

Influencing attitudes towards entrepreneurship with digital game-based educational experience in secondary education

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ABSTRACT

The paper presents a quasi-experimental research conducted on 349 students from 11 secondary schools in Poland. The students were engaged in a digital-game based course on the basics of economics and entrepreneurship. Their attitudes towards entrepreneurship were measured before and after the learning experiences, and subject to a quantitative analysis. The aim of the study was to discover the effects of game-based experience on the change of attitude towards entrepreneurship. Many statistically significant changes have been observed, leading to the conclusion that secondary school students do change their attitudes towards entrepreneurship after playing a specific digital game. In addition, a series of gender and external variables influence effects have been discovered.

Key words: *digital game-based learning, serious games, entrepreneurial attitudes, quantitative research, gender effects*

INTRODUCTION

Youth entrepreneurship is a very important and vital topic among modern societies. Introducing secondary school students to the world of business and economics is a current trend in education. Introducing digital game based programs to secondary students is not a new concept. However, creating a full-scale teaching and learning program with simulation games addressed to the whole population of students is quite new. In the past, many such ventures had been made, but following a rather more event-based methodology. The learning and teaching program discussed in this paper has been introduced to Polish secondary schools as a part of the curriculum in the form of a course entitled “Economics in practice”, optionally offered to students. The course features a web-based simulation game of running a small service company, and is accompanied by in-class exercises, materials, and experience-based learning activities (Wardaszko, 2015). The aim of the course is to give basic knowledge about economics and entrepreneurship, as well as to offer an opportunity to practice teamwork, presentation and social skills.

LITERATURE REVIEW

In Poland, the volume of scientific work devoted to entrepreneurship has increased exponentially during the past years in the academia worldwide.

In this simulation game, the main goal is to examine the mindset of adolescents towards entrepreneurship, and see how it can be nurtured, changed, or influenced in the process of simulation. In order to understand the

delicate changes and developments to the entrepreneurial mindset, it is necessary to define entrepreneurship and its characteristics, and how they can be influenced or changed, as well as the general attitude of entrepreneurs.

It is important to consider whether those specific qualities are inherent or if they can be learned.

Entrepreneurial mentality is often linked to creativity, innovation, and being able to confront risky and demanding situations. Entrepreneurs are sometimes considered pioneers because they conquer new markets and ideas and additionally venture to question and change the established mindsets and patterns.

There are two main approaches in the area of entrepreneurial research: the trait approach and the behavioral approach. For the needs of simulation and gaming purposes, we included both of those approaches in this paper.

Mariotti and Glackin (2010, p. 13) claim that there is a simple definition of 'entrepreneur' that captures the essentials: '*An entrepreneur recognizes opportunities where other people see only problems*'. According to Baron and Shane (2008, p. 5), entrepreneurship involves mainly the ability to and the action of identifying an opportunity that is potentially valuable in the sense that it can be taken advantage of in practical business terms and yield sustainable profits (Bjerke, Björn, Gaddefors & Johan, 2014).

Entrepreneurship is a way of thinking, reasoning, and acting that is opportunity-obsessed, holistic in approach, and leadership balanced. (Timmons, 1999, p. 27). It is often believed, according to the philosophy of market segmentation, that entrepreneurs are members of a homogenous – and unique – group (Koenig, Schlaegel, Gunkel, 2014).

Entrepreneurs are achievement motivated, have a risk-taking propensity, have an internal locus of control, have a need for autonomy, are determined, creative and self-confident and take initiative (Bridge et al., 2003). Many entrepreneurs seem to think counter-factual, live more in the present and in the future than in the past, become more involved when making decisions and evaluating things, underestimating costs as well as time required succeeding (Baron, 1998). The positive consequences for entrepreneurs of starting a business include creating one's own future, having a high degree of independence, being responsible only to oneself, and following in the family's footsteps (Coulter, 2001).

While some researchers discuss entrepreneurship as being an important factor to a venture's creation and performance (e.g., Carland, Hoy, & Carland 1988), the usefulness of entrepreneurship-specific personality traits in the explanation of entrepreneurs' success has also been strongly criticized. Instead of looking at the personality and who an entrepreneur is, some researchers criticize the trait approach and recommend focusing on the behavioral approach and on what an entrepreneur actually does (e.g., Gartner, 1988; Koenig, Schlaegel & Gunkel, 2014).

In our case, we have included both approaches because through multiple questionnaires and the simulation game, we have analyzed the participating students with respect to different traits and qualities which might suggest that they have a more entrepreneurial mindset, but the active involvement in the simulation made it also possible to study their behavior when they were confronted with financial and management opportunities and problems – just like an entrepreneur would. This way we can learn and see how they apply those qualities in their own unique ways.

Entrepreneurial traits, such as achievement motivation (McClelland, 1961), locus of control (Brockhaus, 1982), and self-efficacy (Boyd & Vozikis, 1994), can be defined as relatively stable characteristics of an individual, which have been identified as determinants of entrepreneurial status (e.g., Stewart & Roth, 2001, 2007) and an entrepreneur's success (e.g., Collins, Hanges, & Locke, 2004). Our study indicates (Liñán & Kurczewska, 2014) that openness to change and self-enhancement encourage opportunity-driven entrepreneurship, while conservation and self-transcendence stimulate necessity-based entrepreneurship. The study also confirms that the start-up intention is mostly connected with taking advantage of a potential opportunity. Entrepreneurial intention mediates the relationship from motivational antecedents to opportunity motives. This means that noneconomic factors also have to be taken into account if we want to understand the phenomenon of entrepreneurship.

Entrepreneurial intention is defined as a conscious state of mind that precedes action and directs attention towards a goal, such as starting a new business (Bird, 1988; Krueger et al., 2000; Moriano et al., 2012). Douglas and Shepherd (2000) pointed out that people expressing a strong intention may not take any specific action until the right opportunity is found. For these individuals, a strong intention should be associated with the opportunity motive.

Personal values are the lens through which potential actions and their desirability are viewed. They induce valences of perspective outcomes and influence decisions (Holland and Shepherd, 2011). They play a role of guiding principles which help in making choices and taking actions. Personal values guide attitudes and behaviors (Schwartz, 1992), influence motivated behavior (Schwartz 2006), and correspond to basic psychological needs (Rokeach, 1973).

Our findings may have practical implications for entrepreneurship education, as values might be acquired through unique learning experience of individuals. Although stable in nature, they can be learned and enhanced throughout the education process. Hence, if we know that self-enhancement values boost opportunity-based entrepreneurship, we can start to adjust education accordingly and provide students with more teaching interventions based on building a sense of achievement and some idea-generating techniques. (Liñán & Kurczewska, 2014).

Entrepreneurship has always been a part of education, so it can be learned over a long period of time because the key factors are always Education/Experience/Motivation or Intention.

And finally, research has established that individuals are most likely to decide to start a business if they perceive this action to be more desirable and feasible than other alternatives such as employment (Linán, Santos & Fernandes, 2011; Pifarely & Adrienne, 2014). However, from the point of view marketing/entrepreneurship interface the call for new and more consistent methods of researching entrepreneurial attitudes is still valid and current (Gilmore & Coviello, 1999; Hansen & Eggers, 2010).

SIMULATION GAMES AND ENTREPRENEURSHIP

Business simulation games are considered a primary tool for developing management oriented skills. It also counts to learning entrepreneurship and building entrepreneurship skills. Simulation games provide the most adequate learning environment for experimenting with entrepreneurship because it is action oriented and goal driven (Kriz, Auchter & Wittenzellner, 2008; Low, Venkataraman, & Srivatsan, 1994; Neemuchwala, 2012). There not many articles address research impact of simulation gaming on entrepreneurship and they mostly focus on potential benefits and implantation (Feldman, 1995; Murff & Teach, 2009; Thavikulwat, 1995). In terms of learning effectiveness and attitudes change there are very few articles concentrating the short-term effects (Hindle, 2002; Rahn & Rehg, 2014; Wolfe, 2004; Wolfe & Bruton, 1994) and the most recent and comprehensive research of long term effects of simulation gaming courses on entrepreneurship (Kriz & Auchter, 2016). Especially, this last article is very interesting and valuable. Although authors could not prove long-term impact of the games on the actual entrepreneurial behavior they have established a benchmark to entrepreneurship studies with simulation games and showed many interesting aspects of the research problem from the gender perspective. Their research focused on the adults and authors did not found many evidence on reaching entrepreneurial attitude change with simulation games in the youth (K-18), thus we find this topic as an opportunity to fill the gap of knowledge in this research area.

THE COURSE AND THE SIMULATION GAME

The course was built around “Hotel Stars” – a web browser-based game. It has been designed to be played on PCs and tablet computers (Wardaszko, 2016). The main interface with decision input system, user feedback, and graphic design has been designed and optimized for touch screen technology. The game has been designed to be played in small (2-3 person) groups of students, who run a business in a stand-alone scenario – with the same starting situation. There is a total of 16 decision rounds during which the game participants will have to manage their businesses, which will gradually grow and – consequently – involve more and more complex decisions. The number of decision rounds has been adjusted to the number of teaching hours designed for this program, which is 30, and to the ability to cover all important knowledge areas planned for this course. Moreover, the dynamic scenario of the game features seasonality, random events, and competition, which is designed to grant the players some additional challenge and fun. Students play against computer and do not compete directly with each other. A ranking is introduced in the middle of the game (8th period), and the teams can see the results of all other teams in their game. The general scenario of the game is known to students beforehand, but seasonality and periodic events are not announced, so that students play in a partially obfuscated environment. Partial obfuscation gives additional emotional arousal and a sense of more dynamic – and thus realistic – environment. Periodic events affect all areas of business demand, costs, administrative decisions, sustainable development, ecology and management. Their occurrence is also timed with the game and the complexity level of the stage of the game.

Additionally, the content of the learning program is delivered parallel to the game as a form of support to the main game scenario. Lectures, presentations, exercises and experiential learning exercises are timed with the changes in the game and the storyline.

RESEARCH METHODOLOGY

The basic aim of the research was to analyze the entrepreneurial attitudes and the attitude changes among Polish secondary students before and after experiencing a digital game-based course on the basics of economics and entrepreneurship. The research was conducted based on a quasi-experimental methodology (Butler, 1986; Duke & Geurts, 2002; Kriz, 2003, 2006), with value added data analysis and no hypotheses established prior to the research. However, there were several research questions formulated beforehand:

- 1) Will the students display specific and consistent attitudes towards entrepreneurship?
- 2) Will there be a difference in attitudes before and after the experience?
- 3) Will the students from the winning teams display a more positive towards entrepreneurship than those from the losing teams?
- 4) Will there be any gender differences regarding entrepreneurial attitude change?
- 5) Will the students gain satisfaction from the game-based course correlated with the entrepreneurial attitude change?

The research was conducted among 349 students from 11 secondary schools in Poland, aged 16-18, with 167 females and 182 males. The schools represented in the research were chosen based on the localization and demographic representation between large and small cities (which also include students mostly from rural areas). The series of courses was conducted in the school year 2014/2015.

The research process was designed so as to maximize the simplicity and reliability of the data collected. The students who agreed to participate in the research had to fill out a simple questionnaire. The questionnaire was embedded into the game system and appeared automatically when students logged in to the game system for the first time; they were then asked to fill the questionnaire in the classroom. The course takes a few months' time and right after the series of courses was over, the questionnaires were administered once again through the game system and the students were asked to fill it again in the classroom. Additionally, the in-game data was collected and stored in the database.

The questionnaires were based on yearly OECD entrepreneurship attitudes questionnaires and reports (latest edition of OECD, 2015), and were reworked and adapted to the target audience. Both of the questionnaires had the same set of basic questions on future employment preferences, willingness to start an own company, understanding the role of entrepreneur in the society, and risk acceptance/avoidance. We also added a few questions with a reversed scale in order to check the consistency of the answers provided (for the list of questions, please refer to appendix no. 1.). All questions were created on a seven item Likert scale with different grading directions.

There were 13 questions repeated in ex-ante and ex-post questionnaires (in the tables, ex-ante questions coded with the letter "A", and ex-post questions coded with the letter "B"). Moreover, in the ex-post questionnaire, several additional question were added (please refer also to the list in appendix no.1) in order to measure the level of satisfaction and future education orientation with the game and the course out of which the satisfaction indication was created (in the table, satisfaction factor is coded as "S", and orientation for future studies is coded as "FO").

RESULTS

Many of the reports on youth entrepreneurship focus on the state of the entrepreneurial attitudes among young people (e.g. Borowiec & Rachwał, 2011; ARP Raport 2013; Grabski & Stachura, 2014). One of the most important issues raised by these reports is how the opinions and attitudes are created/influenced. The authors of these reports agree that the experience – the initial one in particular – of economic environment plays the key role in the opinion creation process. Thus, secondary school is of particular significance in the process of entrepreneurship attitude building, as in general, it is the place where those first contacts occur. In different reports we can find various levels of attitudes towards entrepreneurship, but in the study we will concentrate on the issue of attitude change. In order to analyze attitude change effectively, we have to look at the consistency of attitudes. In the test, we have

incorporated three reverse scale questions. They are based on separate questions of opposite nature e.g. we ask about owning a business versus working in a large company.

Table 1. Correlation matrix of reverse scale questions

Variable	Mean	Standard deviation	Q 1a	Q 2a	Q 4a	Q 5a	Q 6a	Q 7a	Q 9a	Q 10a
Q 1a	5,676	1,398	1,000	-0,152**						
Q 2a	2,745	1,199	-0,152**	1,000						
Q 4a	4,095	1,522			1,000	-0,045				
Q 5a	5,862	1,368			-0,045	1,000				
Q 6a	5,436	1,640					1,000	-0,147**		
Q 7a	3,934	1,625					-0,147**	1,000		
Q 9a	3,516	1,636							1,000	0,661**
Q 10a	4,077	1,528							0,661**	1,000

** - statistically significant with $p < ,05000$, $N=349$.

The test is composed of four pairs, and the analysis is based on the initial questionnaire only as it provides data before the learning experience (please refer to table 1). The first pair of questions are the first and the second question, and it is based on a reverse scale. We can observe negative and statistically significant Pearson's correlation coefficient (-0,152 with $p < 0,05$). In the second pair (questions 4 and 5), there is no statistically significant difference. The correlation direction is correct (Pearson's -0,045 with $p < 0,05$), and the pair is based on a reverse scale again. In the third pair of questions (questions 6 and 7), we have negative and statistically significant dependencies (Pearson's -0,147 with $p < 0,05$) with the desired direction. In the fourth and last pair (questions 9 and 10), we observe a very strong positive correlation (Pearson's 0,661 with $p < 0,05$), so the students have opinions about the difficulty of running their own business, which matches their knowledge about economics and business. Looking at the whole table, we can say that in general, the majority of the students had a consistent opinion about their future work, the role of entrepreneur in the society, and on the nature of risk.

Looking at the comparison of the questionnaires administered before the course and directly after the course, we can see some statistically significant changes.

Table 2. Statistical significance t-Test in pairs of questions

Variable	Mean	Std. dev.	Difference - mean	Difference - std. dev.	t	p	Confidence interval		Cohen's d	Effect -size r
Question 1A	5,676	1,398								
Question 1B	5,665	1,408	0,011	1,710	0,125	0,900	-0,169	0,192	0,008	0,004
Question 3A	4,421	1,421								
Question 3B	4,768	1,518	-0,347	1,901	-3,408	0,001**	-0,547	-0,147	-0,236	-0,117
Question 5A	5,862	1,368								
Question 5B	5,814	1,388	0,049	1,740	0,523	0,601	-0,135	0,232	0,035	0,017
Question 6A	5,436	1,640								
Question 6B	5,155	1,680	0,281	1,905	2,754	0,006**	0,080	0,481	0,169	0,084
Question 8A	6,049	1,182								
Question 8B	5,848	1,303	0,201	1,576	2,378	0,018**	0,035	0,366	0,162	0,081
Question 9A	3,516	1,636								
Question 9B	4,120	1,669	-0,605	1,898	-5,951	0,0001**	-0,804	-0,405	-0,365	-0,180
Question 10A	4,077	1,528								
Question 10B	4,642	1,419	-0,564	1,743	-6,048	0,0001**	-0,748	-0,381	-0,383	-0,188
Question 11A	4,330	1,525								
Question 11B	4,539	1,609	-0,209	1,972	-1,981	0,048**	-0,417	-0,002	-0,133	-0,067
Question 12A	3,375	1,742								
Question 12B	4,350	1,748	-0,974	2,110	-8,627	0,0001**	-1,196	-0,752	-0,559	-0,269
Question 13A	3,642	1,619								
Question 13B	3,496	1,631	0,146	1,907	1,432	0,153	-0,055	0,347	0,090	0,045

** - statistically significant, $N=349$.

Note: all ex-ante questions are coded with "A" and ex-post questions are coded with "B".

In the first question about the future as a business owner, we do not observe a statistically significant change, but the level of own opinion is quite high (mean 5,676 and sd 1,398) and remains almost at the same level (please refer to table 2). In the third question about the future as a small company employee, we see a statistically significant rise (two-tailed t-Test for dependent groups -3,408 with $p=0,001$) and small Cohen's d effect size (-0,236). In the fifth question concerning the importance of economic knowledge, we do not observe a statistically significant change, but the level of own opinion is quite high as well (mean 5,862 and sd. 1,368). In the case of the sixth and eighth question, we observe a similar effect. In both cases we have a statistically significant decrease of attitudes (two-tailed t-Test for dependent groups; Question 6 $t=2,754$ with $p=0,006$, Question 8 $t=2,378$ with $p=0,018$) with small Cohen's d effect sizes. In the first case, the students had a very high preference in the direction of seeing themselves as future business owners (mean 5,436 and sd 1,640), and after the simulation game experience, they were more skeptical. In the second case, they had a very high confidence level about their control of the future (mean 6,049 and sd 1,182), but after the learning experience, the level of confidence decreased. The very initial level suggests that the views of the students in both cases could be quite naive and thus providing them with a realistic experience might offer a disillusion factor. All the more because the game offers realistic decisions and quite a lot of random events, seasonality, and a competitive challenge, which all strengthen the learning experience.

Question nine and ten focus on the same problem of knowledge of how to operate an own business from different perspectives. In both cases, we receive statistically significant differences (two-tailed t-Test for dependent groups; Question nine $t=-5,951$ with $p=0,00001$, Question 10 $t=-6,048$ with $p=0,00001$) and medium sizes of Cohen's d effects. Of course, we expected that those questions would inter-correlate because they were directed at the same problem, but the size of the measured effect is one of the strongest in this research. On the one hand, this is a very positive sign because students are more convinced about their knowledge of how to operate a business after the game-based learning experience. On the other hand, it probably contributed strongly to the disillusion effect from the previous questions.

Question eleven asked the students about their opinion on the value of the role of entrepreneur in society. The initial questionnaire displayed neutral attitudes towards this issue, with an indication towards a positive opinion i.e. that this role is somewhat undervalued (mean 4,330 and sd 1,525). After the simulation gaming experience, we received a statistically significant rise (two-tailed t-Test for dependent groups $t=-1,981$ and $p=0,048$), but it was on the border of significance. Especially because Cohen's d suggested a lack of effect, so the students had a stronger inclination towards agreeing on undervaluation of the role of entrepreneurs in the society after the game-based course.

Questions twelve and thirteen cover the issue of risk avoidance/acceptance. In this case, we received mixed results. Question twelve, whose aim is to look at the loan-taking propensity, had the largest effect in the whole table ($t=-8,627$, $p=0,000001$), and actually turned the attitude inclination from negative to positive. However, question thirteen, aiming at looking for active/passive market behavior, does not show any significant change, and oscillates around neutral opinion with a slight inclination towards active/aggressive behavior. One of the reasons for these differences might be attributed to the game itself, which features relatively easy loan-taking mechanics and a constant growing business, and an aggressive market behavior on the market requires more work input from the students.

A different view on the same collection of results is offered by a gender-based analysis. In the literature on the subject, differences between males and females in entrepreneurial behavior are raised very often and discussed at length (most recent: Rossi, Borter & Sansonnens, 2013; Abrar, Rauf & Gohar, 2011; Ettl & Welter, 2010; Ekanem, 2015).

Table 3. Statistical significance t-Test in pairs of questions for females

Variable	Mean	Std. dev.	Difference - mean	Difference - std. dev.	t	p	Confidence interval		Cohen's d	Effect -size r
Question 1A	5,695	1,325								
Question 1B	5,695	1,365	0,000	1,686	0,000	1,000	-0,258	0,258	0,000	0,000
Question 3A	4,509	1,317								
Question 3B	4,743	1,489	-0,234	1,807	-1,670	0,097	-0,510	0,043	-0,166	-0,083
Question 5A	5,910	1,216								
Question 5B	5,784	1,440	0,126	1,750	0,929	0,354	-0,142	0,393	0,095	0,047

Question 6A	5,527	1,601									
Question 6A	5,138	1,639	0,389	1,969	2,554	0,012**	0,088	0,690	0,240	0,119	
Question 8A	6,102	0,992									
Question 8B	6,006	1,254	0,096	1,389	0,891	0,374	-0,116	0,308	0,085	0,042	
Question 9A	3,377	1,555									
Question 9B	3,940	1,748	-0,563	1,838	-3,956	0,0001**	-0,844	-0,282	-0,340	-0,168	
Question 10A	3,928	1,471									
Question 10B	4,539	1,476	-0,611	1,718	-4,595	0,0001**	-0,873	-0,348	0,415	-0,203	
Question 11A	4,323	1,403									
Question 11B	4,449	1,578	-0,126	1,952	-0,833	0,406	-0,424	0,172	-0,084	-0,042	
Question 12A	3,263	1,658									
Question 12B	4,198	1,712	-0,934	2,160	-5,589	0,0001**	-1,264	-0,604	-0,555	-0,267	
Question 13A	4,132	1,438									
Question 13B	3,749	1,642	0,383	1,888	2,624	0,010**	0,095	0,672	0,248	0,123	

** - statistically significant, N=167.

Note: all ex-ante questions are coded with “A” and ex-post questions are coded with “B”.

The first table compares the questions and answers of the female students (please refer to table no. 3). At first glance, we can already observe attitude differences between females and the general population. For comparison, let us also look at the answers of the male students.

Table 4. Statistical significance t-Test in pairs of questions for males

Variable	Mean	Std. dev.	Difference - mean	Difference - std. dev.	t	p	Confidence interval		Cohen's d	Effect size r
Question 1A	5,659	1,466								
Question 1B	5,637	1,449	0,022	1,737	0,171	0,865	-0,232	0,276	0,015	0,008
Question 3A	4,341	1,510								
Question 3B	4,791	1,549	-0,451	1,982	-3,067	0,002**	-0,740	-0,161	-0,294	-0,146
Question 5A	5,819	1,496								
Question 5B	5,841	1,343	-0,022	1,734	-0,171	0,864	-0,276	0,232	-0,015	-0,008
Question 6A	5,352	1,674								
Question 6A	5,170	1,720	0,181	1,843	1,327	0,186	-0,088	0,451	0,107	0,054
Question 8A	6,000	1,334								
Question 8B	5,703	1,334	0,297	1,727	2,317	0,022**	0,044	0,549	0,223	0,111
Question 9A	3,643	1,701								
Question 9B	4,286	1,579	-0,643	1,955	-4,436	0,0001**	-0,929	-0,357	-0,392	-0,192
Question 10A	4,214	1,571								
Question 10B	4,736	1,361	-0,522	1,771	-3,977	0,0001**	-0,781	-0,263	-0,355	-0,175
Question 11A	4,335	1,633								
Question 11B	4,621	1,637	-0,286	1,993	-1,934	0,055	-0,577	0,006	-0,175	-0,087
Question 12A	3,478	1,814								
Question 12B	4,489	1,774	-1,011	2,068	-6,596	0,0001**	-1,313	-0,709	-0,564	-0,271
Question 13A	3,192	1,649								
Question 13B	3,264	1,590	-0,071	1,904	-0,506	0,613	-0,350	0,207	-0,044	-0,022

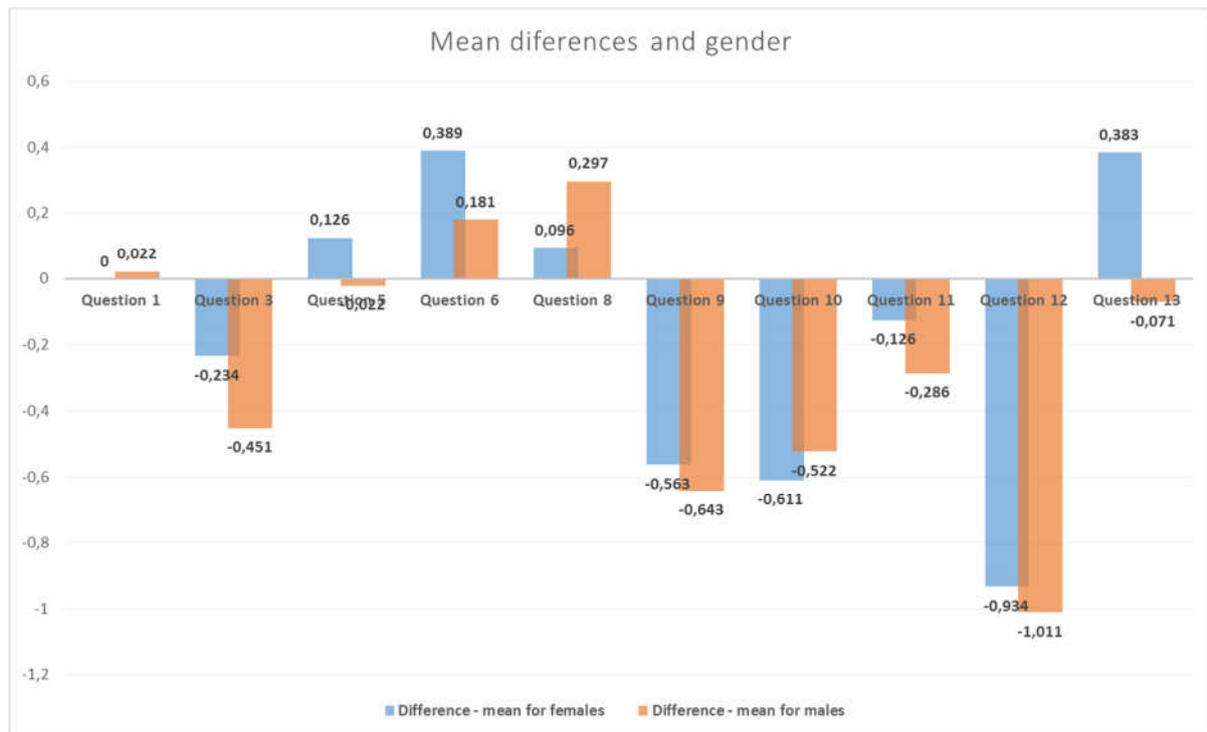
** - statistically significant, N=182

Note: all ex-ante questions are coded with “A” and ex-post questions are coded with “B”.

From the tables above we can infer that in the case of the first question, both subgroups have a very similar attitude, and the effect of the course on both of them was quite similar (please refer to tables 3, 4 and figure 1). However, in the case of question 3, we can see the first difference. In the female group, there was no statistical significant difference, and in the male group, the effect was significant (females $t=-1,67$ with $p=0,097$ and males $t=-3,067$ and $p=0,002$). Therefore we can say that after the gaming experience, males displayed a stronger attitude change towards perceiving themselves as employees in a small company. In the fifth question, both subgroups had a very similar attitude and the effect of the course on both of them was quite similar. The second difference surfaced in question six. In this case, females showed a statistically significant difference and males didn't (females $t=2,554$ with $p=0,088$ and males $t=1,327$ and $p=0,186$). In the case of question eight, we see an exactly opposite effect; females were not impacted in their perception of control over the future while males had a statistically significant fall in the perception of control over the future (females $t=0,891$ with $p=0,374$ and males $t=2,317$ and $p=0,022$).

The disillusion effect had different sources in the female group, which showed weaker perception of themselves as business owners; they had lower perception of control over the future.

Figure 1. Mean differences for females and males



In questions nine and ten, both groups ‘scored’ similar and in both cases the obtained results were significant. This result is a good predicate for game-based courses in secondary education because both females and males felt they had more knowledge about running a business. It also points towards educational verification of this particular game and course design (Feinstein & Cannon, 2002).

In the case of question eleven, both subgroups displayed a very similar attitude, and the effect of the course was quite similar but the changes were not statistically significant.

In the last section, dealing with risk acceptance/avoidance, we can observe two effects. In question twelve, both groups showed statistically significant change, which was of similar extent, and medium-size effects in Cohen’s *d* calculation (females $d=-0,555$ and males $d=-0,564$). As for the aggressive/passive behavior of companies on the market (question thirteen), we can observe that it had a statistically significant impact in the female group and almost no effect in the male group (females $t=2,624$ with $p=0,010$ and males $t=-0,506$ and $p=0,613$). An interesting part of this observation is the opposite direction of changes between the two groups. Females had on average a neutral position with an inclination towards passive behavior, and males had on average a neutral position with an inclination towards aggressive behavior. After the game-based learning experience, females became more aggressive while males leaned more towards passive/cautious behavior.

The last part of the comparison involves an analysis of the attitude change with respect to the game external variables.

Table 5. Correlation matrix of attitude change with external variables

Variable	Mean	St. dev	ΔQ.1	ΔQ.3	ΔQ.4	ΔQ.5	ΔQ.6	ΔQ.8	ΔQ.9	ΔQ.10	ΔQ.11	ΔQ.12	ΔQ.13
P	4,9140	3,0501	-0,213**	-0,114**	0,020	-0,052	-0,205**	-0,084	-0,162**	-0,141**	-0,080	0,009	0,021
RV	925,0726	968,9577	0,074	0,060	0,045	0,035	0,170**	0,066	0,075	0,077	0,027	-0,010	0,030
KTD	54,3295	49,1686	0,156**	0,022	-0,055	0,136**	0,188**	0,217**	0,106**	0,116**	0,073	0,111**	-0,077
S	5,8505	1,0029	0,281**	0,156**	-0,008	0,310**	0,193**	0,261**	0,159**	0,220**	0,025	0,092	-0,073

FO	5,5530	0,9633	0,184**	0,074	-0,032	0,222**	0,195**	0,129**	0,166**	0,201**	0,071	0,190**	0,022
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** - statistically significant with $p < ,05000$ and $N=349$

Note: from 1 to 13 change in questions, P – Game ranking position, RV – Game Score Value, KTD – Knowledge Test Difference, S – Satisfaction indicator, FO – orientation for future studies indicator

The first external variable analyzed was the ranking position in the game (please refer to table 5, where it is coded as “P”), which is designed as an indirect competition mechanism. We can observe that it shows significant correlation with changes to answers in questions one (-0,213), three (-0,114), six (-0,205), nine (-0,162), and ten (-0,141). However, it is a correlation of a negative nature, as we compare higher position ranking to a natural growing scale. Therefore, a higher place in the ranking was actually strengthening the students’ attitude towards entrepreneurship.

The second variable was the game score value (coded as “RV” in table 5). From the middle of the game on, the game ranking is calculated based on the balanced scorecard method and communicated to the teams (Wardaszko, 2016). It has a quite small impact because only question six shows a statistically significant correlation – which is still a weak one (Pearson’s correlation 0,170).

The third variable is the knowledge test value difference measured before and after the game. The tests were administered by teachers at the beginning and at the end of the game; a single test consists of a series of multiple choice questions and a few open questions. We can observe several statistically significant correlations with changes to answers in questions one (0,281), five (0,136), six (0,188), eight (0,217), nine (0,106), ten (0,116), and twelve (0,111). Although none of those correlations was strong, we can assume that the combined effect was quite significant.

The fourth variable is satisfaction indicator (coded as “S” in table 5), which consisted of several questions about the level of satisfaction with the game, the course, and recommendations to others (please refer to appendix 1 for the list of questions). These questions were an additional part, administered with questionnaire B after the course was over. All questions were based on a 7-point Likert scale (with 1 as the most negative answer and 7 as the most positive answer, and 4 as a neutral answer). The satisfaction indicator level shows positive and statistically significant correlations with changes to answers in questions one (0,281), three (0,156), five (0,310), six (0,193), eight (0,261), nine (0,159), and ten (0,220). Judging from the results, it can be argued that satisfaction shows the strongest impact on attitude change. Additionally, based on the calculations of the internal effects, the level of satisfaction was statistically significant correlated with both ranking position (-0,334) and game score value (-0,143) – showing statistically significant dependency between satisfaction and ranking and game score value.

The last variable that was measured is future studies orientation indicator (coded as “FO” in the table 5), which consisted of three questions about the students’ future plans of studies involving programs in economics and business (please refer to appendix 1 for the list of questions). These questions were an additional part, administered with questionnaire B after the course was over. All questions were based on a 7-point Likert scale (with 1 as the most negative answer and 7 as the most positive answer, and 4 as a neutral answer). The future studies orientation indicator level shows positive and statistically significant correlations with changes to answers in questions one (0,184), five (0,222), six (0,195), eight (0,129), nine (0,166), ten (0,201), and twelve (0,190). Judging from the data, it has a similar yet weaker result than the satisfaction indicator does.

DISCUSSION AND LIMITATIONS

Looking at the research questions from the initial section of the paper, we can state that students in Polish secondary schools have established and consistent attitudes towards entrepreneurship, which are in line with previous research of such kind (Borowiec & Rachwał, 2011; ARP Raport 2013; Grabski & Stachura, 2014). Out of ten questions which entrepreneurial attitude was built upon, seven showed statistically significant change after the game-based course experience, so we can objectively say that the course had an impact on the research population. This leads to a conclusion that first encounters with such experiential methods are influential, but looking at the direction of the changes, it might have an effect opposite to the expected, so such methods have to be constructed meaningfully and responsibly (Feinstein & Cannon, 2002). One of the most surprising findings was the correlation between the game position and the attitude change towards entrepreneurship is rather weak, and that winning the game did not secure a better inclination towards entrepreneurship. The problem of measuring the

game score and its impact upon the learning effectiveness has been a subject to many research papers and discussions (Teach & Govahi, 1988; Teach, 1987, 1990, 1993a, 1993b; Teach & Patel, 2007; Wolfe, 1993a; 1993b; 1993c; Wolfe & Roge, 1997; Bernard, Cannon & de Souza, 2010). One of the reasons could be the very high level of competitiveness that was already diagnosed in the research of a similar group (Wardaszko & Jakubowski, 2013). Gender effects are an important topic in entrepreneurship, and our research shows many gender differences. Future orientation, disillusion effects, and risk acceptance works differently in those subgroups, and therefore designing experiential experiences should address the way the attitudes in those subgroups are built and shaped. The analysis of correlation between attitude change and external variables gives us an additional set of interesting insights. One of the most important observations is the role of satisfaction and future orientation, which should not be mistaken with winning the game. From the entrepreneurial point of view, our objective is to create the most satisfactory learning experiences, and not necessarily the most competitive or challenging ones.

The research presented above shows a lot of interesting issues and raises even more questions for the future. First of all, a game-based experimental research into entrepreneurial attitudes at the secondary education level is important and insightful because it is the time when most of students' opinions and attitudes is born. Especially if we take in consideration that for many of them, it is the first "serious" encounter with entrepreneurship and economics. Additionally, in comparison to adults, students at this level of education do not have many other sources of experience with entrepreneurship and economics, so even longer studies may bring even more valid results, not impacted by the noise of the environmental effects. We are aware of the limitations of this research with respect to the geographic location, the types of schools (not profiled), and the type of the game that was offered. Nevertheless, youth entrepreneurship is a global movement and future research should deepen, widen, and explore the discovered dependencies further for other groups and nationalities.

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APPENDIX NO. 1

List of questions from both questionnaires:

1. What do you think about starting your own business in the future?
2. Do you perceive the role of entrepreneur as?
3. In your opinion, the possibility of working in a small company is
4. One cannot win with the rules of the market
5. I consider economic knowledge as
6. In your opinion, career as a business owner is
7. I find that working at someone else's company is
8. Determine to which extent your future is up to you
9. Do you think you have sufficient knowledge to establish and operate your own business?
10. Do you think you know how to run your own business?
11. Do you think that the role of entrepreneur is undervalued in the society?
12. Do you think that taking loans is a good idea?
13. How should companies on the market behave in your opinion?

List of additional questions from the second questionnaire:

1. Would you be interested in further broadening of your economic knowledge?
2. How do you find this curriculum in comparison to other completed at school?
3. How do you assess the use of a simulation game in the pursuit of this school subject?
4. If you had an opportunity, would you like to continue learning about entrepreneurship?
5. Are you going to broaden your knowledge about market rules on your own?
6. Did you enjoy this form of learning about entrepreneurship?
7. Would you recommend this course to your friends?
8. Do you think this form of classes is more interesting than the standard one?
9. Do you think that the use of a simulation game in this subject helped in learning?