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Supporting Entrepreneurial Attitudes at Technical Universities Through Simulation Games. Evidence from Poland

Abstract

RESEARCH OBJECTIVE: The aim of the paper is to evaluate the experience resulting from the use of simulation games as supporting entrepreneurial attitudes at technical universities.

THE RESEARCH PROBLEM AND METHODS: The main problem raised in the article concerns the effectiveness of simulation games as a method of supporting entrepreneurial attitudes at technical universities. The article provides an overview of selected literature and presents the authors' experience in using simulation games.

THE PROCESS OF ARGUMENTATION: The first part presents selected aspects of entrepreneurship and simulation games. The next part presents the results of a case study on the use of simulation games in Poland. As a result, the final part formulates conclusions regarding this issue for the future.

RESEARCH RESULTS: Knowledge and usefulness of a simulation game as an entrepreneurship education method among students of technical universities have been indicated. Conclusions have been formulated pointing to high effectiveness and usability of simulation games in supporting entrepreneurial attitudes.

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CONCLUSIONS, INNOVATIONS AND RECOMMENDATIONS:
The studied method of entrepreneurship education seems to be extremely interesting for students of technical universities and should be further developed as an innovative educational solution.

KEYWORDS:

entrepreneurship education, supporting entrepreneurial attitudes, simulation game, technical faculties

INTRODUCTION

The importance of entrepreneurship for economic development based on innovation and excellence has been confirmed in numerous empirical studies. Promoting and supporting entrepreneurial culture and the environment for creating fast-growing start-ups is becoming particularly important. It is equally crucial to stimulate and support entrepreneurial mindsets, also as part of entrepreneurship education. According to the guidelines of the European Commission (2008), entrepreneurship education matters both at the stage of primary and secondary schools as well as at the level of universities. From the point of view of social needs, entrepreneurship education at the university level seems to play a unique role. Regarding the nature of the fastest growing start-ups, entrepreneurship education is becoming significant not only for economic and business faculties but also for technical faculties.

The purpose of the article is to analyze and evaluate the experience resulting from the use of a simulation game at technical faculties and to formulate conclusions regarding the significance of this method taking into account opinions and assessments of students. The initial statement of the presented research was the assumption that a simulation game can be an important solution for shaping entrepreneurial attitudes at technical faculties and can affect entrepreneurship. The uniqueness of the conducted research lies in taking the opinions and assessments of students into account. These opinions were taken into consideration both before and after the application of this method.

The first part cites the European Union policy guidelines for entrepreneurship education and presents selected aspects of

entrepreneurship education and indicates the importance of these issues. In the next part, the authors concentrate on the simulation game as an innovative education method. The next part presents the results of a case study on the use of a simulation game in the field of entrepreneurship education at technical faculties in Poland. As a result of the presented research, the final part contains conclusions regarding this issue and formulates some guidelines for the future.

1. ENTREPRENEURSHIP EDUCATION

Entrepreneurship can be described as the ability to convert ideas into concrete actions. In this sense, entrepreneurship means being creative and active in taking actions and approaching problem solving (Barzdins, 2012, p. 129). While entrepreneurship has been widely discussed in the related literature, entrepreneurship education, in particular at technical faculties, is a relatively young field (Robinson & Josien, 2014, p. 172). The European Commission pointed to the importance of education in creating entrepreneurial attitudes and the entrepreneurial spirit, also in technical studies. This is particularly important considering the need to commercialize ideas and newly developed technologies. On the other hand, the need to promote and stimulate entrepreneurial thinking among students is emphasized in order to strengthen start-up innovation. What is more, entrepreneurship education is recognized as one of the most important factors for future development and competitiveness (European Commission, 2008, p. 9).

Entrepreneurship affects the competitiveness not only in the short term by creating new jobs, but above all has long-term consequences (Fritsch & Mueller, 2004, p. 962). The positive changes of entrepreneurship depends on the institutional environment, cultural changes as well as the circulation and spread of knowledge. Entrepreneurial-oriented institutions and culture are important in terms of attracting investments, highly qualified employees and talents (Turok, 2004, p. 1070). What is more, entrepreneurship is considered as a self-driving force that tends to concentrate in space and changes the society's culture into a more entrepreneurial culture (Minniti, 2005, p. 3). Universities play a special role in this system (Audretsch & Keilbach,

2004, p. 605) and academic entrepreneurship should become a tool for supporting start-ups but also by promoting cultural change (Huggins & Williams, 2011, p. 908). Developing entrepreneurial skills and mindsets belongs to the tasks of entrepreneurship education, which uses various methods, more or less interactive and innovative. In the next section, the importance of one of these methods is indicated.

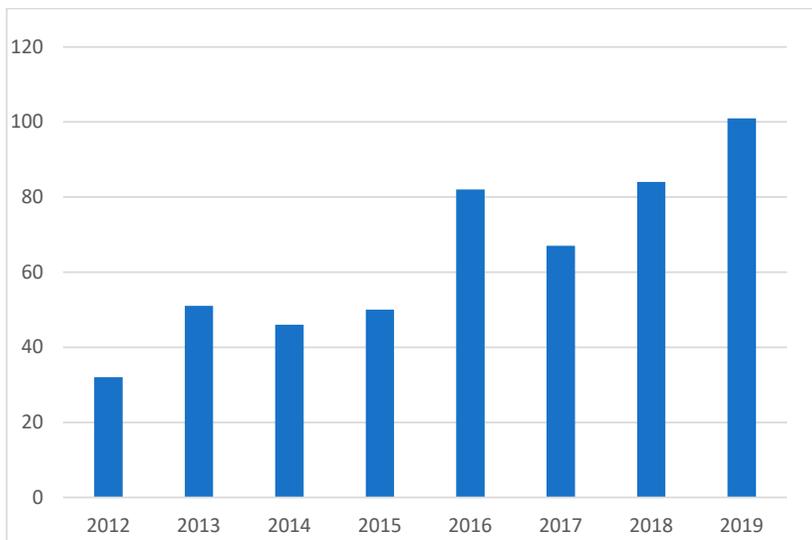
2. SIMULATION GAMES AS METHODS SUPPORTING ENTREPRENEURIAL ATTITUDES AMONG STUDENTS

Entrepreneurship education is recognized as an element strengthening entrepreneurial attitudes among students (Fayolle et al. 2016, p. 897; Pittaway & Cope, 2007, p. 480). The quality of education and the availability of entrepreneurship teaching programs have become factors in the acquisition of entrepreneurial competences (Bosma & Levie, 2009). The role of universities is to support entrepreneurship in four dimensions: through entrepreneurship education, creation of entrepreneurial thinking, support of entrepreneurial activity and creation of leaders. A special role is played in countries where there is a negative attitude towards entrepreneurship, risk aversion or a strong fear of failure. This role involves the sensitization of students to entrepreneurship and the arousal of their interest in it (Davey et al. 2016, p. 173).

However, little is known to date about the role entrepreneurship plays in engineering studies or in engineering career paths. Although entrepreneurship appears more and more often in study programs, little is known about the attitude of engineers towards this subject or how it affects their professional competences (Duval-Couetil et al., 2012, p. 426). Entrepreneurial attributes such as risk appetite, innovation, ability to make quick decisions, far-sightedness, ability to understand others, ability to see opportunities, ability to deal with complex situations, ability to compete cannot be learned instantly, but they can be developed, and students should know them (Munir et al. 2015, 489). In particular, the opportunity to learn and understand managerial competences, the opportunity to learn about the realities of an enterprise and the opportunity to understand one's own potential to

be an entrepreneur become important (Costin et al., 2018, p. 137). In this context, traditional methods of teaching entrepreneurship seem inadequate (European Commission, 2008, p. 8). Experimental methods that allow students to get involved like in the real managerial world and experience the real sensations include simulation games. The interest of researchers in the subject of simulation games in the context of entrepreneurship is reflected in Figure 1. It presents the number of publications including the key words: simulation, games and entrepreneurship in titles, abstracts and key words in Scopus in the years 2012-2019.

Figure 1. The number of publications including the key words: Simulation, Games and Entrepreneurship in Scopus in the years 2012-2019



Source: own study based on Scopus.

The use of simulation games as an innovative method of teaching entrepreneurship is suggested by many authors (Faria et al., 2009, p. 470; Bellotti et al., 2014, Zielińska et al., 2015, pp. 217-237; p. 357; Fox et al., 2018, p. 62). Simulation is a mapping of reality and allows students to learn through interaction. Simulation teaches the complexity of issues related to running a business. The decisions are not made sequentially but simultaneously, as in the real world, on the

basis of incomplete or insufficient information, under time pressure, in competitive conditions, and affect the company's future financial results. Participation in a game supports creativity, supports learning together but also has an individual value in terms of independent decision-making, risk attitude, as well as adaptability and flexibility in thinking and acting (Costin et al., 2018, p. 138).

Fisher, Beedle, and Rouse (2013, pp. 1-16) assessed knowledge, attitudes and experiences with gamification in higher education based on a survey of 70 respondents from business departments. They did a review of the potential of gamification in business education in classrooms. The study showed that the use of this method increases the participants' involvement and interest in the subject of the classes in relation to traditional classes. A statistically significant correlation was demonstrated between the experience with gamification and a positive attitude to this method.

Bellotti et al. (2014, pp. 357-366) reviewed games related to teaching entrepreneurship. The games have been selected to improve entrepreneurial competences such as finance, marketing, company founding, management and discovering new business opportunities. It was found that the application of games for learning entrepreneurship provides a good simulation of company management, but does not develop sufficient skills to innovate and find new solutions in the real world.

Antonaci et al. (2015, pp. 1276-1283) presented an overview of problems related to entrepreneurship education and explained the motivation behind using games as part of stimulating entrepreneurship at non-business universities. The aim of the research was to identify the most suitable games strengthening entrepreneurship education. Students welcomed the use of games and found them useful for introducing complex topics. Entrepreneurial motivation, business competences and entrepreneurship have been identified as key skills that can be developed using simulation games. The study found that more than one game was needed to master the key skills for each course.

In the next part, the authors present the results of a case study on the use of simulation games at a technical university in the Wielkopolska region in Poland.

3. THE RESEARCH METHOD AND RESULTS

The purpose of the case study conducted in 2019 at the engineering faculties of Poznan University of Technology was to analyze the suitability and to evaluate the results of using a simulation game as a method of supporting entrepreneurial attitudes among a group of 25 students of second-cycle extramural studies. The starting point of the research was that a simulation game can be an interesting method of supporting entrepreneurial attitudes of students in extramural studies, which can generate positive effects affecting entrepreneurship. Extramural studies are characterized by the fact that students are already settled in professional practice and already have their first professional experience. Taking this into account, we could check not only the impressions and opinions of students after playing the game but also their views on the similarity of the game to the situations experienced in real life. In addition, we could check the challenges faced by the participants.

To achieve the main goal, the following questions were formulated:

1. Have the students had any experience with the chosen methods of supporting entrepreneurship?
2. What were their opinions on the usefulness of a simulation game before it was played?
3. What were their overall impressions during the game?
4. What difficulties and challenges did they experience during the game?
5. To what extent were their gaming experiences similar to their real life professional experiences?
6. What did they learn during the game?

The data was collected through a questionnaire previously prepared on the basis of an analysis of the related literature. This way allowed the collection of spontaneous and anonymous responses. The questionnaires were prepared in a printed version for individual completion. The first two questions concerned the students' experience with selected methods used in entrepreneurship education and their opinions about these methods. The other two questions concerned the characteristics of respondents. The questions in this part were closed-ended with the possibility of a single choice of answers. The next part of the questionnaire contained three closed-ended questions and two

open-ended questions. For closed-ended questions, a five-point scale was used, for example: very similar, similar, neutral, partly unlike, completely unlike. Open-ended questions allowed for collecting any statements about challenges during the game and new knowledge gained from the game in the opinion of students. This combination of questions allowed for collecting data on the attitude of respondents to selected issues as well as for collecting data on experience during the game. Table 1 contains the profile of students participating in the simulation game (n=25).

Table 1
Profile of students taking part in the simulation game (%)

Gender	Male	80
	Female	20
Professional Experience	Business	12
	Engineering	88

Source: own study.

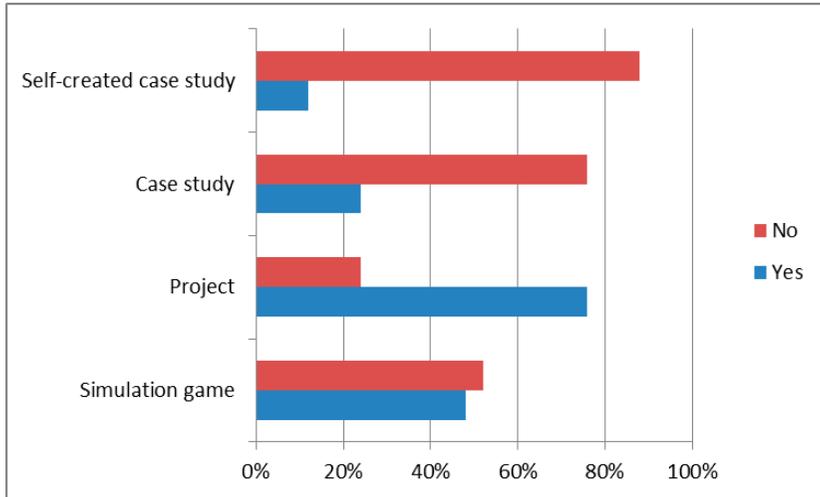
The vast majority of students taking part in the game were male, which reflects the average distribution of sexes in the studied faculties. Also, the vast majority (88%) had experience in technical professions, and only 12% in business-related professions.

Before playing the simulation game, students were asked to answer if they already had any experience with selected methods of supporting entrepreneurship attitudes and what their opinions were regarding these methods. In addition to the simulation game, a case study, a self-created case study and a project were also indicated. These are methods that are also often addressed in the related literature as methods supporting entrepreneurship education (Carl, 2009, p. 96; Karimi et al., 2016, p. 203; Laditka & Houck, 2006, p. 164; Wach, 2014 pp. 16-18).

The test results are presented in Figure 2 and in Table 2.

The vast majority of students did not know the methods presented. The greatest knowledge was recorded in the case of project. The least known method was the self-created case study. It can be assumed that this is related to the profile of engineering studies and methods used in technical sciences. It is worth noting that over 40% of respondents already had experience related to simulation games.

Figure 2. Students' experience with selected entrepreneurship education methods



Source: own study.

Opinions of students regarding the usefulness of these selected methods in entrepreneurship education are summarized in Table 2.

Table 2
Opinions of students regarding the usefulness of selected methods in shaping entrepreneurial attitudes before playing the game (%)

Method	Not at all useful	Partially not useful	I have no opinion	Partially useful	Very useful
Simulation game			52	33	15
Project	9		24	52	15
Case study			76	15	9
Self-created case study			88		12

Source: own study.

Students who did not know the selected methods did not express an opinion on them (item: I have no opinion). Among the known methods, before playing the simulation game, the students found the highest usefulness for the project (15%) and the simulation game (15%).

Next, the students were asked to comment on their own general impressions during the game (Table 3).

Table 3
Students' general impressions during the simulation game (%)

Very positive	72
Positive	28
Neutral	0
Negative	0
Very negative	0

Source: own study.

As can be seen from the table, the vast majority of students had very positive (72%) or positive (28%) impressions during the game. Interestingly, none of the respondents pointed to a neutral impression, which may indicate their high involvement.

Students' comments regarding difficulties and challenges they experienced during the game are collected in Table 4.

Table 4
Students' qualitative evidence of selected challenges during the game

<p>"...no agreement between individual departments of the enterprise".</p> <p>"...fast pace of talks and negotiations".</p> <p>"...misunderstandings and delays in accessing information."</p> <p>"...planning difficulties by making difficult decisions."</p> <p>"...difficulties in fast communication in parallel with various departments of the enterprise, which meant that the planned activities could not be completed on time."</p> <p>"...problems with cost optimization."</p> <p>"...time pressure."</p> <p>"...errors in understanding the intentions of individual departments."</p>
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Source: own study.

Next, it was examined whether the experience from the simulation game was similar to what one would encounter every day at work. The results of the study are shown in Table 5.

Table 5
Assessment of the similarity of the game experiences to real life experiences (%)

Very similar	60
Similar	28
Neutral	8
Partly unlike	4
Completely unlike	0

Source: own study.

Over half of the respondents stated that the experience of the game was very similar (60%) to what they experience in everyday life. Another 28% considered them similar. Interestingly, also respondents who considered the game experience to be neutral (8%) or unlike everyday life (4%) also considered their gaming impressions to be positive or very positive (see Table 3).

Table 6 summarizes the subjective opinions of the game participants about what they learned new during the classes.

Table 6

Qualitative evidence of what students have learned from the participation in the game

"...principles of effective communication in the enterprise." "...cooperation with various departments of the enterprise." "...the basics of financial management." "...negotiation rules." "...ways of understanding and acting for common good so that each department generates the greatest efficiency." "...draw conclusions." "...dependencies between departments." "...patience." "...diligence in performing tasks." "...the basics of enterprise operation." "...collecting information." "...knowledge that investments are the basis of development and can pay back quickly." "...knowledge that there should be a leader in every department." "...production company operating diagram."
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Source: own study.

Finally, students rated the game usefulness for shaping entrepreneurial attitudes after the end of the game (Table 7).

Table 7

Opinions regarding the usefulness of a simulation game in shaping entrepreneurial attitudes after the game (%)

Not at all useful	Partially not useful	I have no opinion	Partially useful	Very useful
0	0	0	24	76

Source: own study.

Before the game, only 15% of students thought that a simulation game was a very useful method of supporting entrepreneurial attitudes, and 33% were of the opinion that it was partially useful (52% did not know this method). After the game, 76% of students found it very useful and 24% found it partially useful.

CONCLUSIONS

The factors supporting the development of entrepreneurship include influencing the culture of entrepreneurship, also among young people and students. The development of entrepreneurial culture, in accordance with the assumptions of the European Commission, should be stimulated through the educational system and promotion of entrepreneurial attitudes. Simulation games are important for the development of entrepreneurial skills such as the ability of creative problem solving, the ability to make quick decisions, communication skills, teamwork and many more. As we have shown in the case study, the use of a simulation game can successfully lead to interesting effects also for students already embedded in the practice of technical professions.

According to the results of the research, the majority of engineering students did not previously know the method, and only a small part found it to be very useful (15%) or partially useful (33%) before they played the game. Comparing this with the results obtained after the game, more than three-quarters of students found this method very useful (76%) or partially useful (24%) in shaping entrepreneurial attitudes.

It is worth noting that the participation in the game was associated with positive or very positive impressions, which may have its source in students' high involvement. This, in turn, may be related to limited knowledge of the method and the interest in the effects of the game. Some students found the experience of the game to be only partly similar to the experience of everyday life, which, however, did not affect their overall positive impressions and opinions on the usefulness of the method in shaping entrepreneurial attitudes.

However, the vast majority assessed that their own experiences were very similar to those of real life. This is also confirmed by the respondents' statements about the challenges and difficulties experienced during the game. The most important of them included, among others: problems with parallel communication, misunderstanding of intentions, problems related to time pressure.

Interesting were the students' statements about that, what they have learned from the participation in the game. The respondents recognized not only the principles of effective communication or the

need for cooperation, but also many other interesting aspects related to enterprise management. It is worth highlighting such elements as the basics of financial management or the basics of enterprise operation.

Considering our experience from this case study conducted among second-cycle extramural students of technical faculties, the following conclusions can be made:

- first, a simulation game is a method that intensively engages students and creates positive emotions in them,
- second, the use of the simulation game led to a change in the perception of the game as a useful method for creating entrepreneurial attitudes in the participants,
- thirdly, the participants were able to spontaneously identify important elements related to entrepreneurial competences after they played the game,
- fourthly, in addition to entrepreneurial competences, the participants subjectively recognized that the participation in the game allowed them to acquire other skills related to small business management.

To sum up, a simulation game is an interesting solution for creating entrepreneurial attitudes in students, including students without or limited business basics. The case study analysis has shown that the use of a simulation game at technical faculties can also contribute to the creation of an entrepreneurial culture. In particular, it has been shown that the students were able to recognize and indicate selected entrepreneurial competences, had the opportunity to learn about the reality of enterprise management, and assess their own challenges related to it.

Our experience indicates that simulation games should be further developed and widely used for technical studies, because they stimulate motivation, commitment and interest in the subject of entrepreneurship. They show the way companies operate, while evoking positive emotions among the participants. Going further, we should measure how and to what extent the participation in simulation games can influence professional careers of students. It will also be interesting to what extent students of technical studies are interested in learning entrepreneurship and how methods such as a simulation game can influence these phenomena.

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