTENT	1.823	0.306	0.000
AGE	0.039	0.033	0.242
GENDER	-0.309	0.306	0.312
TECH	-0.005	0.336	0.989
Constant	-1.647	0.763	0.031
Model Chi-square	72.547		0.000
-2 Log likelihood	275.007		
% correct predictions	74%		

## 7. Conclusion

Entrepreneurs are confronted with many challenges (Hameed & Irfan, 2019) and entrepreneurial learning may be an important factor for entrepreneurial success. Entrepreneurship education may stimulate entrepreneurial learning, but it is still not clear how this could be achieved. Therefore, this study investigates the role of content and teaching methods used in entrepreneurship education for enhancing entrepreneurial learning in a sample of 254 Bulgarian STEM students using a binary logistic regression. The students included in our sample report that active teaching methods such as simulations, games, competitions, study visits, real venture setting up, etc. are not used extensively, while the topics of business idea generation,

discovery of entrepreneurial opportunities, creation and development of a new enterprise are not covered extensively in entrepreneurship courses in which they participated. Our empirical findings reveal that content and teaching methods used in entrepreneurship education have significant positive effect on the likelihood of high entrepreneurial learning.

The limitations of this study are related to the use of a convenient sample limited to the Bulgarian context and self-reported and cross-sectional nature of the survey. Therefore, the findings should be used with caution because they may not be applicable to other contexts and students in other fields of study and do not confirm causal relationships between the variables. Future research needs to replicate this study in representative samples from different countries. Our findings may help educators in the field of entrepreneurship in the choice of content and teaching methods of their entrepreneurship courses to achieve better entrepreneurial learning of their students.

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