THE EFFECTS OF ACTION-BASED ENTREPRENEURSHIP EDUCATION ON AMBIGUITY TOLERANCE AND ENTREPRENEURIAL ALERTNESS

Nicolas van de Sandt, Jean-Baptiste Say Institute for Entrepreneurship, ESCP Europe Berlin
René Mauer, Jean-Baptiste Say Institute for Entrepreneurship, ESCP Europe Berlin

ABSTRACT

The impact of Entrepreneurship Education (EE) programs on elements of the entrepreneurial mind-set remains a subject that is largely under-researched. It is the purpose of this study to examine the effects of an action-based EE program on the development of an entrepreneurial mind-set by testing the effect of the EE program on ambiguity tolerance and entrepreneurial alertness. In a pre-experimental design setting data was collected from a group of 53 graduate students that participated in a 3-months EE program at a European business school. Variables on entrepreneurial alertness and ambiguity tolerance were measured both before the treatment and afterwards using an online survey. The participation in the action-based EE program led to a significant increase in ambiguity tolerance. Furthermore, students who participated in the program developed a better ability of evaluation and judgment of entrepreneurial opportunities, which forms an important part of entrepreneurial alertness. Nevertheless, this study did not find a significant change of overall entrepreneurial alertness as well as in the two elements alert scanning and search and alert association and connection.

Keywords: Entrepreneurship, Entrepreneurship Education, Entrepreneurial Mind-set.

INTRODUCTION

With its growing popularity among universities and beyond (Fayolle, 2013) the discipline of Entrepreneurship Education (EE) is expanding in depth and breadth (Kuratko & Morris, 2018). EE has grown substantially as a field of research (Heuer & Kolvereid, 2014; Kuratko, 2005) and scholars report a variety of approaches and different curricula across the globe to teach Entrepreneurship (Vanevenhoven, 2013). There is no shortage of literature arguing that traditional teacher-centered models of education relying on lectures and focusing on business planning or skills development, do not effectively promote entrepreneurial action of students (Barr et al., 2009; Gibb, 2002; Gielnik et al., 2015; Neck & Greene, 2011). As the entrepreneurial environment is marked by uncertainty and entrepreneurial learning is considered to be highly experiential (Morris et al., 2012; Pittaway & Thorpe, 2012) and emotional (Baron, 2008; Cardon et al., 2012), the ability to navigate in this environment becomes paramount and approaches that include either the simulation or the execution of entrepreneurial action are deemed to be more effective (Neck & Corbett, 2018). These approaches are believed to stimulate entrepreneurial learning (Pittaway & Cope, 2007a) and provide learning environments meant to develop an expert mind-set that has been seen as important characteristic for the identification and shaping of opportunities and as a characteristic of successful entrepreneurs (Krueger, 2007).

Scholars have reviewed recent empirical research on EE (Bae et al., 2014, Mwasalwiba, 2010), noting that the majority is focused on impact indicators. A growing body of research on attitudes or intentions (Fayolle & Gailly, 2015; Liñán et al., 2011; Pfeifer et al., 2016; Piperopoulos & Dimov, 2015) and self-efficacy (Wilson et al., 2007) was found to have mixed results that are difficult to generalize (Bae et al., 2014). Furthermore, little attention has been paid specifically to action-based EE and scholars have called for further research on the development of the entrepreneurial mind-set (Nabi et al., 2016). Hence, in this study, a pre-experimental design is used to examine the effects of an action-based EE program on ambiguity tolerance as an element of the entrepreneurial mind-set. In addition, the effect of the EE program on entrepreneurial alertness was tested.

The rest of this article is divided as follows. In the next section, literature in EE that is relevant for the study is being discussed. This is followed by a further elaboration on both the concept of ambiguity tolerance as well as on entrepreneurial alertness. The following section discusses the research method. Finally, the results of the research and their implications are presented and discussed. The article ends with its limitations and potential avenues for further research.

ENTREPRENEURSHIP EDUCATION AND THE ENTERPRENEURIAL MIND-SET

Early EE teaching practices focused on content, with common teaching methods being the business plan, lectures or case studies (Gartner & Vesper, 1994; Plaschka & Welsch, 1990; Solomon et al., 2002). With EE becoming popular in research and practice (Fayolle, 2013; Heuer & Kolvereid, 2014; Kuratko, 2005) different curricula that included a variety of approaches to teach Entrepreneurship emerged across the globe (Vanevenhoven, 2013). An improving understanding of Entrepreneurship led scholars to argue that classical entrepreneurship trainings with a strong focus on the development of entrepreneurial skills, would fail to effectively promote entrepreneurial action of students (Barr et al. 2009). Based on advances in research on entrepreneurial learning (Cope, 2003; 2005; Pittaway & Cope, 2007b) and different learning theories, such as experimental learning (Kolb, 1984), social cognitive, self-directed (Bandura, 1986; Zimmerman, 2000) or transformative learning theory (Mezirow, 1981) scholars argue that in order to stimulate entrepreneurial learning in EE, students should be exposed to a real-life entrepreneurship context (Pittaway & Thorpe, 2012). They suggest that alternative learning environments should replace or complement classroom-centered education. Either through simulation of or actual engagement in entrepreneurial activities, they argue that students can cultivate a self-reflective mind-set that enables adaptable decision making and allows the individual to learn from new situations and think beyond existing biases (Haynie et al., 2012; Haynie et al., 2010; Neck & Corbett, 2018). It is believed that in these action-based approaches that emphasize learning through action and experience, students may develop the entrepreneurial mind-set and competencies (Gielnik et al., 2015; Krueger, 2007) that allow entrepreneurs to recognize and assess opportunities (DeTienne & Chandler, 2004) and act in real-life entrepreneurial situations characterized by novelty, uncertainty and change (Fayolle, 2013; Neck & Greene, 2011).

A growing body of empirical research on impact indicators of EE, like intentions, self-efficacy or behavior (DeTienne & Chandler, 2004; Pfeifer et al., 2016; Piperopoulos & Dimov, 2015; Wilson et al., 2007) remained largely inconclusive (Bae et al., 2014; Mwasalwiba, 2010). The studies often lacked detailed descriptions of the pedagogies that were subject to the research (Byrne et al., 2014; Nabi et al., 2016). Further, it has been argued, that further inquiry into

aspects of the entrepreneurial mind-set in EE would contribute to a better understanding of EE and its impact (Nabi et al., 2016). Following these calls for research, this study examines the effects of an action-based EE program on two elements of the entrepreneurial mind-set: ambiguity tolerance and entrepreneurial alertness.

Ambiguity Tolerance

Concepts like uncertainty or ambiguity have been subject to ongoing discussion and played a role for the definition of entrepreneurship, starting from classical entrepreneurship literature (Kirzner, 1973; Knight, 1971). From early research that sought to define the personality of an entrepreneur by comparing entrepreneurs to managers (Schere, 1982; Sexton & Bowman, 1985) to more recent views of entrepreneurial cognition (McMullen & Shepherd, 2006; Mitchell et al., 2002), the manner in which individuals handle ambiguity plays an important role. Ambiguity tolerance describes how ambiguity is perceived and handled by an individual. While individuals with high ambiguity tolerance may enjoy uncertain tasks, people with low ambiguity tolerance perceive uncertainty as a threat and give up more easily (Budner, 1962). Schere argues that ambiguity tolerance is a major characteristic of difference between entrepreneurs and managers. In his comparison of the two, he finds that entrepreneurs have significantly higher ambiguity tolerance (1982). In their study on 70 entrepreneurs in Singapore, Teoh & Foo (1997) find that the ability of these entrepreneurs to respond positively to ambiguous situations led to higher performance outcomes of their ventures. Simultaneously, scholars have consistently emphasized that entrepreneurial action is key for business creation and that it is the way that ambiguity is perceived and dealt with that keeps individuals from or engages them in entrepreneurial action (McKelvie et al., 2011; McMullen & Shepherd, 2006). Tolerance for ambiguity can therefore be seen as important element of the entrepreneurial mind-set (Ireland et al., 2003). Researchers have argued repeatedly that EE programs with an action-based approach, that engage students in the uncertainty and ambiguity inherent in entrepreneurial action, may help develop the cognitive abilities that allow them to operate in and make sense of ambiguous situations (Gielnik et al., 2015; Neck & Greene, 2011; Ollila & Williams-Middleton, 2011). However, quantitative studies that analyze the direct effect of these programs on ambiguity tolerance have not been found until now. While studies have shown quantitatively that, for example, entrepreneurial self-efficacy can be improved through the participation in EE programs (Karlsson & Moberg, 2013; Wilson et al., 2007), only a few qualitative studies that included tolerance for ambiguity in their discussion were found (Arpiainen & Tynjälä, 2017; Lackéus, 2014). Lackéus (2014) looks at the emotions that students experience in the course of an action-based EE program. Following three engineering students over the course of nine months, he finds qualitative evidence that the perceived ambiguity of the program as well as the emotions experienced during this interactive setting could be linked to the development of ambiguity tolerance. Arpiainen & Tynjälä (2017) conduct a qualitative thematic analysis of semi-structured interviews with higher education students who participated in a similar program. They argue that by feeling as part of the venture team the students experienced a psychological safety that helped them to build a tolerance for the uncertainty they experienced during the program. The preceding discussion leads to the formulation of the following hypothesis:

H_1: Participating in action-based EE will have a positive effect on students' ambiguity tolerance.

Entrepreneurial Alertness

Researchers understand the recognition, evaluation and exploitation of opportunities as a central part of entrepreneurial action (Alvarez & Barney, 2007; Sarasvathy et al., 2010; Shane & Venkataraman, 2000). Entrepreneurial alertness is seen as playing a role in the process of identifying and creating new opportunities (Baron, 2006; Short et al., 2010). Entrepreneurial alertness was conceptualized by Kirzner (1973, 1979) as critical characteristic for the recognition of opportunities that are overlooked by others, and has been associated with different cognitive capacities (Baron & Ensley, 2006; Tang et al., 2012). It has been argued that the development of individual entrepreneurial alertness might play a role for the increase in startup activities and outcomes (Busenitz, 1996). Kaish & Gilad (1991) compare the alertness of executives with that of founders, finding that entrepreneurs exhibit more general alertness than managers. Further, in their study with 120 entrepreneurs Amato et al. (2017) find that entrepreneurial alertness has a positive impact on firm performance. In a similar setting Adomako et al. (2018) also find a positive impact of entrepreneurial alertness on new venture performance. Given the relevance that entrepreneurial alertness has in entrepreneurship research, it does not come as a surprise that it is seen as an essential element of an entrepreneurial mind-set by many researchers (Ireland et al., 2003; McGrath & MacMillan, 2000). Equally, it was noted by scholars that the development of entrepreneurial alertness, as an element of the entrepreneurial mind-set is on the agenda of many modern entrepreneurship programs (Kuratko & Morris, 2018).

The preceding discussion leads to the following hypothesis:

H_2: Participating in action-based EE will have a positive effect on students' entrepreneurial alertness.

Tang et al. (2012) understand entrepreneurial alertness as a construct of three components, *"alert scanning and search"*, *"alert association and connection"* and *"alert evaluation and judgement"*. The component *"alert scanning and search"* describes the active and regular search for information as part of the development of an individual's base of tacit and explicit knowledge (Tang et al., 2012). This process allows individuals to develop cognitive frameworks that reflect their knowledge and beliefs about the external world. These frameworks in turn are essential for processing and utilizing stored information and knowledge. *"Association and connection"* describe the cognitive ability to recognize patterns in new information (Baron & Ensley, 2006; Tang et al., 2012). Individuals proactively receive and process new information to create the big picture and creatively make new extensions and connections that are unique and unprecedented. Following the association and connection, the individuals then exercise *"evaluation and judgement"* when in two steps they first assess and evaluate, whether an opportunity generally exists for someone with the right skill and background. And in a second step they evaluate whether this opportunity is a valid one for them personally and whether they should engage in entrepreneurial action (Tang et al., 2012).

Therefore, drawing on the arguments above it can further be hypothesized that:

H_3: Participating in action-based EE will have a positive effect on students' alert scanning and search.

H_4: Participating in action-based EE will have a positive effect on students' alert association and connection.

H_5: Participating in action-based EE will have a positive effect on students' evaluation and judgement.

METHODOLOGY

Setting

In order to examine the effects of an action-based EE program on ambiguity tolerance and entrepreneurial alertness a pre-experimental design was followed. The EE program was selected based on its pedagogical approach and its aim to use action-based methods to develop competences and mind-set for decision making under uncertainty. The program is held as a one-semester major in Entrepreneurship for students enrolled in the last year of a graduate Management program (Msc.) at a business school in Europe. The students take part in a series of action-based modules and engage in different intensive group projects (Rasmussen & Sørheim, 2006). In these different modules students either have to simulate or engage in actual entrepreneurial activities (Neck & Corbett, 2018). They have the opportunity to engage with the local startup ecosystem and have to work in teams to develop ideas that lead to venture creation (Ollila & Williams-Middleton, 2011). In this way they are confronted with both the rapidly changing and uncertain environments and the affect that individuals experience during the entrepreneurial process (Baron, 2008).

The modules are accompanied by lectures to discuss the theoretical foundation of entrepreneurship. Further, the participants are familiarized with behavioral models and theoretical concepts present in entrepreneurship research. They learn about different decision making logics or strategies to deal with uncertainty: effectuation as a strategic decision making logic under uncertainty (Reymen et al., 2015; Sarasvathy, 2001), bricolage and improvisation as skills to effectively deal with constraints in time and other resources (Baker & Nelson, 2005; Welter et al., 2016).

The study followed an O_1 X O_2 design, with O_1 depicting an observation before the 3-months program (X) and (O_2) depicting an observation afterwards (Cook & Campbell, 1975). Figure 1 depicts a framework with the study design and the hypotheses. All variables were measured both before the treatment (O_1) and afterwards (O_2) using an online survey that was distributed to the participants before and after the program.

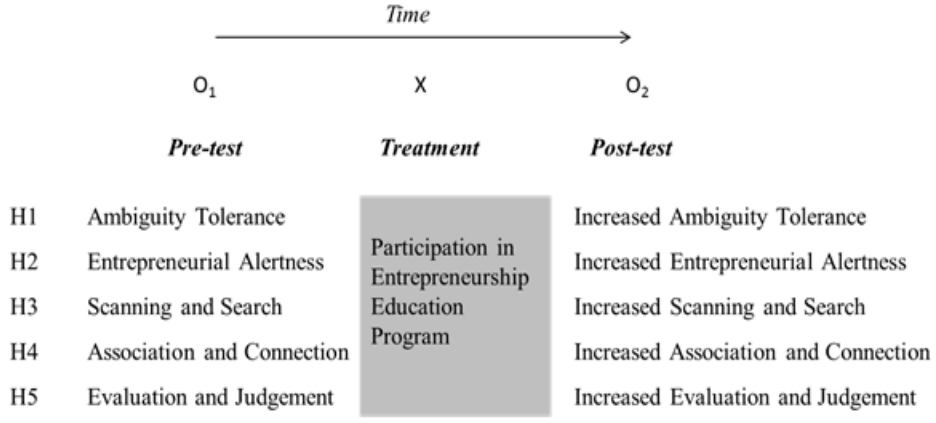

FIGURE 1
PRE-POST-TEST STUDY DESIGN WITH HYPOTHESES

The group is described in Table 1 in terms of age, gender and educational background. The average age of the students was 23.6 years, 43.4% of the sample were female. The students were mainly European, with 66.0% having French, 7.5% German, 5.7% Italian and the rest having other nationalities. The majority had a background in business (84.9%) and already some experience working in a startup either as intern or as employee (60.4%).

Table 1
DESCRIPTIVE STATISTICS OF RESEARCH PARTICIPANTS

	N=53	
	Mean	**S.D.**
Age	23.6	1.58
	n	percent
Gender		
Female	23	43.4
Male	30	56.6
Nationality		
French	35	66
German	4	7.5
Italian	3	5.7
Others	11	20.8
Background		
Business-oriented studies	45	84.9
Other studies	8	15.1
Family owns and operates a business	20	37.7
Working experience in a startup (internship or job)	32	60.4

Measurements

The measures of all constructs were adopted from existing scales with an established validity and reliability of the items. All constructs were measured both at O_1 and at O_2.

Ambiguity tolerance

Ambiguity tolerance is generally conceived as personality variable and was defined by Budner (1962) as: *"the tendency to perceive ambiguous situations as desirable,…",* whereas an ambiguous situation can be *"a completely new situation in which there are no familiar cues, a complex situation in which there are a great number of cues to be taken into account and a contradictory situation in which different elements or cues suggest different structures-in short, situations characterized by novelty, complexity, or insolubility" (p. 29-30).* The effect of the action-based EE program on ambiguity tolerance was measured using the 16-item scale by Budner (1962). As one of the first self-reported measures of ambiguity tolerance, Budner's scale has been widely used in studies of psychology, but also has been applied in entrepreneurship research (Furnham & Marks, 2013).

Entrepreneurial alertness

For their conceptualization of entrepreneurial alertness Tang et al. (2012) integrated Kirzner's early understanding of entrepreneurial alertness as an individual's ability to identify opportunities which are overlooked by others (1973, 1979) and more recent understandings of

entrepreneurial alertness that include individual proactive judgment and a movement towards entrepreneurial action (McMullen & Shepherd, 2006). In order to measure the learning impact of the action-based EE program on entrepreneurial alertness, a 13-item-scale was used that has been developed and validated by Tang et al. (2012) based on a sample of students. Their scale is divided into three distinct elements of alertness: scanning and search, association and connection, and evaluation and judgment. An example item is *"I often see connections between previously unconnected domains of information."* The participants were asked to rate these items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

RESULTS

A non-parametric test, commonly used in experiments, was utilized to compare differences of samples with ordinal dependent variables. Using the software STATA, the Wilcoxon Signed Rank Test was conducted to analyze the pre- and post-differences. Table 2 shows the pre and post-test differences of the study.

Table 2
DIFFERENCES BETWEEN PRE- AND POST-TEST

Variables						
	Pretest (O_1)	**Posttest (O_2)**	**Sum of Ranks**		**Z(p)**	**p**
	Mdn	**Mdn**	**Negative**	**Positive**		
Ambiguity Tolerance	4.5	4.67	958	472	-2.15	0.03
Entrepreneurial Alertness	3.62	3.78	894	530	-1.61	0.11
Alert Scanning and Search	3.83	4	814	572	-1.08	0.28
Alert Association and Connection	3.67	3.67	754	662	-0.41	0.68
Evaluation and Judgement	3.25	3.5	941	399	-2.43	0.02

H_1, which predicted the participation in the action-based EE program would have a positive effect on the students' ambiguity tolerance, was supported. The Wilcoxon Signed Rank Test indicates that the ambiguity tolerance was significantly higher after the course (Mdn O_1= 4.50; Mdn O_2 = 4.67; Z=-2.15; p=0.03). H_2, predicting that the participation in the action-based EE program would have a positive effect on the students' entrepreneurial alertness was not supported. Although the post-treatment median was higher the change was not significant (Mdn O_1=3.62; Mdn O_2=3.78; Z=-1.61; p=0.11). H_3 and H_4 predicted that the participation in the action-based EE program would have a positive effect on the students' *"alert scanning and search"* and their *"alert association and connection"* respectively. Again the Wilcoxon Signed Rank Test did not show any significant change, resulting in a rejection of the hypotheses (H_3: Mdn O_1=3.83; Mdn O_2=4.00; Z=-10; p=0.28; H_4: Mdn O_1=3.67; Mdn O_2=3.67; Z=-0.41; p=0.68). However, significant support was found for H_5, predicting that the participation in the action-based EE program would have a positive effect on the students' *"evaluation and judgement"* (Mdn O_1=3.25; Mdn O_2=3.50; Z=-2.42; p=0.02).

DISCUSSION

In this study a pre-experimental pre-post design was used to examine the effects of an action-based EE program. Specifically, the effect of a 3-months program on ambiguity tolerance and entrepreneurial alertness was measured. The findings of this study contribute to the EE literature in several ways. In recent discussions scholars have argued that EE should diverge from traditional teacher-centered approaches towards more action-based forms of EE (Barr et al.,

2009; Rasmussen & Sørheim, 2006). This study clearly supports the voice of these scholars who argue that action-based EE can contribute to the development of an entrepreneurial mind-set. By providing evidence on the effectiveness of an action-based EE program this study contributes to a better understanding of EE and its impact on elements that have been underemphasized in existing research (Nabi et al., 2016). The action-based program under study had a significant positive influence on ambiguity tolerance. It has been argued that ambiguity tolerance forms an important element of the entrepreneurial mind-set (McGrath & MacMillan, 2000) that for example has been connected to positive venture performance (Teoh & Foo, 1997). The finding of this study support existing evidence that experiencing the highly uncertain environment of entrepreneurship and the connected emotional dynamics in action-based EE may contribute positively to the development of the entrepreneurial mind-set (Lackéus, 2014). These findings further have important implications for educators, and entrepreneurs. From the educators' perspective, this research suggests that a pedagogy that has as its purpose to facilitate the development of the entrepreneurial mind-set would benefit from the inclusion of action-based elements that go beyond traditional teaching methods and that include the elements of uncertainty similar to those experienced in an entrepreneurial environment. Further, it is likely that in the course of their entrepreneurial action, nascent entrepreneurs who are exposed to uncertainty can develop a certain ambiguity tolerance without external training. Turning to the effect of the EE program on entrepreneurial alertness, it was found that H_2 was rejected. In addition, H_3 and H_4 on the development of alert scanning and search and alert association and connection respectively, were rejected as well. At the same time, the results of this study indicate that the action-based EE program could significantly contribute to the development of evaluation and judgment (H_5). There is some possibility that alertness includes challenging components that are difficult to learn. For example alert association and connection not just focuses on the reception of information, but also on making extensions in logic and on creativity (Tang et al., 2012). In their study Tang et al. (2012) found a high correlation between creativity and both alert scanning and search and alert association and connection. It has been argued that creativity is not easily teachable (Haase & Lautenschläger, 2011). In addition, Tang et al. (2012) found that affectivity is significantly related to entrepreneurial alertness. As researchers have argued that action-based EE can lead to the experience of different emotions (Arpiainen et al., 2013; Jones & Underwood, 2017), these could play a role for the development of these elements of alertness. Investigating the interplay of these emotions with learning would offer avenues for future research. Given the relevance that entrepreneurial alertness has for the agenda of many entrepreneurship programs (Kuratko & Morris, 2018), it is interesting to see that evaluation and judgment can be effectively improved through an action-based EE program, especially as researchers have found it to be an antecedent of entrepreneurial intentions (Turner & Gianiodis, 2018).

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This study is clearly not without limitations and thus offers opportunities for future research. A number of considerations should be kept in mind. First, although a pre-post study was conducted, it is difficult to give insights on the permanence of the impact of the program or the progression or development of any developed skill or mind-set over a longer time period. A more elaborated longitudinal design would allow addressing the extent to which ambiguity tolerance or entrepreneurial alertness would change over time and what role this would play for subsequent entrepreneurial behavior. Second, the program was not mandatory for all students.

The self-selection of students into the program could play a role for the development of the measured effects. As this research does not include a control group, its design does not allow gaining a deeper understanding on what differences were caused specifically by the participation in the program. A study with a control group of students who did not participate in the program would allow establishing more confidence in the validity of the results. Furthermore, other action-based EE programs in terms of format or length could lead to different outcomes. A comparison of different programs would provide more insights. Lastly, the measured constructs are not standalone parts of the entrepreneurial mind-set and for example the antecedents of entrepreneurial alertness are not well understood (Valliere, 2013). Researchers could analyze other interacting factors that might affect the development of entrepreneurial alertness and ambiguity tolerance. For example, scholars have provided evidence that different personality factors play a role for the development of entrepreneurial alertness (Obschonka et al., 2017). The interplay of specific personality traits with the result of different learning environments therefore could be the subject of further studies of both qualitative and quantitative nature. Hopefully this study stimulates further research on the effects that EE programs that differ in length and content have on different elements of the entrepreneurial mind-set.

CONCLUSION

Insightful discussions exist regarding the 'what' and the 'how' in EE (Neck & Corbett, 2018). Yet, although different approaches of EE have been suggested to develop an entrepreneurial mind-set, the impact of EE programs on elements of the entrepreneurial mind-set remains a subject that is largely under-researched (Nabi et al., 2016). Conducting a pre-post study of an action-based EE program, this study makes several contributions to the existing literature. The results of this study enhance EE research by showing that action-based EE can alter the ambiguity tolerance of students and hence contribute to the development of an entrepreneurial mind-set. At the same time, this study shows that the EE program did not play a role for the development of entrepreneurial alertness, as conceptualized by Tang et al. (2012). We think that further investigation of action-based EE on different elements of the entrepreneurial mind-set would offer avenues for future research.

REFERENCES

Adomako, S., Danso, A., Boso, N., & Narteh, B. (2018). Entrepreneurial alertness and new venture performance: Facilitating roles of networking capability. *International Small Business Journal: Researching Entrepreneurship*, *36*(5), 453-472,

Alvarez, S.A., & Barney, J.B. (2007). Discovery and creation: Alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal*, *1*(1), 11-26.

Amato, C., Baron, R.A., Barbieri, B., Bélanger, J.J., & Pierro, A. (2017). Regulatory modes and entrepreneurship: The mediational role of alertness in small business success. *Journal of Small Business Management*, *55*, 27-42.

Arpiainen, R.L., & Tynjälä, P. (2017). Introducing team learning in a developing economy: Students' experiences of experiential entrepreneurship education in Namibia. *Journal of Enterprising Culture*, *25*(2), 179-210.

Arpiainen, R.L., Lackéus, M., Täks, M., & Tynjälä, P. (2013). The sources and dynamics of emotions in entrepreneurship education learning process. *Trames*, *17*(4), 331-346.

Bae, T.J., Qian, S., Miao, C., & Fiet, J.O. (2014). The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review. *Entrepreneurship: Theory and Practice*, *38*(2), 217-254.

Baker, T., & Nelson, R.E. (2005). Creating something from nothing: Resource construction through entrepreneurial Bricolage. *Administrative Science Quarterly*, *50*, 32-366.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. NJ: Prentice-Hall: Englewood Cliffs.

Baron, R.A. (2006). Opportunity recognition as pattern recognition. *Academy of Management Perspectives*, *20*, 104-120.

Baron, R.A. (2008). The role of affect in the entrepreneurial process. *Academy of Management Review*, *33*(2), 328-340.

Baron, R.A., & Ensley, M.D. (2006). opportunity recognition as the detection of meaningful patterns: Evidence from comparisons of novice and experienced entrepreneurs. *Management Science*, *52*(9), 1331-1344.

Barr, S., Baker, T., Markham, S., & Kingon, A. (2009). Bridging the valley of death: Lessons learned from 14 years of commercialization of technology education. *Academy of Management Learning and Education*, *8*(3), 370-388.

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*(1), 29-50.

Busenitz, L.W. (1996). Research on entrepreneurial alertness: Sampling, measurement, and theoretical issues. *Journal of Small Business Management*, *34*(4), 35-45.

Byrne, J., Fayolle, A., & Toutain, O. (2014). Entrepreneurship education: What we know and what we need to know. In E. Chell (Ed.), *Handbook of Research on Small Business and Entrepreneurship*, pp. 261-288. Cheltenham, UK.

Cardon, M.S., Foo, M., Shepherd, D., & Wiklund, J. (2012). Exploring the heart: Entrepreneurial emotion is a hot topic. *Entrepreneurship: Theory and Practice*, *36*(1), 1-10.

Cook, T., & Campbell, D.T. (1975). *Quasi-experimentation: Design and analysis issues for field settings.* Boston, MA: Houghton Mifflin Company.

Cope, J. (2003). Entrepreneurial learning and critical reflection: Discontinuous events as triggers for "higher-level" learning. *Management Learning*, *34*(4), 429-450.

Cope, J. (2005). Toward a dynamic learning perspective of entrepreneurship. *Entrepreneurship: Theory and Practice*, *29*(4), 373-397.

DeTienne, D.R., & Chandler, G.N. (2004). Opportunity identification and its role in the entrepreneurial classroom: A pedagogical approach and empirical test. *Academy of Management Learning & Education*, *3*(3), 242-257.

Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development*, *25*(7-8), 692-701.

Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management*, *53*(1), 75-93.

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology*, *4*(9), 717-728.

Gartner, W.B., & Vesper, K.H. (1994). Experiments in entrepreneurship education: Successes and failures. *Journal of Business Venturing*, *9*(3), 179-187.

Gibb, A. (2002). In pursuit of a new "enterprise" and "entrepreneurship" paradigm for learning: Creative destruction, new values, new ways of doing things and new combinations of knowledge. *International Journal of Management Reviews*, *4*(3), 233-269.

Gielnik, M.M., Frese, M., Kahara-Kawuki, A., Katono, I.W., Kyejjusa, S., Ngoma, M., Munene, J., Namatovu-Dawa, R., Nansubuga, F., Orobia, L., Oyugi, J., Sejjaaka, S., Sserwanga, A., Walter, T., Bischoff, K.M., & Dlugosch, T.J. (2015). Action and action-regulation in entrepreneurship: Evaluating a student training for promoting entrepreneurship. *Academy of Management Learning and Education*, *14*(1), 69-94.

Haase, H., & Lautenschläger, A. (2011). The teachability dilemma of entrepreneurship. *International Entrepreneurship and Management Journal*, *7*(2), 145-162.

Haynie, J.M., Shepherd, D., Mosakowski, E., & Earley, P.C. (2010). A situated metacognitive model of the entrepreneurial mindset. *Journal of Business Venturing*, *25*(2), 217-229.

Haynie, J.M., Shepherd, D.A., & Patzelt, H. (2012). Cognitive Adaptability and an Entrepreneurial Task: The Role of Metacognitive Ability and Feedback. *Entrepreneurship: Theory and Practice*, *36*(2), 237-265.

Heuer, A., & Kolvereid, L. (2014). Education in entrepreneurship and the theory of planned behaviour. *European Journal of Training and Development*, *38*(6), 506-523.

Ireland, R.D., Hitt, M.A., & Sirmon, D.G. (2003). A model of strategic enterpreneurship: The construct and its dimensions. *Journal of Management*, *29*(6), 963-989.

Jones, S., & Underwood, S. (2017). Understanding students' emotional reactions to entrepreneurship education: A conceptual framework. *Education+Training*, *59*(7/8), 657-671.

Kaish, S., & Gilad, B. (1991). Characteristics of opportunities search of entrepreneurs versus executives: Sources, interests, general alertness. *Journal of Business Venturing*, *6*(1), 45-61.

Karlsson, T., & Moberg, K. (2013). Improving perceived entrepreneurial abilities through education: Exploratory testing of an entrepreneurial self-efficacy scale in a pre-post setting. *International Journal of Management Education*, *11*(1), 1-11.

Kirzner, I.M. (1973). *Competition and Entrepreneurship.* Chicago, IL: University of Chicago press.

Kirzner, I.M. (1979). *Perception, Opportunity, and Profit.* Chicago, IL: University of Chicago Press.

Knight, F.H. (1971). *Risk, Uncertainty and Profit.* Chicago, IL: University of Chicago Press.

Kolb, D.A. (1984). *Experiential learning. Experience as the source of learning and development*. NJ: Pearson Education Limited.

Krueger, N.F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice*, *31*, 123-138.

Kuratko, D.F. (2005). The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship: Theory & Practice*, *29*, 577-597.

Kuratko, D.F., & Morris, M.H. (2018). Examining the future trajectory of entrepreneurship. *Journal of Small Business Management*, *56*(1), 11-23.

Lackéus, M. (2014). An emotion based approach to assessing entrepreneurial education. *International Journal of Management Education*, *12*(3), 374-396.

Liñán, F., Rodríguez-Cohard, J.C., & Rueda-Cantuche, J.M. (2011). Factors affecting entrepreneurial intention levels: A role for education. *International Entrepreneurship and Management Journal*, *7*(2), 195-218.

McGrath, R., & MacMillan, I. (2000). *The entrepreneurial mindset.* Boston, MA: HBS Press.

McKelvie, A., Haynie, J.M., & Gustavsson, V. (2011). Unpacking the uncertainty construct: Implications for entrepreneurial action. *Journal of Business Venturing*, *26*(3), 273-292.

McMullen, J.S., & Shepherd, D.A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management Review*, *31*(1), 132-152.

Mezirow, J. (1981). A critical theory of adult learning and education. *Adult Education Quarterly*, 32(1), 3-24.

Mitchell, R.K., Busenitz, L., Lant, T., McDougal, P.P., Morse, E.A., & Smith, J.B. (2002). Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship: Theory and Practice*, *27*(2), 9-104.

Morris, M.H., Kuratko, D.F., Schindehutte, M., & Spivack, A.J. (2012). Framing the entrepreneurial experience. *Entrepreneurship: Theory and Practice*, *36*(1), 11-40.

Mwasalwiba, E. (2010). Entrepreneurship education: A review of its objectives, teaching methods, and impact indicators. *Education+Training*, *52*(1), 20-47.

Nabi, G., Liñán, F., Krueger, N., Fayolle, A., & Walmsley, A. (2016). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of Management Learning & Education*, *16*(2), 277-299.

Neck, H.M., & Corbett, A.C. (2018). The scholarship of teaching and learning entrepreneurship. *Entrepreneurship Education and Pedagogy*, *1*(1), 8-41.

Neck, H.M., & Greene, P.G. (2011). Entrepreneurship education: Known worlds and new frontiers. *Journal of Small Business Management*, *49*(1), 55-70.

Obschonka, M., Hakkarainen, K., Lonka, K., & Salmela-Aro, K. (2017). Entrepreneurship as a twenty-first century skill: entrepreneurial alertness and intention in the transition to adulthood. *Small Business Economics*, *48*(3), 487-501.

Ollila, S., & Williams-Middleton, K. (2011). The venture creation approach: integrating entrepreneurial education and incubation at the university. *International Journal of Entrepreneurship and Innovation Management*, *13*(2), 161-178.

Pfeifer, S., Šarlija, N., & Zekić Sušac, M. (2016). Shaping the entrepreneurial mindset: Entrepreneurial intentions of business students in Croatia. *Journal of Small Business Management*, *54*(1), 102-117.

Piperopoulos, P., & Dimov, D. (2015). Burst bubbles or build steam? Entrepreneurship education, entrepreneurial self-efficacy, and entrepreneurial intentions. *Journal of Small Business Management*, *53*(4), 970-985.

Pittaway, L., & Cope, J. (2007a). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal*, *25*(5), 479-510.

Pittaway, L., & Cope, J. (2007b). Simulating entrepreneurial learning: Integrating experiential and collaborative approaches to learning. *Management Learning*, *38*(2), 211-233.

Pittaway, L., & Thorpe, R. (2012). A framework for entrepreneurial learning: A tribute to Jason Cope. *Entrepreneurship & Regional Development*, *24*(9-10), 837-859.

Plaschka, G.R., & Welsch, H.P. (1990). Emerging structures in entrepreneurship education: Curricular designs and strategies. *Entrepreneurship: Theory & Practice*, *14*(3), 55-71.

Rasmussen, E.A., & Sørheim, R. (2006). Action-based entrepreneurship education. *Technovation*, *26*(2), 185-194.

Reymen, I.M.M.J., Andries, P., Berends, H., Mauer, R., Stephan, U., & van Burg, E. (2015). Understanding dynamics of strategic decision making in venture creation: A process study of effectuation and causation. *Strategic Entrepreneurship Journal, 9*(4), 351-379.

Sarasvathy, S.D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, *26*(2), 243-263.

Sarasvathy, S.D., Dew, N., Velamuri, S.R., & Venkataraman, S. (2010). Three views of entrepreneurial opportunity. In Acs, J.Z., & Audretsch, D.B. (Eds.), *Handbook of Entrepreneurship Research*, (pp.77-96). New York, NY: Springer.

Schere, J.L. (1982). Tolerance of ambiguity as a discriminating variable between entrepreneurs and managers. *Academy of Management Proceedings*, *8*(1), 404-408.

Sexton, D.L., & Bowman, N. (1985). The entrepreneur: A capable executive and more. *Journal of Business Venturing*, *1*(1), 129-140.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, *25*(1), 217-226.

Short, J.C., Ketchen, D.J., Shook, C.L., & Ireland, R.D. (2010). The concept of opportunity in entrepreneurship research: Past accomplishments and future challenges. *Journal of Management*, *36*(1), 40-65.

Solomon, G.T., Duffy, S., & Tarabishy, A. (2002). The state of entrepreneurship education in the United States: a nationwide survey and analysis. *International Journal of Entrepreneurship Education*, *1*(1), 1-22.

Tang, J., Kacmar, K.M.M., & Busenitz, L. (2012). Entrepreneurial alertness in the pursuit of new opportunities. *Journal of Business Venturing, 27*(1), 77-94.

Teoh, H.Y., & Foo, S.L. (1997). Moderating effects of tolerance for ambiguity and risktaking propensity on the role conflict-perceived performance relationship: Evidence from Singaporean entrepreneurs. *Journal of Business Venturing*, *12*(1), 67-81.

Turner, T., & Gianiodis, P. (2018). Entrepreneurship unleashed: Understanding entrepreneurial education outside of the business school. *Journal of Small Business Management*, *56*(1), 131-149.

Valliere, D. (2013). Towards a schematic theory of entrepreneurial alertness. *Journal of Business Venturing*, *28*(3), 430-442.

Vanevenhoven, J. (2013). Advances and challenges in entrepreneurship education. *Journal of Small Business Management*, *51*(3), 466-470.

Welter, C., Mauer, R., & Wuebker, R.J. (2016). Bridging behavioral models and theoretical concepts: Effectuation and bricolage in the opportunity creation framework. *Strategic Entrepreneurship Journal*, *10*, 5-20.

Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship: Theory and Practice, 31*(3), 387-406.

Zimmerman, B.J. (2000). Attaining self-regulation. In: Boekarts, M., Zeidner, M., & Pintrich, P. (Eds.), *Handbook of Self-Regulation* (pp. 13-39). San Diego, CA: Academic Press.