

Game-based Entrepreneurship Education: Impact on Attitudes, Behaviours and Intentions

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Abstract: Despite the worldwide increasing interest in entrepreneurship education (EE), little attention has been paid to the game approach as a useful instrument for boosting entrepreneurial attitudes, entrepreneurial intentions and entrepreneurial behaviour. This contribution utilized a structured questionnaire to analyze a new scale tested on a first sample of 41 participants. As a primary basis for further research this work assesses the impact of game elements in EE with 42 items. In particular, by conducting linear regression analyses the study draws special attention to significant positive impacts of key game elements in EE such as indicators of flow on entrepreneurial attitudes, intention and behaviour, whereas indicators of curiosity appear to decrease entrepreneurial intention and the probability of starting a business. Explanatory factor analyses and Cronbach's alpha confirm the reliability and validity of the construct. In addition, the findings of this currently neglected issue call for more research to be done on web-based teaching methods in EE, which are considered to be essential not only to academia, but also to business, potential entrepreneurs and policy makers.

Keywords: entrepreneurship; entrepreneurship education; game approach, impact study; entrepreneurial perception; entrepreneurial intention; entrepreneurial attitudes; entrepreneurial behaviour; game design

1. Introduction

As the global diffusion of entrepreneurship education (EE) continues (Solomon and Fernald Jr, 1991; Joshi and Ganapathi, 2008; Edelman *et al.*, 2008; Kailer, 2009; Ion and Viorica, 2011; Boyles, 2012), scholars dedicated to entrepreneurship have shed relatively little light on the game approach in the sphere of EE (Alsever and Sacks, 2005; Sawyer, 2007; Barnes *et al.*, 2009; Lester *et al.*, 2013; Vaz de Carvalho *et al.*, 2014; Orji *et al.*, 2014). Along with currently growing academic interest in the role and impact of EE worldwide (Saeed *et al.*, 2014; Sipon and Lope Pihie, 2014; DeJaeghere and Baxter, 2014; Fayolle and Gailly, 2015), we face a critical challenge with mixed results concerning the relationship between EE and entrepreneurial intentions (Sánchez, 2013; Bae *et al.*, 2014). In spite of a growing consensus regarding EE, there appears to be little agreement concerning the content of EE and implemented teaching materials and tools (Honig *et al.*, 2005; Neergaard and Ulhøi, 2007; Edelman *et al.*, 2008). In addition, significant methodological deficiencies in the past have masked the tremendously positive impact of EE (Lorz *et al.*, 2013), and there is little agreement regarding the pedagogical content (Davidsson, 2006; Mwasalwiba, 2010; Williams-Middleton and Donnellon, 2014). In response to this under-researched but promising topic (Mayer *et al.*, 2014; Hindle, 2002), this article draws attention to a game approach within the field of EE from both business and non-business perspectives.

Based on the promising game aspects for EE, which appear to be not adequately explored at present (Lorz *et al.*, 2013), this contribution focuses on impacts of essential game elements such as indicators of flow, as well as curiosity (Fang *et al.*, 2010; Wu *et al.*, 2013; Qin *et al.*, 2009) on entrepreneurial attitudes, entrepreneurial intention, and finally, entrepreneurial behaviour. By providing a game-based EE tool in order to change an individual's entrepreneurial behaviour, this work will enhance previously published studies in EE (e.g., Pittaway and Cope, 2007; Godsey and Sebor, 2009; Flottesmesch, 2013; Williams-Middleton and Donnellon, 2014) with a theoretical focus, taking the entrepreneurial game approach and the vital impact of necessary game indicators for successful games in this phenomenon into account. Because most EE studies are carried out at the tertiary level (Volery *et al.*, 2013; Vanevenhoven and Liguori, 2013; Zhang *et al.*, 2014), this study broadens the theoretical scope of an impact study, using the game approach as a practical tool for increasing entrepreneurial awareness with regard to currently insufficiently addressed target groups such as students at the secondary level and in vocational schools (Lorz *et al.*, 2013), as well as educators, teachers, researchers, advisors and entrepreneurs. Only few studies have analyzed the impact of EE offered at the secondary and vocational school level (Athayde, 2009; Kourilsky and Esfandiari, 1997; Oosterbeek *et al.*, 2010; Peterman and Kennedy, 2003) or to other involved parties (Hindle, 2002).

A game approach has been employed in this contribution in order to assess its impact on entrepreneurial attitude, intentions, and behaviour. Accordingly, particular attention has been paid to the starting point of this impact study while implementing game-based designs to answer the following research question comprehensively:

Do game elements in EE support both entrepreneurial attitudes and entrepreneurial intention so that entrepreneurial behaviour is influenced positively?

This contribution starts with a discussion of the underlying theoretical framework and hypothesis development. Scale development and empirical procedures are described in the

subsequent section on methodology. A summary of the statistical results follows. Finally, after discussing the central results, the article ends with limitations and implications.

2 Theoretical framework and hypothesis development

2.1 The game approach

Overall, games rely on rules to detect and exploit challenges (Hainley and Henderson, 2006; Haurie *et al.*, 2012; Mariais *et al.*, 2012). Based on previous studies, the recent engagement in this research field with a focus on education presents opportunities to adequately address state-of-the-art teaching materials (Bennett *et al.*, 2008; Lei, 2009; Margaryan *et al.*, 2011). Although games with pedagogical aspects were received with scepticism, stressing that they do not represent universal toolkits (Neville and Shelton, 2010; Nolan and McBride, 2014), educational science needs to meet the altering demands of the new generation and its innovative entrepreneurs (Chaudhary, 2008; Kim *et al.*, 2009; Hwang and Wu, 2012). However, the main drawbacks of educational games are the time they demand from educators (Gros, 2007) and the complexity required from developers. Substantial cooperation on multiple levels by both developers and educators is necessary to include games in the programme of study effectively (Squire, 2005; Shen *et al.*, 2009; Muratet *et al.*, 2009). Nevertheless, only few studies have focused on the critical aspects of serious games for educational purposes (Lindh *et al.*, 2008; Connolly *et al.*, 2012); this calls for more research.

Despite established groundwork across many fields (Ruben, 1999; Qing *et al.*, 2013; Kapp, 2014), there are still unanswered questions regarding educational games (Leemkuil and De Jong, 2012). Results indicate that interactive learning objects, usability, the ability to learn and multimodality enhance motivation and educational outcomes to create an ideal learning environment (Ritterfeld *et al.*, 2009; Wen-Hao David *et al.*, 2010; Chen and Huang, 2012; Brink, 2012; Kuan-Cheng *et al.*, 2012). Due to the escalating curiosity and increasing attention of the involved communities such as students, teachers and parents, game technologies and serious game elements are becoming progressively more important for educational purposes (Sawyer, 2007; Deterding *et al.*, 2011; Wortley, 2013) to boost motivation and influence behaviour positively (Alsever and Sacks, 2005; Sawyer, 2007; Barnes *et al.*, 2009; Lester *et al.*, 2013; Vaz de Carvalho *et al.*, 2014; Orji *et al.*, 2014).

Based on a review of required game evaluation principles (Fellnhofer, 2014; Fellnhofer, 2016), this work builds on a tailored set of criteria for successful EE game development (Fang *et al.*, 2010), flow (Wu *et al.*, 2013) and curiosity (Qin *et al.*, 2009) impact behaviour (Shinnar *et al.*, 2009) or are key elements of web-based learning environments for education (Lester *et al.*, 2014). The criteria stress the increased applicability to real-life entrepreneurship, which will be discussed in the next section.

2.2 Entrepreneurship Education

All over the world the interdisciplinary field of EE and its impact on entrepreneurial actions are receiving increased attention (e.g., Fayolle *et al.*, 2006; Souitaris *et al.*, 2007; Rasmussen, 2011; Lorz *et al.*, 2013). Although progress is being made and EE is gaining legitimacy in the literature, disagreement still exists. For instance, several scholars such as

Pittaway and Cope (2007), von Graevenitz et al. (2010), or Lautenschläger and Haase (2011) stress the positive impact of EE, whereas other authors such as Oosterbeek et al. (2010) found negative effects of EE. Even this pessimistic stream has not gained significant footing in the scientific community, emphasizing that research is in its infancy (Lorz *et al.*, 2013; Rideout and Gray, 2013; Bae *et al.*, 2014).

Despite various teaching techniques to complement lectures on entrepreneurship, the effectiveness and the appropriateness of the applied methods have not been taken into account adequately in the current body of literature. Prior work recommended a focus on broadening entrepreneurial spirit rather than on skills acquisition (Lautenschläger and Haase, 2011). While only few business practitioners are involved in the full curriculum (Gendron, 2004), more interactive learning approaches are suggested (Hao *et al.*, 2005; Heinonen and Poikkijoki, 2006; Neck and Greene, 2011; Miller *et al.*, 2012). Even though game dimensions for entrepreneurial purposes tend to advance continuously (Przybylski *et al.*, 2010), the lack of reliability and construct validity is highlighted (Pápay *et al.*, 2013), although this is continually improving (Kim and Kim, 2010). Despite little experience, considering games as an adequate method for promoting entrepreneurial orientation appears to be attractive. Accordingly, this work expands previous investigations of games designed to increase the quality of entrepreneurial decisions through interactive web-based tools (Chisholm, 2007; Dibbell, 2011) and focuses or builds on research findings that game elements (Fang *et al.*, 2010), such as flow (Wu *et al.*, 2013) and curiosity (Qin *et al.*, 2009), are receiving the most attention in mixed-reality interactive playgrounds, generating high values of entertainment (Yannakakis and Hallam, 2007) as factors of influencing entrepreneurial attitudes, intention, and behaviour, which will be discussed hereafter.

2.3. Entrepreneurial attitudes, intention and behaviour

While the definitions of entrepreneurial attitudes and behaviour are still in their infancy, Bosma and Schutjens (2011) describe entrepreneurial attitudes as the awareness of entrepreneurial opportunities, possession of entrepreneurial skills and knowledge, and fear of failure. Robinson et al. (1991) identified four important entrepreneurial attitudes – achievement, self-esteem, personal control and innovation – and measured these characteristics on an Entrepreneurial Attitude Orientation Scale. This scale has been implemented in a number of subsequent contributions (e.g., Koh, 1995; Tan *et al.*, 1996; Shetty, 2004). Intensively discussed in the literature during recent years, the term intention demonstrates a reliable predictor of planned behaviours (Kolvereid, 1996; Krueger *et al.*, 2000). There is now a large body of literature stressing that intentions influence the process of formation of a company (Liñán and Chen, 2009), and more recently that the game approach in EE shows this potential as well (Fellnhöfer, 2016).

Universalizing key findings of Shinnar et al. (2009) show that individuals' views on entrepreneurship differ (Carsrud and Olm, 1986). However, several previous studies found a positive impact of EE on the perceived attractiveness of entrepreneurship (e.g., Peterman and Kennedy, 2003; Fayolle *et al.*, 2006; Nguyen and Phan, 2014). Nevertheless, the role of attitudes in the entrepreneurial cognitive process requires more attention (Autere and Autio, 2000; Fayolle *et al.*, 2014), in particular in the sphere of a game-based EE setting. Accordingly, the following hypothesis is proposed:

Hypothesis 1: Game elements in EE support entrepreneurial attitudes.

Krueger and Carsrud (1993) studied the correlation between attitudes and entrepreneurial intentions, concluding that starting a new venture is an intentional course of action that can be influenced by attitudes and behaviour. Overall, entrepreneurial goals link intention and action (Schindehutte *et al.*, 2008; Nimalathan and Achchuthan, 2012). Based on the theory that entrepreneurial progression is not linear and the fact that previous work of several researchers highlighted different stages of intentions (Gollwitzer and Brandstätter, 1997; Gollwitzer, 1999), values and motivators influence goal-directed behaviour (Bay and Daniel, 2003). Moreover, these antecedents play a central role in the intention approach for overcoming barriers and difficulties when starting a venture (Fayolle *et al.*, 2014). For purpose of assessing an EE game, the present contribution is based on Fayolle *et al.* (2006) and Souitaris *et al.* (2007), who argue that individual intention forms real behaviour. This work relies on prior research stressing that attitudes predict intention towards behaviour (Kolvereid, 1996). Overall, intentions are immediate antecedents of behaviour (Krueger *et al.*, 2000; Souitaris *et al.*, 2007). As a basis for the analysis of a game approach in EE, this study builds on this well-built theory in the literature. Thus, the following hypotheses:

Hypothesis 2a: Entrepreneurial attitudes support entrepreneurial intention.

Hypothesis 2b: Game elements in EE support entrepreneurial intention.

Previous contributions support the assumption that entrepreneurial attitudes have a positive effect on entrepreneurial behaviour (Arenius and Minniti, 2005) defined as behaviour for acting entrepreneurially (Gilmore and Carson, 2000), in other words, a significant influence on real entrepreneurial activity (Tamasy, 2006). Fundamentally, previous entrepreneurship research concerning entrepreneurial behaviours (Krueger, 2007; Brännback and Carsrud, 2009; Carsrud and Brännback, 2009) implies that entrepreneurial attitude is a crucial factor but is still under-researched with respect to the game approach in the educational curriculum (Carsrud *et al.*, 2009; Lorz *et al.*, 2013; Mayer *et al.*, 2014; Gedeon, 2014) in view of its significant importance to entrepreneurial behaviours (Muda *et al.*, 2011; Carsrud and Brännback, 2011; Wright, 2015). Although a number of contributions found a positive impact of EE taking entrepreneurial attitudes into account which influence behaviour (e.g. Krueger, 2007; Brännback *et al.*, 2007; Cheung, 2008; Petridou and Glaveli, 2008; Dickson *et al.*, 2008; Oosterbeek *et al.*, 2010; von Graevenitz *et al.*, 2010), whether and how a generalization of those results to a range of game-based EE settings with respect to the game approach may be made remains a question. In line with this argumentation, the following hypotheses are assumed:

Hypothesis 3a: Entrepreneurial attitudes support entrepreneurial behaviour.

Hypothesis 3b: Game elements in EE support entrepreneurial behaviour.

In other research disciplines such as psychology, intention has been shown to be an adequate forecaster of planned behaviour, especially when behaviour is difficult to examine, such as in entrepreneurship (Bird, 1988; Krueger and Brazeal, 1994). Overall, EE aspires to a positive increase in intentions in order to be a successful entrepreneur. The majority of studies that analyze the impact of EE on entrepreneurial intentions report positive results (e.g., Hansemark, 1998; Liao and Gartner, 2008; Wilson *et al.*, 2007; Liao and Gartner, 2008; Lorz *et al.*, 2013; Bae *et al.*, 2014). However, in contradiction, several scholars are calling for more

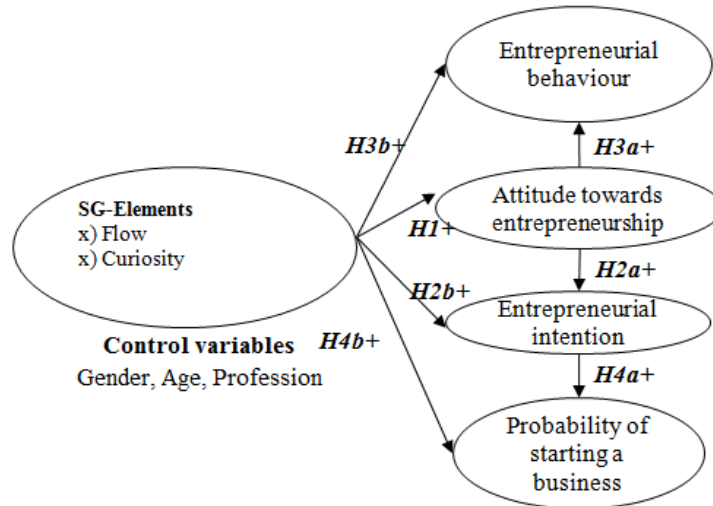
research in this field of expertise because of methodological limitations (Peterman and Kennedy, 2003). Applying an ex ante/ex post research design, only two studies reported that EE shows a negative effect on entrepreneurial intention (Oosterbeek *et al.*, 2010; von Graevenitz *et al.*, 2010). Other researchers have proposed a positive link between EE and entrepreneurial intention, but the evidence is still not strong (e.g. Krueger, 2007; 2011; Souitaris *et al.*, 2007; Oosterbeek *et al.*, 2010; von Graevenitz *et al.*, 2010; Sánchez, 2013; Fellnhofner, 2016). Nonetheless, whether and how a generalization of those results to a range of game-based settings in EE may be made remains a question (Zhao, Siebert, & Hills, 2005). Based on a previous study stressing that a game environment influences entrepreneurial intentions and behaviour significantly when non-players and players were evaluated (Fellnhofner, 2016), it is assumed that entrepreneurial intention and game elements in EE will positively influence entrepreneurial behaviour as well as the probability of starting a venture. Thus, it is proposed that:

Hypothesis 4a: Entrepreneurial intention support the probability of starting a business.

Hypothesis 4b: Game elements in EE support the probability of starting a business.

Based on the outlined research hypotheses development, the following model is proposed.

Figure 1: Research model



3 Methodology and Data

Based on a systematic review of the methods in EE, any impact study needs to rely on an appropriate design for demonstrating causality. In conducting such a study extra attention must be paid to the related theories with respect to validity and reliability measurements, structured sampling procedures, and adequate sample size, so that the initial levels of attitudes, intentions and behaviours can be analyzed (Lorz *et al.*, 2013). First, data were collected via a web-based survey using a structured questionnaire with five-point Likert scales (1 for "totally disagree" and 5 for "completely agree"), based on the existing literature (see used items in the Appendix) critically assessing the impact of EE (Duval-Couetil, 2013).

3.1 Participants and procedure

As shown in Table 1, the total random sample ($n=41$; 36.6% female) includes educators, teachers, researchers, students or individuals in training, advisors, and finally entrepreneurs serving as expert groups for this empirical study testing for a new construct, taking both players and non-players of EE games into account. The empirical data were gathered via a random sample in March 2015.

Table 1 Survey participants

	Gender		player of SG		player of EE SG		
	male	female	no	yes	no	yes	
Expert groups							
Educator, teacher or researcher	6	5	7	4	8	3	11
Student or in training	4	2	6	0	4	2	6
Advisor	7	7	9	5	5	9	14
Entrepreneur	9	1	7	3	1	9	10
Respondents	26	15	29	12	18	23	41

3.2 The research instrument

A game prototype supported by the Austrian Research Promotion Agency (FFG) was adjusted for the purpose of this research. While focusing on central goals of learning mathematics in a farm setting during a current market entry phase, EE questions were elaborated and implemented for this specific context. The player or the entrepreneurial farmer receives money and animals for correct answers to entrepreneurial questions while competing with other farmers or entrepreneurs in a small village. This game approach of a first prototype dedicated to entrepreneurial questions in a farm setting combines theories of entrepreneurship practice and education which have already been examined rigorously with respect to qualitative aspects in a descriptive study (Fellnhofer, 2015).

4 Results

4.1 Data analysis, reliability and validity tests

An Exploratory Factor Analysis (EFA) and Cronbach's alpha for data analysis, reliability and validity tests have been applied, followed by regression analyses of the influence of game elements in EE on entrepreneurial attitudes, intentions and behaviour to test the hypotheses (Jin *et al.*, 2006; Coakes and Steed, 2009). Reliability mirrors the steadiness of the scale and measured instrument related to the hypotheses (Letz and Gerr, 1995). Validity is concerned with the success of scales and measurements. In this contribution construct validity and content validity are applied (Haertel, 1985; Murphy and Davidshofer, 1988; Fraenkel and Wallen, 1993). Based on Hair *et al.* (1995), the content validity of this instrument examines the adequate description of the research field.

To tackle non-response bias a study report was proposed. As single informants are applied, common-method bias might occur. However, common-method bias does not seem to be a critical problem in this study.

4.2 Exploratory Factor Analysis

A performed Exploratory Factor Analysis (EFA) confirms the structural quality of the concept for this study (Fellnhofer, 2016). First of all, using Kaiser-Meyer-Olkin (Dziuban and Shirkey, 1974), the items were examined regarding sufficient common information. EFA is

suitable because Kaiser-Meyer-Olkin was more than 0.5 (Kaiser, 1974). Next, with respect to extract factors an eigenvalue of not less than 1 is implemented (Parlett, 1980). The study represents a sufficient structure. First of all, the determinants of the correlation matrix are greater than the required value of 0.00001. In addition, the communalities of all variables are not less than 0.5. In addition, Cronbach's alpha is extensively used for internal consistency and is therefore applied in this contribution as well (Cronbach, 1951). All of the Cronbach's alpha values for the constructs developed were equal to or higher than 0.70, indicating that the reliability of this measurement and scale is adequate (Fellnhofer, 2016) which show strong internal consistency according to Nunnally (1978) and Hair et al. (1995). Overall, the reliability of the construct to invest in EE with a game approach using a new scale consisting of 42 items measured on a five-point Likert rating scale ranging from 1 (strongly disagree) to 5 (strongly agree) is determined to be sufficient with respect to all applied statistical tests in a preceding article (Fellnhofer, 2016) and enhanced in this contribution (see Appendix).

4.3 Regression analyses

Linear regression analyses were employed to test the hypotheses. Then the assumptions for regression analyses were observed. No multi-collinearity was identified in any of the hypotheses. First of all, the next table 2 shows the overall fit statistics of all hypotheses. The Durbin-Watson is $1.5 < d < 2.5$ and it can therefore be assumed that there is no firstorder linear auto-correlation in the data. The results of an exploratory factor analysis (see Appendix) stress the reliability of the construct.

Table 2: Linear regression model summary and overall fit statistics

Hypotheses	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	1	0.677(a)	0.459	0.381	0.424	0.459	5.931	5	35	0.0004
a Predictors: (Constant), Indicators of flow, Indicators of curiosity, Gender, Age, Profession; b Dependent Variable: Attitudes										
2a	0.714(a)	0.510	0.456	0.91152	0.510	9.370	4	36	0.000	1.997
a Predictors: (Constant), Attitudes, Age, Profession, Gender b Dependent Variable: Intention										
2b	0.593(a)	0.352	0.259	1.063	0.352	3.801	5	35	0.007	2.169
a Predictors: (Constant), Indicators of flow, Indicators of curiosity, Gender, Age, Profession; b Dependent Variable: Intention										
3a	0.796(a)	0.634	0.593	0.44546	0.634	15.570	4	36	0.000	1.487
a Predictors: (Constant), Attitudes, Age, Profession, Gender b Dependent Variable: Behavioural control										
3b	0.644(a)	0.414	0.331	0.571	0.414	4.950	5	35	0.002	1.790
a Predictors: (Constant), Indicators of flow, Indicators of curiosity, Gender, Age, Profession; b Dependent Variable: Behavioural control										
4a	0.860(a)	0.740	0.711	21.2461	0.740	25.574	4	36	0.000	2.117
a Predictors: (Constant), Intention, Age, Profession, Gender b Dependent Variable: Probability of starting a business										
4b	0.627(a)	0.393	0.306	32.902	0.393	4.533	5	35	0.003	1.653
a Predictors: (Constant), Indicators of flow, Indicators of curiosity, Gender, Age, Profession; b Dependent Variable: Probability of starting a business										

Table 3 summarizes the tests on the null hypotheses. When the beta coefficient is equal to zero, there is no effect. The positive unstandardized beta coefficients for H2a, H3a and H4a are sufficient. For example, the beta coefficient of 1.596 is statistically significant, stressing that entrepreneurial attitudes positively influence entrepreneurial intention. This outcome confirms prior studies (e.g., Krueger and Carsrud, 1993, Schindehutte *et al.*, 2008; Nimalathasan and Achchuthan, 2012; Fayolle *et al.*, 2014). The data also support H3a, that entrepreneurial attitudes significantly influence entrepreneurial behaviour, which has been concluded in prior studies as well (e.g., Arenius and Minniti, 2005; Krueger, 2007; Brännback and Carsrud, 2009; Carsrud and Brannback, 2009). Finally, and also in line with prior investigations (e.g. Krueger, 2007; 2011; Souitaris *et al.*, 2007; Oosterbeek *et al.*, 2010; von Graevenitz *et al.*, 2010; Sánchez, 2013; Fellnhofer, 2016), entrepreneurial intention has a significant positive influence on the probability of starting a business.

Table 3: Basis for the linear regression analyses results

	H2a Entrepreneurial intention	H3a Entrepreneurial behaviour	H4a Probability of starting a business
Entrepreneurial attitudes	1.596*** (.270)	1.020*** (.132)	
Entrepreneurial intention	----	----	26.377*** (2.769)
Control variables			
Gender (female=1, male=2)	.661** (.312)	-.003 (.153)	2.852 (7.302)
Age (<21=0, 21-30=1, 31-40=2, 41-50=3, 50-100=4)	-.031 (.153)	.040 (.075)	6.882 (3.559)
Profession (Advisor=1, Entrepreneur=2 Educator/ Teacher/ Researcher=3, Student or in training=4)	-.165 (.138)	-.083 (.067)	1.026 (3.226)
F	9.370***	15.570***	25.574***
R²	.510***	.634***	.740***
Adjusted R²	.456***	.593***	.711***

As outlined in Table 4, the game elements referring to indicators of flow significantly influence entrepreneurial attitudes. In addition, while these indicators have a significant positive influence on entrepreneurial intention, indicators of curiosity have a significant negative influence on entrepreneurial intention. Interestingly, both H2a and H2b stress that gender influences entrepreneurial intention. Furthermore, indicators of flow support entrepreneurial behaviour significantly in a positive manner. Moreover, when it comes to predicting the probability of starting a business, once again indicators of flow increase entrepreneurial behaviour significantly, whereas indicators of curiosity decrease entrepreneurial behaviour significantly.

Table 4: Linear regression analyses results

Game elements in EE	H1 Entrepreneurial attitudes	H2b Entrepreneurial intention	H3b Entrepreneurial behaviour	H4b Probability of starting a business in %
Indicators of flow	0,499*** (0,479)	1,355*** (0,378)	0,561*** (0,203)	49,182*** (11,710)
Indicators of curiosity	-0,109 (0,151)	-0,773** (0,381)	-0,074 (0,205)	-39,880*** (11,801)
Control variables				
Gender (female=1, male=2)	0,104 (0,152)	0,905** (0,381)	0,151 (0,205)	26,362** (11,799)
Age (<21=0, 21-30=1, 31-40=2, 41-50=3, 50-100=4)	0,046 (0,073)	-0,023 (0,184)	0,099 (0,099)	3,712 (5,708)
Profession (Advisor=1, Entrepreneur=2, Educator/Teacher/Researcher=3, Student or in training=4)	-0,005 (0,064)	-0,200 (0,162)	-0,093 (0,087)	-4,751 (5,008)
F	5,931***	3,801***	4,950***	4,533***
R²	0,459***	0,352***	0,414***	0,393***
Adjusted R²	0,381***	0,259***	0,331***	0,306***

Significance: ***=p<.01, **=p<.05, *=p<.1
Standard errors are in grey and brackets.

5 Discussion and Conclusion

This paper seeks to fill a long-lasting research gap by exploring whether games can facilitate personalized learning to motivate nascent entrepreneurs in the process of becoming entrepreneurial (Low *et al.*, 1994; Hindle, 2002). Theories of entrepreneurship practice and education are combined by using a game prototype dedicated to entrepreneurial questions in a farm setting, which has already been examined successfully in a descriptive qualitative study (Fellnhöfer, 2015). Based on 42 items, the applied statistical analyses with EFA, Cronbach's alpha and linear regression analyses from a sample of 41 individuals assess an innovative construct leading to the finding that game elements in EE appear to be adequate instruments for promoting and teaching entrepreneurship because indicators of flow in particular increase entrepreneurial attitudes, intentions and behaviour. Furthermore, this study emphasizes that special attention has to be paid to game curiosity. Finally, the research question can be answered positively – particular game elements in EE such as flow support entrepreneurial attitudes as well as entrepreneurial intention, so that entrepreneurial behaviour is influenced positively.

5.1 Limitations

As part of this section, it is required to judge the limitations of this research work. As regards generalizability, first of all, validity is examined. Data limitations involve testing the hypotheses on individuals. While this limitation does not seriously handicap this examination, it should be kept in mind with respect to population validity. Despite a small sample size, other impact studies of EE show similar sizes: Clouse (1990) with 47, Kourilsky and Esfandiari (1997) with 51, Hansemark (1998) with 19, Fayolle (2000) with 25, Wee (2004) with 52, Friedrich et al. (2006) with 27, Fayolle et al. (2006) with 20, Radu and Loué (2008) with 44, Jones et al. (2008) with 50, Cheung (Cheung, 2008) with 50, and Singh and Verma (2010) with 52.

Furthermore, this contribution did not try to evaluate the change in entrepreneurial intentions using Ajzen's theory of planned behaviour (1991). As such, the game approach in EE is supposed to influence the antecedents of the intention, which in turn influence intention. Accordingly, the regression analyses require more advanced statistical procedures such as structured equation modelling. Although these findings suggested a modest limitation, the discussion should be interpreted with caution in this respect.

In view of these limitations, further research is necessary to examine the nature of a wider population and geographical scope, with special regard to a longitudinal study and applied measures. However, this work provides a fruitful basis for future research in this context.

5.2 Implications for Theory and Practice

Overall, this research supports 19 prior studies, in which positive effects of EE on attitudes were found (Lorz *et al.*, 2013), and enhances the current literature with a game approach. In particular, this finding is consistent with Bakotic and Kruzic (2010), Nabi *et al.* (2008), Souitaris *et al.* (2007), Fayolle *et al.* (2006), Lee *et al.* (2006), Kolvereid and Moen (Kolvereid and Moen, 1997), and Clark *et al.* (Clark *et al.*, 1984), who reported a positive influence of EE on entrepreneurial intentions. Accordingly, this investigation enhances the theoretical research basis by using a game approach in the field of EE. However, it is contrary to the findings of Oosterbeek *et al.* (2010), or Von Graevenitz *et al.* (2010), who found a negative influence of EE on intentions. Overall, the findings in this work suggest that special game elements such as flow can positively influence individuals' entrepreneurial attitudes, entrepreneurial intention and entrepreneurial behaviour, confirming that games appear to be useful tools to shape and foster entrepreneurship at early stages, guided by other training, education, and of course learning by doing.

Appendix

Items

- G1: What is your gender? (male, female)
- G2: What is your age? (<20; 20-30; 31-40, >40)
- G3: What is your profession? (entrepreneur/advisor, educator/teacher/ researcher, student or in training)
- G4: What is your area of expertise?
- G5: Have you ever played a serious game explicitly designed for educational purposes?
- G6: Have you ever played a serious game dedicated to entrepreneurship?
- G7: Have you ever participated in any form of entrepreneurship education?

Indicators of flow (based on Wu *et al.*, 2013)

- IF1: Playing a serious game in a farm setting dedicated to entrepreneurship will be interesting.
- IF2: Playing a serious game in a farm setting dedicated to entrepreneurship will be fun.
- IF3: I will feel curious while playing a serious game in a farm setting dedicated to entrepreneurship.
- IF4: I will be in control of a serious game in a farm setting dedicated to entrepreneurship.
- IF5: I will be entirely absorbed in playing a serious game in a farm setting dedicated to entrepreneurship.

Indicators of curiosity (based on Qin *et al.*, 2009)

- IC1: I want to know the rest of the story line in the course of playing a serious game in a farm setting.
- IC2: A serious game in a farm setting dedicated to entrepreneurship sounds interesting.
- IC3: I will feel successful when I overcome the obstacles, tasks or opponents in the farm game.
- IC4: I will actively explore the farm game.
- IC5: I will enjoy concentrating on the story of a serious game in a farm setting dedicated to entrepreneurship.
- IC6: The story in a serious game in a farm setting dedicated to entrepreneurship should quickly grab my attention at the beginning.

Attitude towards entrepreneurship

- AE1: In business it is preferable to be an entrepreneur rather than a large-firm employee. (Carayannis *et al.*, 2003)
- AE2: It is more beneficial to society to have large enterprises than small firms. (Carayannis, Evans, & Hanson, 2003)
- AE3: I would rather found a new company than be the manager of an existing one. (Lüthje & Franke, 2003)
- AE4: Starting my own business sounds attractive to me. (Krueger *et al.*, 2000)
- AE5: I personally consider entrepreneurship to be a highly desirable career alternative for people with my professional and educational background. (Autio *et al.*, 2001)
- AE6: Overall, I consider pursuing an entrepreneurship career. (Francis *et al.*, 2004)
- AE7: A career as an entrepreneur is totally unattractive to me. (Liñán and Chen, 2009)

AE8: If I had the opportunity and resources, I would love to start a business. (Liñán and Chen, 2009)

AE9: Amongst various options, I would rather be anything but an entrepreneur. (Liñán and Chen, 2009)

AE10: Being an entrepreneur would give me great satisfaction. (Liñán and Chen, 2009)

AE11: Being an entrepreneur holds more advantages than disadvantages for me. (Liñán and Chen, 2009)

Perceived behavioural control

PBC1: I am confident that I would succeed if I started my own business. (Autio *et al.*, 2001)

PBC2: It would be easy for me to start my own business. (Autio *et al.*, 2001)

PBC3: Starting my own firm would probably be the best way for me to take advantage of my education. (Autio *et al.*, 2001)

PBC4: I have the skills and capabilities required to succeed as an entrepreneur. (Autio *et al.*, 2001)

PBC5: I have ever thought about starting a business. (Shinnar *et al.*, 2009)

PBC6: I am interested in a serious entrepreneurial game in a farm setting. (Shinnar *et al.*, 2009)

PBC7: Starting a firm and keeping it viable would be easy for me. (Liñán and Chen, 2009; Kolvereid, 1996)

PBC8: I believe I would be completely unable to start a business. (Liñán and Chen, 2009 and Kolvereid, 1996)

PBC9: I am able to control the creation process of a new business. (Liñán and Chen, 2009 and Kolvereid, 1996)

PBC10: If I tried to start a business, I would have a good chance of being. (Liñán and Chen, 2009 and Kolvereid, 1996)

PBC11: I know all about the practical details needed to start a business. (Liñán and Chen, 2009 and Kolvereid, 1996)

PBC12: The number of events outside my control which could prevent me from starting a new business are very few. (Liñán and Chen, 2009 and Kolvereid, 1996)

PBC13: For me, developing a business idea would be easy. (Liñán and Chen, 2009 and Kolvereid, 1996)

Entrepreneurial intentions

EI1: I'm ready to do anything to be an entrepreneur. (Liñán and Chen, 2009)

EI2: My professional goal is to become an entrepreneur. (Liñán and Chen, 2009)

EI3: I will make every effort to start and run my own business. (Liñán and Chen, 2009)

EI4: I'm determined to create a firm in the future. (Liñán and Chen, 2009)

EI5: I have very seriously thought about starting a business. (Liñán and Chen, 2009)

EI6: I'm determined to start a firm someday. (Liñán and Chen, 2009)

EI7: I'm going to start my own business within one year. (Kolvereid, 1996; Armitage and Conner, 2001)

Probability of starting a business

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Estimate the probability (0-100%) that you will start your own business in the next five years?
(Krueger *et al.*, 2000)

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Appendix 1: Results of an exploratory factor analysis

Construct	Items	Extraction Sums of Squared Loadings ^a	Communalities ^b	Cronbach's $\alpha \geq 0.7^c$	Kaiser-Meyer-Olkin Measure of Sampling Adequacy ^d	Determinant ^e	Bartlett's Test of Sphericity ^f
Indicators of flow	IF1		0.806				
	IF2		0.780				
	IF3	3.352	0.715	0.876	0.834	0.059	106.235***
	IF4		0.547				
	IF5		0.504				
Indicators of curiosity	IC1		0.758				
	IC2		0.749				
	IC3	4.165	0.691	0.910	0.818	0.014	158.420***
	IC4		0.717				
	IC5		0.685				
	IC6		0.565				
Attitude towards entrepreneurship	AE1		0.614				
	AE2		0.892				
	AE3		0.858				
	AE4		0.739				
	AE5		0.617				
	AE6	5.391	0.652	0.696	0.829	0.001	234.581***
	AE7		0.801				
	AE8		0.746				
	AE9		0.602				
	AE10		0.751				
	AE11		0.655				
Perceived behavioural control	PBC1		0.664				
	PBC2		0.665				
	PBC3		0.603				
	PBC4		0.595				
	PBC5	7.251	0.486	0.883	0.860	0.012	369.537***
	PBC6		0.536				
	PBC7		0.829				
	PBC8		0.783				
	PBC9		0.773				
	PBC10		0.799				

	PBC11		0.596				
	PBC12		0.468				
	PBC13		0.795				
	EI1		0.577				
	EI2		0.857				
	EI3		0.913				
Entrepreneurial Intentions	EI4	5.487	0.847	0.953	0.886	0.000	304.698***
	EI5		0.836				
	EI6		0.747				
	EI7		0.711				

^a All factor loadings are significant ($t > 3.1$; $p < .001$)

^b All communalities of all items are greater than 0.5 (Field, 2005).

^c All Cronbach's alpha are greater than 0.7 (Nunnally, 1978).

^d All Kaiser-Meyer-Olkin Measure of Sampling Adequacy are more than 0.5 (Kaiser, 1974).

^e All determinants of the constructs' correlation matrix are greater than the necessary value of 0,00001.

^f All significant values conclude that there are correlations in the data set that are suitable (Bartlett, 1937).