Assessing the Impact of Entrepreneurship Education
From ABC to PhD

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From ABC to PhD

Kåre Moberg

The PhD School of Economics and Management

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Assessing the Impact of Entrepreneurship Education - From ABC to PhD

Kåre Moberg

The Danish Foundation for Entrepreneurship

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"The Doctoral School of Economics and Management is an active national and international research environment at CBS for research degree students who deal with economics and management at business, industry and country level in a theoretical and empirical manner".

To my primary school teacher Berit Jacobsson

Everyone should have a primary school teacher who knows how to best support and stimulate your learning; unfortunately, this is not always the case. I was, however, one of the lucky ones, and I want to thank you for this!

PREFACE

This thesis consists of five chapters, which explore the effects and influence of different approaches to entrepreneurship education at different levels of the education system. Chapter 1 gives an introduction to the field and presents the purpose of the thesis as well as a theoretical and methodological overview. The consecutive three chapters are a collection of research papers which address different aspects of the overall research question. In chapter 2 the influence of two different approaches to entrepreneurship education at the lower secondary level is analysed. The chapter focuses on how entrepreneurial content and pedagogy affect the pupils' level of school engagement and entrepreneurial intentions. Chapter 3 presents a refined and modified entrepreneurial self-efficacy scale, specifically designed for programme evaluation of entrepreneurship education at the tertiary level, which involves students with different educational backgrounds. The chapter also explores the influence of entrepreneurial experience on the dimensions of the measure. In chapter 4 the short-term effects of eight master programmes in entrepreneurship education on students' level of entrepreneurial self-efficacy and entrepreneurial behaviour is analysed and tested. The thesis ends with a concluding chapter which summarizes the findings of the papers and discusses their limitations as well as their implications for future research. Below the author and the titles of the three research papers are listed:

- Moberg, K. "Two Approaches to Entrepreneurship Education: The Different Effects of Education For and Through Entrepreneurship at the Lower Secondary Level".
- Moberg, K. "An Entrepreneurial Self-efficacy Scale with a Neutral Wording: Refining the ESE Measure to Adapt it to Programme Evaluation of Entrepreneurship Education".
- Moberg, K. "The Role of Ownership and Contextual Background Knowledge in Entrepreneurship Education".

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defence, and, together with Karl Wennberg, he provided excellent feedback that has been very valuable for the results of my thesis. I am extra grateful to Karl Wennberg here, because his specific and practical comments made it possible for me to finalize my dissertation. I am also very grateful to my colleagues at the Danish Foundation for Entrepreneurship, who, in a very practical way, have assisted me in my PhD project. I have had excellent assistance in the data collection process by my student assistants Elisabeth Markussen, Sose Hakhverdyan, Nare Hakhverdyan and Simon Kejlstrup Rasmussen. My colleagues Casper Jørgensen and Susanne Kærn Christiansen also deserve my gratitude, as they have in different ways assisted me in my research process. Casper for his endless efforts in getting the statistics right, and Susanne for her excellent assistance in the writing process. Furthermore, I would like to thank my team leader Lene Vestergaard for shielding me from numerous other assignments so I could focus on my research. It is impossible to include the names of all the individual researchers who have inspired me and assisted me in my research process, but I hope that my fellow colleagues in the PACE project and in the ASTEE project as well as in the ESU network understand how important our discussions have been for my PhD thesis. Martin Lackeus does, however, deserve to be mentioned separately, as our collaboration and methodological differences have been very valuable in my development as a researcher. The research project that this PhD project is a part of was fortunate to have an advisory board, consisting of excellent and intelligent researchers and practitioners, and I am very grateful to the following for their support: Thomas Cooney, Denny Dennis, Sannie Fisker, Alan Gibb, Norris Krueger, and Karen Wilson. Finally, I would like to thank my family, especially my wife, Fanny Kärfve, who has supported me and encouraged me throughout this process.

Kåre Moberg

Copenhagen, March 2014

ABSTRACT

Entrepreneurship education has spread enormously during the last decades, and today entrepreneurship is taught to numerous pupils and students in various disciplines and at different levels of education. Policy makers around the world view entrepreneurship as a key competence to be fostered already at an early stage of education, and an increasing amount of resources are spent on various initiatives in the field. Entrepreneurship research is, however, a heterogeneous field, and, consequently, there are numerous approaches to entrepreneurship education. Little is known about the effectiveness of these approaches, and much conceptual and definitional confusion makes it complicated to compare the different initiatives in the field.

This dissertation seeks to remedy this problem. As such, the overarching research question guiding this dissertation is: *What effects do different approaches to entrepreneurship education have at different levels of the education system?* To answer this research question a categorization model, based on research about entrepreneurship, entrepreneurship education, entrepreneurial learning, and cognitive and non-cognitive skill development, which addresses the diverse foci of different approaches to entrepreneurship education, is provided. In addition, the dissertation comprises three research papers that individually address different approaches to evaluating the effects of entrepreneurship education at different levels of education.

SAMMENFATNING

Der har været en massiv vækst på området for entreprenørskabsundervisning i løbet af de sidste årtier. I dag undervises et stort antal elever og studerende på forskellige uddannelser og forskellige uddannelsesniveauer i entreprenørskab. Politikere verden over opfatter entreprenørskab som en kernekompetence, der skal dyrkes og styrkes allerede tidligt i uddannelsessystemet, og samtidig afsættes der i de forskellige lande stigende ressourcer til at igangsætte initiativer på området. Forskning i entreprenørskab er dog et heterogent område, og der findes utallige tilgange til entreprenørskabsundervisning. Viden om effekterne af disse tilgange er stadig sparsom, og der er en del forvirring omkring begreber og definitioner, hvilket gør det vanskeligt at sammenligne de forskellige initiativer på området.

Denne afhandling søger at afhjælpe problemet. Udgangspunktet for det helt overordnede spørgsmål, som har guidet afhandlingen, er derfor: *Hvilke effekter har forskellige tilgange til entreprenørskabsundervisning på forskellige niveauer af uddannelsessystemet?* Til at besvare dette forskningsspørgsmål og gå i clinch med de forskellige tilganges opfattelser af entreprenørskabsundervisning fremføres en kategoriseringsmodel baseret på forskning i entreprenørskab, entreprenørskabsundervisning, entreprenøriel læring samt udviklingen af kognitive og ikke-kognitive færdigheder. Derudover indeholder afhandlingen tre forskningsartikler, som på hver deres måde behandler de forskellige tilgange til evaluering af effekterne af entreprenørskabsundervisning på forskellige uddannelsesniveauer.

CONTENTS

1. ASSESSING THE IMPACT OF ENTREPRENEURSHIP EDUCATION: FROM ABC TO PHD

For many decades it has been a controversial issue in the public debate as well as in the research community what type of education should be provided to students at different educational levels. As society and the economy develop at an increasing speed, some types of knowledge become obsolete as they are replaced by new knowledge, and some skills, competences and traits, highly valued and advantageous to possess in previous times, are of minor value today (Lundvall, 1992). Throughout the nineteenth century and the dominant part of the twentieth century, the period when most western countries established their public education system, the labour market was dominated by blue collar factory work, and attributes such as docility, dependability, and persistence were more valued by employers than cognitive abilities such as independent thought and critical thinking (Bowles, Gintis & Osborne, 2001). Today, where entrepreneurship and innovation are recognized as the main drivers of growth (Landström, 2005; Plaschka & Welsch, 1990), most researchers and policy makers agree that another type of skill set is needed. The skills needed and how these are best taught, have, however, been debated intensively (Neck & Greene, 2011).

The increased demand for highly specialized human capital has had a major influence on the education system, as it is required that more students accomplish a tertiary level of education. As a consequence, in the 1970s most countries (at least western countries) shifted their educational focus towards the fostering of more academic- and cognitive-oriented skills (Lundvall, 1992). In the view of researchers such as Herrnstein and Murray (1994) and Jensen (1998) it makes little sense, however, to invest heavily in general public education, because, as they argue, it is determined long before children enter school age whether they will become successful or not. In their view cognitive ability is a stable and innate trait that can only be marginally altered and changed. It would therefore make more sense to invest in an education system which "picks winners" at an early age. On the

other hand, researchers such as Bowles and Gintis (2002) have shown that the level of cognitive ability is not being anymore rewarded in the labour market today than it was in the 1960s and 1970s (Bowles & Gintis, 2002), and that educational interventions, especially at an early stage, have had a significant effect on participants' consecutive success in the labour market (Bowen, Chingos & McPherson, 2009; Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011; Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005).

How can this be the case? According to researchers such as Bowles and Gintis (1976, 2002), Cunha and Heckman (2006, 2007) and Lindqvist and Vestman (2011) it can be explained by the increasingly important role which non-cognitive skills, such as character and social skills, play in today's economy. The growing focus on innovation as the main competitive advantage of firms has increased the complexity of most industries' operations (Cohen & Levinthal, 1990; Etzkowitz, Webster, Gebhardt & Cantisano Terra, 2000). Skills such as self-monitoring and self-motivation (Foss & Lindenberg, 2013) as well as creativity, pro-activeness, and sense of initiative (Gibb, 2002a, 2002b), that is, typically non-cognitive entrepreneurial skills, have become increasingly sought for in the labour market (Arthur & Rousseau, 1996; Drucker, 1993; Hannon, 2005; Humes, 2002).

These types of skills have traditionally been viewed as being important only to a limited number of individuals, that is, to innovators and venture creators (Sarasvathy & Venkataraman, 2011). During the last decades, however, entrepreneurship has become increasingly viewed as a mundane activity which is important to the daily practise of many individuals within many different contexts (Foss & Klein, 2012; Pittaway & Cope, 2006; Steyaert & Katz, 2004). This growing focus on entrepreneurial and innovative skills has increased the interest in entrepreneurship education, both as a discipline and as a teaching approach (Blenker, Korsgaard, Neergaard & Thrane, 2011; Fayolle, 2013; Katz, 2003; 2008; Kuratko, 2005; Mahieu, 2006). The entrepreneurial process

involves both *art* and *science*, that is, elements which are cognitively-oriented, codifiable, and easy to teach (the science), as well as the more tacit non-cognitive skills (the art) which must be learnt through practical experience (Gibb, 2002a, 2002b; Jack & Anderson, 1998; Sexton & Smilor, 1986; Shepherd & Douglas, 1996). This distinction between cognitive[1] and non-cognitive skills makes it possible to divide entrepreneurship into three categories: 1) education *about* entrepreneurship, where the focus is mainly on cognitively-oriented entrepreneurial skills; 2) education *for* entrepreneurship, where the focus is often evenly distributed between cognitive and non-cognitive entrepreneurial skills; and 3) education *through* entrepreneurship, where the focus is mainly on non-cognitive skills. The education *through* entrepreneurship category is sometimes understood as action-oriented education *for* entrepreneurship (Johnson, 1988; Lackeus, 2013; O'Connor, 2013), or as entrepreneurship education which targets practicing small-business owners (Kirby, 2004). My understanding of education *through* entrepreneurship is more in line with the view of Blenker et al. (2011) and Hannon (2005), who understand it as a way to teach other subjects by applying an entrepreneurial teaching method.

It is, however, a challenge to teach non-cognitive skills in an educational system that has traditionally focused on codifiable knowledge, which is easy to assess and grade with tests and exams (Heckman, Stixrud & Ursua, 2006). The challenges which entrepreneurship education poses to the educational system have, however, not stopped policy makers and politicians from emphasizing the importance of incorporating entrepreneurship already at an early stage of education (Mahieu, 2006). As new venture creation has been increasingly recognized as the main contributor to growth and economic renewal (Birch, 1979; Chrisman, Cuha & Sharma, 2003; Landström, 2005; Plaschka & Welsch, 1990), the main interest for policy makers and politicians has been to increase

[1] Cognitive skills should in my thesis be understood as skills that comprise mainly declarative and codifiable knowledge. This is the way the concept is understood by researchers such as Rosendahl-Huber, Sloof and Van Praag (2012). However, cognitive skills are also often measured with IQ tests (Lindqvist & Vestman, 2011) and I would like to emphasize that this is not what I refer to when I discuss the concept later in the text.

the students' willingness to pursue a career as self-employed (Blenker et al., 2011). The focus has therefore been mainly on education *about* and *for* entrepreneurship, where codifiable and cognitive entrepreneurial skills, such as how to identify and evaluate business ideas and how to structure these in a business plan, encompass the dominant part of the educational content (Gibb, 2002a, 2002b; Honig, 2004). The more non-cognitive entrepreneurial skills, such as pro-activity, creativity, and sense of initiative, which are harder to assess with traditional exams, have been viewed as un-teachable traits, which are innate rather than fostered (Cunningham and Lischeron, 1991; Hindle, 2007; Neck & Greene, 2011; Ronstadt, 1987). As entrepreneurship researchers have unfortunately categorized these types of skills as belonging to the *art*, rather than the *science*, of entrepreneurship, there has been a high level of mystery associated with them (Sarasvathy & Venkataraman, 2011).

Nevertheless, important progress has been made during the last decades, as many researchers have put a major emphasis on disenchanting the "art part" of entrepreneurship in order to increase the understanding of how entrepreneurial skills are developed (see for example Baron, 2012; Baker & Nelson, 2005; Cope, 2005; Neck & Greene, 2011; Politis, 2005; Santos & Eisenhardt, 2009; Sarasvathy, 2001, 2008; Sarasvathy & Venkataraman, 2011), and to move the field from craft to science (Fayolle & Gailly, 2008). However, there are still major disagreements about:

1) *How these skills are best taught* (Béchard & Grégoire, 2005; Fiet, 2000a, 2000b; Gibb, 1987, 2002a, 2002b, 2011; Gorman, Hanlon & King, 1997; Hannon, 2006; Honig, 2004; Johannisson, 1991; Kyrö, 2008; Lackeus, 2013; Pittaway & Cope, 2006, 2007; Mwasalwiba, 2010; Neck & Greene, 2011).

2) *How they should be taught at different levels of the education system* (Johannisson, 2010; Jones & Iredale, 2006, 2010; Pepin, 2012; Rosendahl-Huber, Sloof & van Praag, 2012; Sánchez, 2013).

3) *How we best assess whether or not the educational initiatives have the intended effects* (Davidsson, Low & Wright 2001; Elert, Andersson & Wennberg, 2012; Fayolle, 2005; 2013; Fayolle & Gailly, 2013; Haase and Lautenschlager 2011; McMullan & Long, 1987; Rideout & Gray, 2013; Vesper & Gartner, 1997).

My thesis focuses on these three questions. I do not, by any means, claim to have answered any of these questions extensively, but the following chapters should be viewed as a first step in a extensive research project that, in time, will further our knowledge about entrepreneurship education, what effects different initiatives in the field have on students at different levels of education, both in the short term and, more importantly, in the long term, and which mechanisms are behind these effects. In order to identify these mechanisms I have used a quantitative and longitudinal research design.

The Research Project

The research project is composed of two large scale studies. In one of the studies we follow three cohorts of 2,000 randomly selected Danish ninth-graders born in 1996, 1997 and 1998[2]. The other study focuses on master-level students, and here the focus is on the programme design. Twelve master level programmes, eight with a focus on entrepreneurship and innovation and four which are used as a control group, have been followed since 2011. Since my PhD project only lasts three years and much time has been required to develop the survey instruments, the longitudinal data available for analysis have been limited. Only one in three surveys included in this thesis is based on longitudinal data. In return, this research design has allowed me to replicate most of my findings. This has increased my confidence in the associations and patterns that I have identified.

[2] Only responses from students born in 1996 and 1997 are included in the analysis in this thesis, as the responses from students born in 1998 have just recently been collected.

Assessment studies of education are, however, inherently difficult to perform, as the educational setting is a complex context composed of subjective as well as inter-subjective differences (Illeris, 2009), and we need to take into account that both the personal characteristics of the students as well as their interaction with the context influence the outcome (Ames, 1992; Finn & Rock, 1997; Maehr, 1984; Mohr, 1995). It is, however, not possible to take into account all these different factors that might influence the outcomes which we are interested in analysing, as parsimony is necessary in order to identify specific relationships and associations between particular aspects and factors. The reader is, however, advised to keep in mind that the surveys included in this thesis are simplified models of the world and its actors.

As my focus has been to analyse effects of different educational initiatives at different levels of the educational system I have been required to use an eclectic theoretical framework. At the lower levels of education, where pupils are far from the labour market, it often makes little sense to use career related aspects as outcome variables. Since there is a long-standing tradition of focusing on *entrepreneurial intentions* within programme evaluations of entrepreneurship education (Krueger, 2009), I do, however, also include this measure in the survey. My focus in this analysis is to investigate how the influences of different approaches to entrepreneurship education differs depending on whether the focus is on fostering cognitive entrepreneurial skills or non-cognitive entrepreneurial skills. It is therefore important to measure multiple outcomes, since the approaches have different educational objectives. I have therefore also included *school engagement* (Fredricks, Blumenfeld & Paris, 2004; Libbey, 2004) as an outcome variable.

At tertiary level, where the students are closer to the labour market, I have focused on assessing the effects of different approaches to entrepreneurship education on students' entrepreneurial behaviour, but also on how these approaches influence students' level of *entrepreneurial self-efficacy.* Entrepreneurial self-efficacy is a theoretical concept that has its roots

in Bandura's social learning theory (Bandura, 1977a, 1977b, 1986, 1997). Both entrepreneurial activities and entrepreneurial self-efficacy are concepts that have been extensively used in evaluation studies of entrepreneurship education, and, fortunately, many before me have performed rigorous research on how these concepts are related to entrepreneurship education (see for example Barbosa, Gerhardt, & Kickul, 2007; Chen, Greene & Crick, 1998; Florin, Karri, & Rossiter, 2007; Mueller & Goic, 2003; Segal, Borgia & Schoenfeld, 2002; Zhao, Seibert, & Hills, 2005). Already at the beginning of the 1990s, Boyd and Vozikis (1994) developed a conceptual framework about how entrepreneurial self-efficacy could be related to both entrepreneurial intentions and entrepreneurial activities, as well as the extent to which the individual will persist in his/her entrepreneurial efforts and the likeliness that (s)he will succeed (Boyd & Vozikis, 1994)[3]. In this sense, it has been uncomplicated to use ESE as it is well established in entrepreneurship literature. Unfortunately, the established ESE-scales have been developed with practicing and active entrepreneurs in mind, and, as a consequence, it has been necessary to refine the measure in order to be able to use it in programme evaluations that target students with different disciplinary backgrounds.

In the subsequent chapters I present the results of my surveys. The eclectic character of my theoretical framework might be perceived as challenging to some readers. However, I would already at this point like to emphasize that my view of entrepreneurship education is that it is a heterogeneous topic, and that in order to further our understanding about its effects we need to recognize that these effects depend to a large extent on the design of the educational approaches and their objectives and intended goals. There is, however, a common theme in my chapters which I hope will bring some structure and clarity to the fragmented field of entrepreneurship and entrepreneurship education.

[3] Boyd & Vozikis based their conceptual framework on Barbara Birds' (1988) pioneering work on entrepreneurial intentions and entrepreneurship as a planned behaviour. See also Krueger (1993).

I have focused on the concept of cognitive and non-cognitive skill development as a way to categorize different approaches and strands in entrepreneurship research and to guide assessment studies of educational initiatives in the field. The concept of cognitive and non-cognitive skill development has been extensively used in educational science (see for example Levin, 2011) as well as in economics (Bowles & Gintis, 1976, 2002; Cunha & Heckman, 2006, 2007, 2010; Heckman et al., 2006) and psychology (Wolfe & Johnson, 1995; Duckworth & Seligman, 2005), but it has only recently been discovered by entrepreneurship researchers (Rosendahl-Huber et al., 2012). In my view, this line of research has much to offer to the field of entrepreneurship, entrepreneurship education, and evaluations of initiatives in the field. I will therefore outline how the concept of cognitive and non-cognitive skills relates to entrepreneurship education and educational assessments. In order to do this it is, however, necessary to take a closer look at the field of entrepreneurship research and entrepreneurship education.

In the next section I will present a brief overview of the field of entrepreneurship research and entrepreneurship education and how it has developed over the last decades. This will be followed by a presentation of how cognitive and non-cognitive skill development relates to different approaches and strands in entrepreneurship research, and why it is important to include this concept in assessments of entrepreneurship education. My thesis is based on three empirical research papers, which necessarily need to be "streamlined" in order to be communicable. Empirical research is, however, an iterative and messy procedure, and in order to give the reader a better view of the research process which has resulted in these three papers, I have dedicated a part of chapter 1 to describe the evolution and development of my PhD-project. The chapter will end with a presentation of the research methodology and its limitations as well as a brief introduction to the papers in the thesis.

WHAT IS ENTREPRENEURSHIP, ENTREPRENEURSHIP RESEARCH, AND ENTREPRENEURSHIP EDUCATION?

What is entrepreneurship, entrepreneurship research, and entrepreneurship education? These are all dreaded questions for an evaluator of initiatives in the field. Entrepreneurship research has, ever since its early days, been plagued by conceptual confusion and definitional vagueness (Landström, 2005), and education in the field is characterized by multiple objectives and purposes (Fayolle & Gailly, 2008). Conceptual clarity is important to all types of research, but it is perhaps particularly important in programme evaluations, as the focus is on linking treatments to outcomes (Mohr, 1995). In this part of the chapter I will present different definitions of entrepreneurship, how entrepreneurship researchers have delineated it as a specific field of research, and how different perspectives in entrepreneurship research relate to education in the field. Based on the work of Landström (2005), I will present how research in the field of entrepreneurship has developed from the end of the 19th century to the present day. The influence of three specific economists, Joseph Schumpeter (1912), Frank Knight (1921) and Israel Kirzner (1973), will receive special attention, as these theorists, in different ways, have had a major influence on the entrepreneurship research performed today.

What is Entrepreneurship and Entrepreneurship Research?

Ever since the word "entrepreneur" first appeared in the *1437 Dictionnaire de la langue française*, where its most commonly used definition was "celui qui entreprend quelque chose", a person who is active and achieves something, it has been plagued with definitional vagueness and conceptual confusion (Landström, 2005). When reviewing how entrepreneurship has been defined in journals and textbooks over a five-year period, Morris (1998) found 77 different definitions of the concept.

Still this plethora of definitions is natural for a field characterized by multidisciplinarity (Landström, 2005).

Entrepreneurship research can, according to Landström (2005), be divided into three different time periods, each dominated by a certain discipline focusing on different aspects of entrepreneurship. During the first period (1860-1920), it was mainly economists who were interested in analysing the *function* which entrepreneurship had in economic development. In the second period (1950-1970), the interest changed from trying to explain entrepreneurship to trying to develop it, and researchers from the behavioural sciences started to dominate the field. The research during this time period mainly focused on the kind of psychological *traits* that separated entrepreneurs from the population in general. Traits such as *need for achievement*, *risk-taking propensity*, *locus-of-control*, *over-optimism*, and *desire for autonomy* were identified as being typically entrepreneurial (Brockhaus & Horwitz, 1986; Delmar, 2000; Rauch & Frese, 2007). This dispositional stance did, however, prove to be largely unsuccessful, as it was increasingly recognized that teams rather than single entrepreneurs were the creators of high growth companies. Rather than focusing on what characterizes the entrepreneur, the entrepreneurial *process* became the focus of interest to researchers – who mainly came from management studies - during the third period (1985-present) (Landström, 2005).

There is thus no lack of definitions of what entrepreneurship is. Some of the more commonly used are: *The creation of new enterprise* (Low & MacMillan, 1988); *the creation and emergence of new organizations* (Gartner, 1988); *the process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control* (Stevenson & Jarillo, 1990); *alertness to new opportunities* (Kirzner, 1973); *identification, evaluation and exploitation of opportunities* (Shane & Venkataraman, 2000); *judgmental decision-making under uncertainty* (Foss & Klein, 2012; Knight, 1921); and *the creation of new economic*

activity (Davidsson & Wiklund, 2001). These definitions can be said to represent two relatively distinct social realities, as the focus is either on occupational form and outcome (self-employment, start-ups) or on behaviour (ways of thinking and acting) which fulfils a certain function (Davidsson, 2004; Klein, 2008a). There are thus two distinctive strands within the field of entrepreneurship research that have developed during the last centuries.

The ground-breaking work of the economist Joseph Schumpeter (1911) can be said to have influenced both of these research strands. Although pioneering work on entrepreneurship had already been performed by Richard Cantillon (1755) and Jean-Baptiste Say (1803), it is Joseph Schumpeter who, without a doubt, is recognized as the founding father of the field (Landström, 2005). Schumpeter's main focus was to explain the role which innovation and entrepreneurship play in economic development. In his view it is the entrepreneur who, by introducing "new combinations" (new products, production methods, markets, sources of supply, industrial combinations), moves the economy from its previous equilibrium to a new one. This introduction of new combinations sets off a process of "creative destruction", that is, when old knowledge and organizational methods are replaced by new forms of value creation; which will in time be copied by competitors (Foss & Klein, 2012; Landström, 2005). Schumpeter did, however to some extent, depart from his functional perspective in his attempt to describe the characteristics of the entrepreneur, whom he viewed in a heroic manner as an individual with the will to conquer (the will to succeed) and to found private kingdoms (desire for power and independence), an individual who enjoys the process of creating new things (the satisfaction of getting things done) (Swedberg, 2000). This view of the entrepreneur had a major influence on the trait-oriented perspective which came to dominate the field after the Second World War until the 1980s (Landström, 2005).

As the early work in management studies strongly positioned itself against this dispositional stance, the unit of analysis became the context, that is, small, young or owner managed businesses,

rather than the individual entrepreneur (see for example Aldrich, 1990; Gartner, 1988; Low & MacMillan, 1988; Shaver & Scott, 1991). However, since the majority of independent businesses are relative stable organizations, many entrepreneurship researchers became dissatisfied with this overt focus on the organizational form *per se*, as it in many ways leaves out important dimensions such as uncertainty and novelty and does not recognize that entrepreneurial activity can take place within many different organizational contexts (see for example Davidsson, 2004; Foss & Klein, 2012; Hitt & Ireland, 2000; Shane & Venkataraman, 2000; Stevenson & Jarillo, 1990). In order to understand why small businesses and new firms are interesting, these dissatisfied researchers felt that the focus should rather be on the novelty of these ventures, and by doing this it would be hard to not recognize that similar venture activities also take place within established firms (Foss & Lyngsie, 2012; Hitt & Ireland, 2000; Stevenson & Jarillo, 1990). The change of focus thus reduces the interest in studying a specific context and instead turns the interest towards understanding entrepreneurship as a phenomenon (Wiklund, Davidsson, Audretsch & Karlsson, 2011).

The Austrian school of economics[4] has also had a major influence on entrepreneurship research. The school of thought's view of the economy as being characterized by heterogeneity and uncertainty - with concepts such as distributed, tacit knowledge and entrepreneurial discovery - are well in line with the perspectives of entrepreneurship researchers, who have had problems with finding their space within dominating economic theories (Foss & Klein, 2012). Theories stating that economic aggregates are made up by the sum of identical micro-level entities, and that the reality is characterized by certain and calculable risks, have little room for entrepreneurial activities (Davidsson, 2004). This has made the Austrians' view of economics a strong ally for many

[4] Austrian economists are a group of economists who trace their idea tradition back to the work of Carl Menger, Eugen von Böhm-Bawerk and Friedrich von Wieser; economists active in Vienna during the late 19th and early 20th centuries. Their focus on methodological individualism and their consequential rejection of econometrics have caused the work by economists belonging to this school of thought (for example Ludwig von Mises, Ludwig Lachmann, Friedrich Hayek, Murray Rothbard and Israel Kirzner) to be regarded as heterodox by mainstream economists (Foss & Klein, 2012; Landström, 2005).

entrepreneurship researchers (Foss & Klein, 2012; Davidsson, 2004). It is, however, mainly the work of Israel Kirzner (1973, 1979, 1992, 1997), which is viewed as *the* Austrian conception of entrepreneurship by many entrepreneurship researchers (for example Casson, 2005; Shane, 2000, 2003; Van Praag, 1999). The Kirznerian influence is particularly noticeable in the seminal article by Scott Shane and Sankar Venkataraman (2000), which to a large extent changed the focus of entrepreneurship researchers; from context and organizational form, to opportunities. This change in focus has generated numerous studies which define entrepreneurship as the act of discovering opportunities (see Tang, Kacmar & Busenitz, 2012, for a review).

Klein (2008b) does, however, argue that this research strand has misunderstood Kirzner's opportunity concept. According to Klein, the concept of opportunity should be understood metaphorically rather than as a concrete entity. In the same way as microeconomic theory conceptualizes individual preference as explaining individuals' behaviour in the market - by inferring it from choices made and activities performed - opportunity should be understood as explaining entrepreneurs' activities and investments. If the actions of the entrepreneurs generate net profits, they have successfully seized an opportunity, but this can only be analysed *ex post* (Klein, 2008b). Rather than trying to capture the obscure concept of "opportunity" it would be more productive to study the investments, that is, the decisions which entrepreneurs make about how to allocate resources. Klein has developed this perspective more extensively in collaboration with Foss in their work about entrepreneurship as judgmental decision-making under uncertainty (Foss & Klein, 2012).

Foss and Klein (2012) also lean heavily on the Austrian school of economics in their conceptualization of entrepreneurship. They do, however, delineate two strands within the Austrian school of economics. On the one hand, there is the opportunity-focused tradition, which emphasizes knowledge, discovery and alertness - the Wiser-Hayek-Kirzner strand. This strand can be contrasted

with the more uncertainty-focused tradition, represented by the work of Böhm-Bawerk-Mises-Rothbad. Rather than focusing on the function which entrepreneurs play in bringing the market closer to equilibrium – which, in Kirzner's view, entrepreneurs do by being alert to asymmetries and by identifying overlooked opportunities (Kirzner, 1973, 1997) – it is the entrepreneur's role as a resource allocator who exercises judgmental decision-making under uncertainty that is of main interest to this strand. In this sense, the roots of these Austrians' approach to entrepreneurship can be found in the pioneering research performed by Richard Cantillon (1755) and Jean-Babtist Say (1803), but first and foremost in the ground-breaking work by Frank Knight (1921) (Foss & Klein, 2012).

Frank Knight has had a major influence on the field of economics in general[5], but he has been particularly important to the research strand within entrepreneurship research that emphasizes uncertainty as being central in entrepreneurial processes. In his most influential work, *Risk, Uncertainty and Profit* (Knight, 1921), he distinguishes between risk and uncertainty. The degree to which the probability of the outcome is *apriori* known or can be *statistically* inferred, determines whether the situation is characterized by risk or by uncertainty. In uncertain situations, the probability of the outcomes cannot be known beforehand, and the decision-maker is forced to make judgments of the *estimated* probability (Foss & Klein, 2012). Foss and Klein (2012), who focus on aligning their theory of entrepreneurship with *the theory of the firm*, view Knight's conceptualization of uncertainty to be precisely the bridge that this alignment needs. Judgment cannot, according to Knight (1921), be assessed in terms of its marginal product, which means that there is no market for judgment and, consequently, no market for entrepreneurship. It is thus the resource-owner who is the entrepreneur, as he is the one who exercises judgment under uncertainty, whether this takes place within an established organization or in the form of a business start-up.

[5] Frank Knight was one of the founders of the so-called Chicago school. He was the teacher of Nobel laureates Milton Friedman, George Stigler, and James Buchanan (Emmett, 2010).

Entrepreneurial activities can therefore be traced to investments that have been made under circumstances characterized by uncertainty (Foss & Klein, 2012).

Knight's theory about uncertainty is also central in the work of Saras Sarasvathy (2001, 2008) who has analysed the principals which entrepreneurs use when engaging in decision-making under uncertainty. In her study of expert entrepreneurs, she discovered that, in contrast to managers who are very goal-oriented and rely heavily on predictive methods, entrepreneurs are much more control-oriented and focus on the means at hand. The type of venture that is created depends not only on the sole vision and input of the entrepreneur, but also to a large extent on the kind of stake-holder who chooses to engage in the venture and in what ways contingencies are leveraged and used as an advantage rather than an adversity (Sarasvathy, 2001, 2008). Entrepreneurs, thus, use an *effectual* logic rather than a *causational* logic, according to Sarasvathy. The work of Sarasvathy has had a major influence in the field of entrepreneurship research, and it has especially been important within the field of entrepreneurship education (Fayolle, 2013), as it offers a concrete approach to how and why entrepreneurs use divergent methods compared to managers – something that had earlier been categorized as belonging to the fuzzy category labelled the "art of entrepreneurship" (Henry, 2005). Sarasvathy's categorization of the two different logics is related to Alvarez and Barneys' (2007, 2010) distinction between the so-called *creation* and *discovery* approaches to entrepreneurial opportunities, which also has influenced the field of entrepreneurship education in a significant way (Barr, Baker, Markham & Kingon, 2009).

Alvarez and Barney (2007, 2010) distinguish between two different approaches of how entrepreneurs engage in entrepreneurial activities. On the one hand there is the *discovery approach* which in many ways is similar to classic management methods as the focus is on future gains, development of complete and stable strategies, careful analysis and planning, and access to external funding. Entrepreneurial action is, in this approach, seen as responses to exogenous shocks

(Eckhardt & Shane, 2003; Shane, 2000, 2003). The creation approach to entrepreneurial opportunity, on the other hand, views entrepreneurial activities as endogenous, as entrepreneurs enact and create opportunities by incremental, iterative, and inductive decision-making and uses flexible and emergent strategies which to a larger extent rely on internal funding (Gartner & Carter, 2003; Sarasvathy, 2001, 2008).

I will return to these *effectuation/causation* and *creation/discovery* categorizations more in-depth in the section about entrepreneurship education below, but for now let us recapitulate what researchers in entrepreneurship argue are the properties and aspects that delineate the field of research. So, entrepreneurship is a *function* performed by individuals - who possess (or do not possess) certain *traits* - which takes the form of an *emerging new venture,* outside or within *established organizations,* through a *process* that involves *judgmental decision-making* under *uncertainty* about *investments* of *resources* and through the use of an *entrepreneurial method* that involves an *effectual logic*, which is performed in order to pursue and *exploit opportunities,* which are either *discovered* or *created*. I would argue that this potpourri of concepts and perspectives clearly shows that entrepreneurship is still an emerging field of research. And, as we will see, this continuous development of perspective and emergence of new approaches, are specifically noticeable within the field of entrepreneurship education. In the next section I will present how these different perspectives of entrepreneurship have influenced entrepreneurship education as a field.

What is Entrepreneurship Education?

When the field of entrepreneurship research is characterized by such extensive conceptual confusion and definitional vagueness, it does not come as a surprise that this is also the case for the field of entrepreneurship education. If we also take into account that educational initiatives in

entrepreneurship have a wide spectrum of goals and objectives (Fayolle & Gailly, 2008; Jones & Iredale, 2010; Mwasalwiba, 2010; Pittaway & Cope, 2006), we can expect a fragmented field characterized by many different perspectives, approaches, concepts and rationales. The field of entrepreneurship research has, however, since the start of the 21st century become more theory driven (Wiklund et al., 2011), whereas this is not the case for entrepreneurship education (Bechard & Gregoire 2005; Fayolle, 2013). In a recent literature review of the field it was found that 25 per cent of the articles reviewed were not theoretically grounded or did not clearly refer to a specific theoretical approach (Nabi, Fayolle, Linan, Krueger & Welmsley, 2013). According to Fayolle (2013), there is a potential for aligning research in the field with the ongoing debates that have developed within entrepreneurship research, in particular the opposing strands regarding whether or not opportunities are created or discovered (Alvarez & Barney, 2007, 2010; Echardt & Shane, 2003; Sarasvathy, Dew, Velamuri & Venkataraman, 2003).

The theoretical fragmentation within the field can, however, be viewed as a positive feature, as it allows the field to continuously develop and include new approaches and perspectives, and, consequently, avoid the paradigm paralysis which has consumed many business disciplines (Kuratko, 2005). As entrepreneurship becomes more and more trendy, it does, although, run a risk of becoming a washed-out concept meaning everything and nothing. This can be exemplified by the overt use of the word "entrepreneurial" as a prefix to a large variety of other disciplines such as marketing, finance and strategy (Kuratko, 2005). Taken together, the many objectives and purposes of entrepreneurship education combined with the lack of theoretically driven research makes research in the field a challenging task. However, I would argue that there are some promising advances made during the last decades, but in order to identify which these are a brief presentation of the field's development and progress is needed.

The development of entrepreneurship education as a field

According to Katz (2003), the first class in entrepreneurship was taught already at Harvard business school in 1947[6]. The field did not, however, take off until the 1970s when many American business schools included entrepreneurship as a part of their MBA educations (Kuratko, 2005). The field has experienced an explosive growth since then, and entrepreneurship is today taught to students within many different disciplines and at different levels of education (Jones & Iredale, 2010; Katz, 2003, 2008; Kuratko, 2005; Mahieu, 2006). According to Ronstadt (1987), the field has since its early days been characterized by practice. During its infancy, this practice orientation was overtly emphasized, as the field was dominated by practitioners, and most educators tended to believe that whether or not the students would become entrepreneurs was decided long before they attended their courses (Ronstadt, 1987).

This overt focus on practice changed during the 1980s and 1990s as researchers in the field started to become more interested in the process (Kuratko, 2005). According to Honig (2004), as well as Neck and Greene (2011), it is this process orientation that has led to management science dominating the field – especially strategy (Ireland, Hitt & Sirmon, 2003; Hitt, Ireland, Camp, & Sexton, 2001) - since this approach makes it possible to view entrepreneurship as a sequence of linear activities which typically suits the management methods well. The use of the business plan - an archetypical example of management methods - has dominated entrepreneurship education and is still a prominent feature in most education within the field (Solomon, Duffy &Tarabishy, 2002; Honig, 2004). The focus in this type of management-dominated approach to entrepreneurship education is on exploration and evaluation of business opportunities (Mwasalwiba, 2010). The students are mostly trained in cognitive-oriented entrepreneurial skills, such as planning and

[6] According to McMullan and Long (1987) the first class in entrepreneurship was held 1938 at Kobe University in Japan

finance, as prediction of the future and avoidance of risk and contingency are essential dimensions in this approach (Neck & Greene, 2011).

However, advances made in entrepreneurship research during the last decade have made many researchers critical of this linear and "business plan"-dominated approach to entrepreneurship (Mwasalwiba, 2010). Solomon, Duffy and Tarabishy (2002), who conducted a major empirical analysis of the field, argue that the core objective of entrepreneurship education is that it is different from business education. This view is supported by many researchers who are critical of the fields' dominance of business schools (see for example Gibb, 2002a, 2002b; Hindle, 2007; Plaschka & Welsch, 1990). According to Sarasvathy and Venkataraman (2011), entrepreneurship should be viewed as a method. In the same way as the scientific method has been codified and described, which has led to the development that there are today millions of "ordinary" scientists working in systematic ways, there is a possibility of codifying and deconstructing the entrepreneurial method and teaching it to all students, not just a selected few. Changing the focus from process to method will have major implications for the field of entrepreneurship education, as it would imply that education in the field should not focus on educating students in the discipline, but rather on equipping the students with the skills and tools needed to navigate the discipline (Neck & Greene, 2011).

As the world is to a large extent unpredictable and characterized by ambiguity, uncertainty and constant change, it makes little sense to teach students management methods, which focus on prediction and linear processes. It is more important to engage students in uncertain and ambiguous processes and teach them how to manage these with control strategies, such as stake-holder involvement and continuous iterations (Neck & Greene, 2011; Sarasvathy, 2008). These types of non-cognitive entrepreneurial skills are not easy to learn in the classroom since they require practice (Jack & Anderson, 1998; McMullan & Long, 1987). This practice orientation implies that the focus

of entrepreneurship education should be on the exploitation phase rather than on the exploration and evaluation phase, which characterizes the management dominated perspective to entrepreneurship education (Mwasalwiba, 2010).

The perspectives presented above are all examples of approaches which focus on education *for* entrepreneurship. The most common educational approach to entrepreneurship in higher education is, nevertheless, education *about* entrepreneurship, that is, education focusing on transmitting declarative knowledge about what entrepreneurship is and what entrepreneurs do (Mwasalwiba, 2010). However, there is a third approach to entrepreneurship education that is relatively different from the two other approaches. Education *through* entrepreneurship is an approach that focuses on using entrepreneurship as a teaching method (Hannon, 2005; Surlemont, 2007)[7]. This approach to entrepreneurship education is closely related to the concept *enterprise education,* as the goal is much broader compared to education *for* entrepreneurship (Gibb, 1992; Jones & Iredale, 2010). Whereas education *for* entrepreneurship focuses on new venture creation, the focus of education *through* entrepreneurship is on fostering innovative, creative and enterprising individuals (Blenker et al., 2011; Hannon, 2005; Mathieu, 2006). The educational content in this approach does not need to focus on entrepreneurship, at least not in its contextual definition as an organizational form characterized by small business and new venture creation (Surlemont, 2007). The focus of this approach is rather on the pedagogy and the teaching methods (Jones & Iredale, 2006).

Education *through* entrepreneurship is not subject specific, which makes it possible to introduce across the curriculum (Iredale, 2002). This possibility of embedding entrepreneurship education in many different topics rather than introducing it as a specific discipline has made this

[7] Some authors view education through (or in) entrepreneurship as an approach which focuses on small business management (growth and survival) especially targeting practitioners (Mwasalwiba, 2010). In my view, this would be education in small business management rather than in entrepreneurship. Pittaway and Edwards' (2012) concept of "embedded" entrepreneurship is close to what I refer to as *through* entrepreneurship.

pedagogy-oriented approach to entrepreneurship popular at the lower levels of the education system (Mahieu, 2006; Surlemont, 2007). Naturally, this lack of entrepreneurship-oriented content makes it questionable if this approach can really be regarded as education in entrepreneurship. However, even if self-employment is not an objective of this approach, I would argue that it still can be viewed as belonging to the field of entrepreneurship education as it has a clear focus on fostering non-cognitive entrepreneurial skills. Furthermore, it is through the process of studying how entrepreneurs learn (see for example Cope, 2005; Politis, 2005) and how entrepreneurial passion and motivation develop (see for example Cardon, Wincent, Singh & Drnovsek, 2009), that this approach to education has developed (Gibb, 2011; Mahieu, 2006). In this sense, education *through* entrepreneurship, understood here as a pedagogical approach to entrepreneurship, has many similarities to the method approach proposed by Sarasvathy and Venkataraman (2011).

To sum up, there has been an explosive growth in the field of entrepreneurship education from the 1970s onwards. Since the field has its roots in American business schools, it is natural that management science has dominated its development (Honig, 2004). During the last decade important advances in entrepreneurship research have, however, led to a growing critique of the linear process approach that has dominated educational initiatives in the field (Neck & Greene, 2011). This new strand in entrepreneurship research argues that the focus should be on the exploitation phase rather than on the exploration and evaluation phases, and that the students should learn how to handle ambiguity and constant change, as well as to manage uncertainty and contingencies, rather than be taught predictive management methods (Gibb, 2002b; Neck & Greene, 2011; Sarasvathy, 2008). Viewed from this perspective, entrepreneurship is more like a method than a discipline (Sarasvathy & Venkataraman, 2011). This method approach is similar to education *through* entrepreneurship, or enterprise education, which is a related concept (Blenker et al., 2011;

Jones & Iredale, 2010), and which is more focused on the teaching methods than the content, as it is its objective to foster creative and enterprising individuals rather than stimulating self-employment.

It is clear that the heterogeneity that characterizes the field makes it complicated to effectively evaluate entrepreneurship education. Evaluators need to pay attention to the specific objectives of the different approaches, since these differ a lot. It is, however, also important that these different approaches, which have their conceptual roots in the same field, can be compared on the basis of similar standards, at least on some critical dimensions. In the next section I will discuss how the inclusion of the concept of cognitive and non-cognitive skill development in entrepreneurship research can assist evaluators of entrepreneurship education in that it offers a simple, yet effective way to categorize, compare, and evaluate different approaches to entrepreneurship education.

Evaluating Different Approaches to Entrepreneurship Education

The generic teaching model for entrepreneurship (see figure 1), presented by Fayolle and Gailly (2008), is a good starting point when designing and assessing entrepreneurship education. It includes questions that every curriculum designer should ask themselves when they plan a new course or programme: *why*, *for whom*, *what*, *how*, and *for which results*? This process starts, according to Fayolle and Gailly (2008), at the ontological level. By considering fundamental questions such as *what entrepreneurship education is*, *what education in an entrepreneurial context means,* and *what roles do the educators and the participants have in this context*, many of the other questions will be answered. By using the teaching model concept, the differences between and similarities of education *about*, *for* and *through* entrepreneurship can be identified.

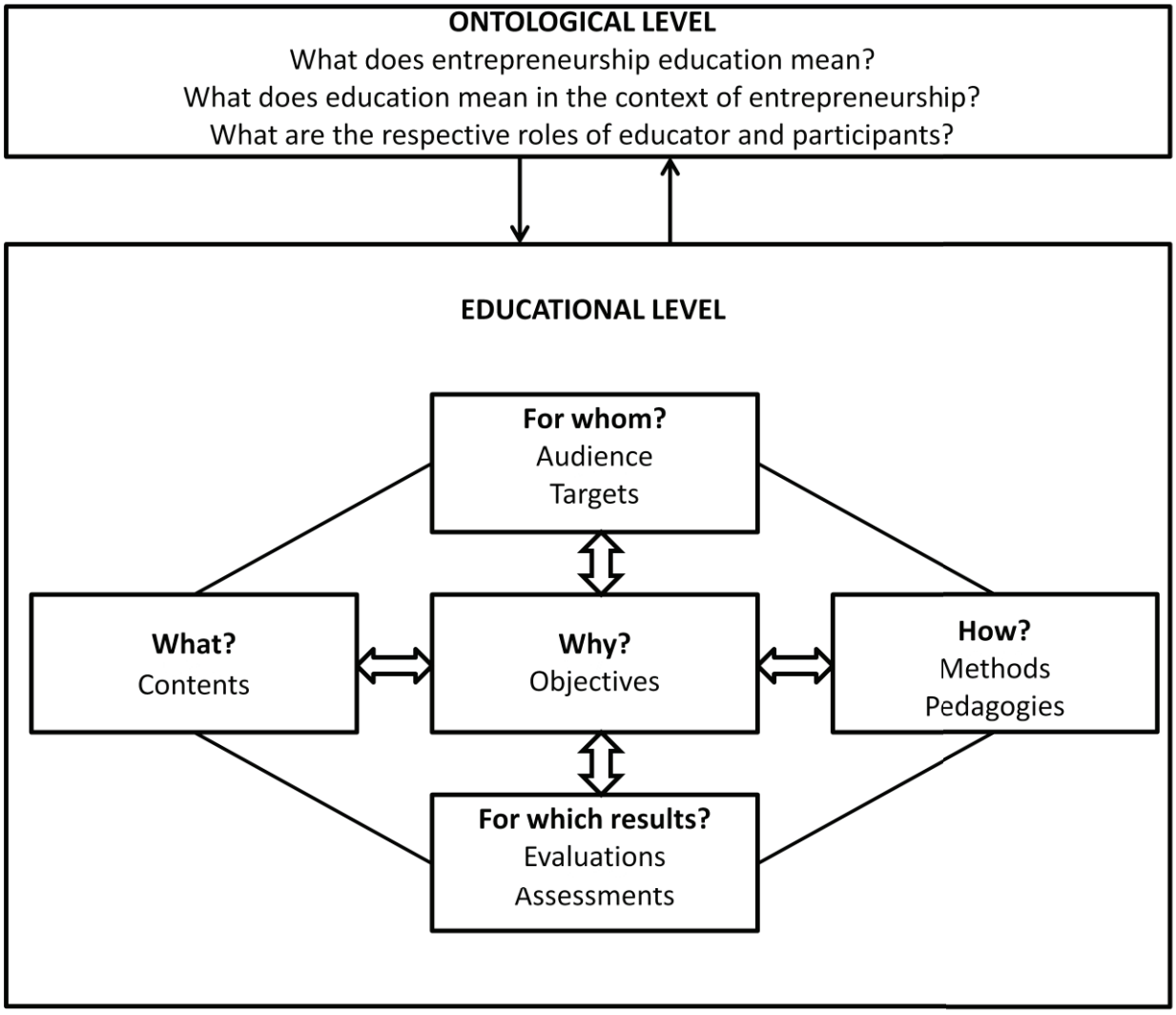

Figure 1: Generic teaching model for entrepreneurship education (Fayolle & Gailly, 2008: 572)

Educations *for* and *about* entrepreneurship are to some degree similar when it comes to content and outcomes, and, as a result, it is possible to compare and evaluate these two approaches on the same basis. Both of these approaches focus on teaching students cognitive entrepreneurial skills (what) and on increasing students' awareness of self-employment as a potential career choice (objective). Education *for* entrepreneurship does, however, also focus on teaching students non-cognitive entrepreneurial skills (what), which entails the use of action-based teaching methods (how). Learning outcomes such as an increased competence level in managing ambiguity and uncertainty (objective) as well as an increased understanding of how to apply and use discipline-specific

knowledge (objective) can also be viewed as important learning objectives of this approach. In this sense it is possible to compare education *for* entrepreneurship with education *through* entrepreneurship, as they, to some degree, focus on similar learning outcomes (objective) and use similar action-based teaching methods (how).

Three interrelated categories, each of which can be divided into two dimensions, are therefore specifically important in this categorization of entrepreneurship education: 1. *Skills* (cognitive and non-cognitive), 2. *Teaching methods* (active and passive), and 3. *Outcomes* (self-employment and creative self-directed individuals). In figure 2 the three educational approaches are positioned in the models according to their focus on the dimensions in these three categories.

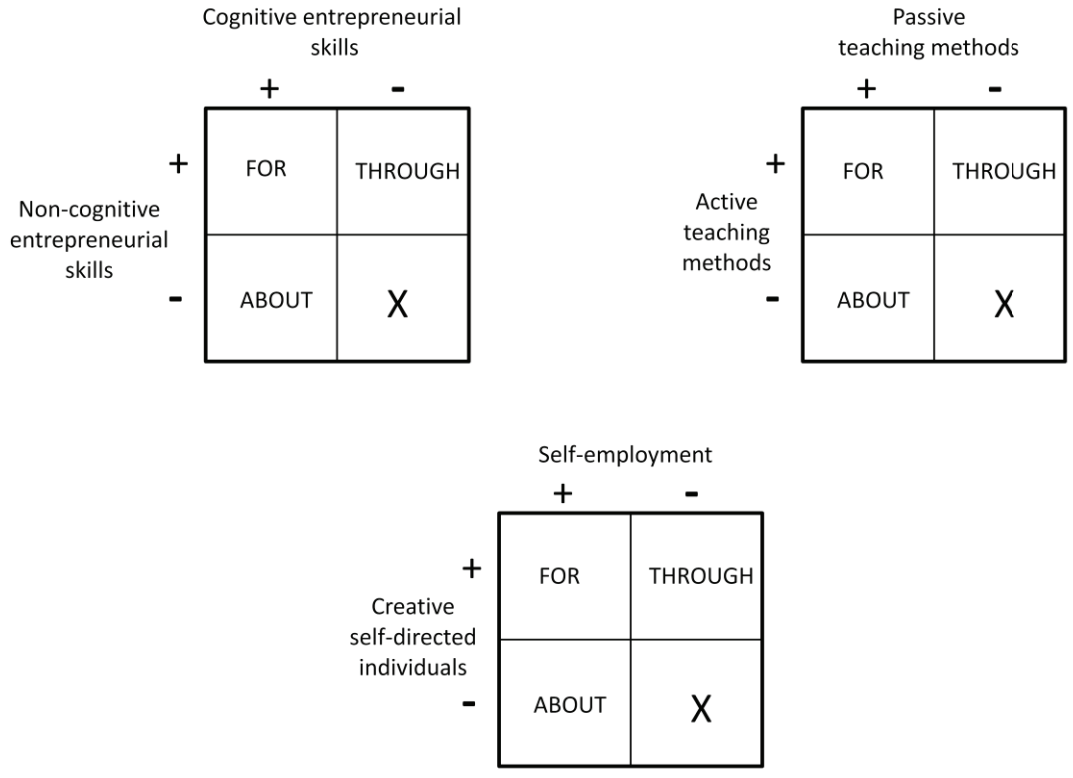

Figure 2: Categorization of education *about*, *for* and *through* entrepreneurship

As figure 2 shows, it seems that education *for* entrepreneurship is always better than the other two approaches, since it is always located in the plus quadrants. However, this is far from the case, as resources and costs, as well as the specific objectives, all play a major role in determining the effectiveness of an educational approach. Education *about* entrepreneurship can easily be taught to hundreds of students, because it does not rely on action-based teaching methods. If the primary objective is to increase students' awareness and knowledge of entrepreneurship, then this is probably the most effective educational approach. If, on the other hand, the goal of the intervention is to foster creative and proactive students who understand how they can use and apply their knowledge in innovative ways, probably education *through* entrepreneurship is more effective, because it can be embedded in many different topics in a cross-curricular manner.

So where do the advances in entrepreneurship research and the new approaches in entrepreneurship education fit into this model? As these approaches focus predominantly on education *for* entrepreneurship, which in my model has a high focus on the dimensions of each of the three categories, it is the degree of this focus that matters. The traditional *process-oriented* approach to entrepreneurship education typically has a higher focus on cognitive entrepreneurial skills and on the exploration and evaluation phases, which most often entails an increased use of passive teaching methods. The more recent *entrepreneurship as a method* approach has a higher focus on non-cognitive entrepreneurial skills and on the exploitation phase, which entails an increased use of active teaching methods.

When it comes to intended outcomes, the process-approach usually has as a clear goal that the students, now that they have learnt how to identify, evaluate and prepare business opportunities, will go out and exploit such opportunities as soon as possible (especially if the education has been business-plan oriented). However, since cognitively-oriented entrepreneurial skills are typically required in corporate venturing and innovation projects within established organizations (Ireland,

Hitt & Sirmon, 2003; Hitt, Ireland, Camp, & Sexton, 2001), it is also likely that many students will become more incline to pursue a career as employees. In the method-approach, the focus is more on the non-cognitive entrepreneurial skills and the exploitation phase. Here the students typically work with their own personal entrepreneurial projects and move them forward during the educational process. This can have the effect that many students discover that they are not suited for a career as self-employed or that their knowledge, abilities, and interests are more in line with a career within established organizations (Neck & Greene, 2011). However, since many students will advance their venture projects when attending educational programmes which focus on teaching entrepreneurship as a method, it is likely that the entrepreneurial activities and the number of students who view themselves as entrepreneurs will increase as a result of education in this approach. In chapter 4 I will present a more detailed discussion about this.

Accordingly, the categorization models presented in figure 2 are a good place to start when performing assessment studies of entrepreneurship education. The position of the educational approach in the skill category and in the teaching method category will provide a good indication as to which types of outcomes can be expected. The effectiveness of education *through* entrepreneurship should not be evaluated on the basis of whether or not this approach changes the participants' intentions to become self-employed, or to which degree the participants start up new and well-performing ventures. In the same way education *about* entrepreneurship should not be evaluated on the basis of how many of the participants become creative and self-directed individuals and how many of them become valued and innovative employees.

When it comes to the different approaches of education *for* entrepreneurship, deciding the outcome variable is a bit trickier. I would argue that the temporal dimension is important here. At the end of the day it is not the number of start-ups per year that are important when it comes to creating growth (even if there is naturally a correlation), but rather how successful the individuals

are in creating, sustaining and growing their ventures, regardless of whether this happens in the same year in which the students graduate or after ten years. Accordingly, this type of evaluation does require longitudinal data. However, if our interest is to assess the short-term effects of these educational approaches, a solution could be to focus on the skill category, that is, the focus of these approaches on cognitive and non-cognitive entrepreneurial skills.

Educational approaches can have many different objectives and goals, but an increased level in the specific skills which they focus on can always be considered a successful outcome. However, the tasks of assessing cognitive skills and non-cognitive skills, respectively, are quite different, because the latter is difficult to evaluate through ordinary exams (Cunha & Heckman, 2006). The self-efficacy concept (Bandura, 1977a, 1977b; 1997), however, may offer some assistance here. Perceptions of task-specific self-efficacy have proven to be a factor which determines whether or not individuals will apply the specific skills they have acquired (Bandura, 1983), and in what extent they will persist and become successful in applying their skills (Bandura, 1997). The self-efficacy measure often includes multiple dimensions as most tasks require multiple skills (both cognitive and non-cognitive) to be performed successfully. As self-efficacy is a self-assessed measure it is more or less equally easy/difficult to assess the effects of an educational approach on individuals' perceived cognitive and non-cognitive skills. Accordingly, the measure can be used in evaluations of all three approaches to entrepreneurship education, but the expected outcomes should naturally be in line with the approaches' focus in the skill dimension.

The task specific measure entrepreneurial self-efficacy (ESE) has become a popular measure in the field of entrepreneurship (McGee et al., 2009) and in assessment studies of entrepreneurship education (Mauer et al., 2009), because it has been demonstrated to have a major influence on entrepreneurial behaviour (Krueger, 1993) and a strong relation to entrepreneurial intentions (Fayolle, 2005). Entrepreneurial self-efficacy can thus be viewed as a measure that should be

included in all evaluation studies within the field of entrepreneurship. This is also my own personal belief, but as we shall see in the next part of the chapter, this was not clear to me when I started my PhD project.

THE RESEARCH PROCESS AND THE RESEARCH METHODOLOGY

This research project has been a great learning process but naturally it has been filled with frustration and disappointments, as primary data collection is a messy and time-consuming process. Unfortunately there is no way to circumvent this burdensome process when it comes to educational assessment studies, especially in a new field such as entrepreneurship education, because access to secondary data is limited. The main objectives of my PhD-project has been to design surveys which can be used in longitudinal studies of entrepreneurship education, but which also provided short-term results. I have therefore mainly focused on making the survey instrument as informative, useful and reliable as possible, and, consequently, a large part of my PhD-project has been to test and validate different measures. This is an iterative practice and everyone who has worked with empirical data knows that ambiguous results and disappointments are part of the process.

The process behind the studies in this thesis has been a balance between, on the one hand, increasing the reliability and usefulness of the survey instruments and the survey designs to be used in the longitudinal project, and, on the other hand, getting useful and interesting short-term results. Luckily for me, since I had to complete this project in just three years, short-term results have an important role to play in educational assessment studies. Naturally, the most important educational effects are those that unfold in the long term, but in order for an educational assessment study to be informative it also needs to focus on the short-term effects since these offer quick feedback to programme designers (Mohr, 1995).

In this part of the text I will present the process behind my PhD-project. Many of the considerations one makes cannot be communicated in research papers, and as this is a compilation thesis, the main part of it is constituted by papers. I therefore find it important to present the considerations that I have made during this process regarding measurements and survey designs, as well as my theoretical focus and research methods.

Assessing the Influence of Entrepreneurship Education at Tertiary Level

As my original intention was to use a longitudinal research design, I started my research project with the ambition to begin collecting data from day one. It was therefore important to get access to a validated and tested survey design that was ready to be implemented. I was invited by Benson Honig to participate in the ISEEO project[8], which not only offered me the chance to use a validated survey based on a robust theoretical framework, but also the opportunity to compare my results with researchers in many other countries. The ISEEO project is a large-scale assessment project which uses the theory of planned behaviour (TPB) as its conceptual framework. TPB is a good example of an approach that offers quick feedback to programme designers (see for example Fayolle, 2005; Krueger & Carsrud, 1993; Kolvereid, 1996), but it also offered interesting research opportunities as the link between entrepreneurial intentions and entrepreneurial behaviour is yet to be established (Krueger, 2009).

Another attractive aspect of TPB is its parsimonious design. Because the theory states that all factors influencing an individual's intentions to engage in a certain behaviour are mediated through three variables (attitudes, social norms and perceived behaviour control), it becomes a fairly easy task for an evaluator to construct an effective and manageable pre/post survey and measure the effects of entrepreneurship education on students' intentions of becoming self-employed. The third

[8] The International Study of Entrepreneurship Education Outcome.

and perhaps most important aspect of TBP is that it has been applied in a large number of studies, which makes it possible to build on prior research and compare results and effects.

In the beginning of this project I did actually believe that students of their own accord would fill out the questionnaires online if they were just presented to the project. The 2% response rate that I got was a harsh awakening for me. Another problem, which this initial data collection brought to my attention, was that many students who had started to fill out the survey did not finish it. I talked to some of the students who had participated in the survey, as well as some of the programme leaders who had allowed me to collect data from their students. The students found the questionnaire to be way too extensive, and many of the students who did not participate in entrepreneurship education had a hard time understanding some of the questions and could not really motivate themselves to complete the survey. The programme leaders questioned the strong focus on attitudes and intentions and did not really see how the survey design would give them any valuable feedback, as they did not see these variables as aligned with their educational objectives. The programme leaders requested a stronger focus on competences and skills, because they saw this as the raison-d´être of education. At the time I had also started my method-training, and as my focus was on structural equation modelling (SEM), I started to question the survey design myself, as many of the constructs included up to 20 items, which would be impossible to fit into a structured model.[9]

My assistant supervisor Tomas Karlsson presented me with a solution to some of these problems. He had recently received a revise-and-resubmit on a paper which focused on measuring the influence of entrepreneurship education on students' level of entrepreneurial self-efficacy (ESE). The reviewers requested a control group, which I was able to provide. The ESE scale used in this paper was developed by McGee et al. (2009). This scale focuses on five different skill sets

[9] There are techniques to handle this problem, such as treating these constructs as multidimensional or use parceling techniques, but I did not know this at the time. I would also like to emphasize that I have very positive opinions of the ISEEO project, but, unfortunately, it did not fit my research design.

which are aligned with four different phases (search, planning, resource-marshalling, implementation) in an entrepreneurial project (Stevenson, Roberts & Grousbeck, 1985). As the programme leaders had requested a measure of entrepreneurial competences I found this scale to be very suitable. The concept of self-efficacy (Bandura, 1977a, 1977b; 1997) had many appealing features, and as it was a measure of individuals' perceived competences to perform a specific task, it could be used in a survey design that focused on self-reported data.

I used McGee's et al. (2009) survey designed and collected pre and post data from a five week management course at master level. I discussed the survey design with the students, and they had some concerns about the overt focus on new venture creation and some problems with the questions that focused on human resource management, as they felt unable to really assess their level of skill in activities with which they were unfamiliar. We did manage to get the paper published (see Karlsson & Moberg, 2013), but the internal consistency of the separate dimensions in the measure was not at a sufficiently high level (especially not for the students in the control group), and when I ran an exploratory factor analysis on the data it was hard to find the same construct loadings as McGee et al. (2009).

According to Davidsson (2004), it is preferable to use established measures, even if they have a questionable dimensionality and item properties, since the possibility of comparing the results with other studies are often of more importance than an expansion of the validity and reliability of the measures. I am inclined to agree with Davidsson on this point, when it comes to single studies with a "one-off" character. However, as the designs of my surveys were to be longitudinal, it was important not to frustrate and provoke the respondents with questions that they would find hard to understand and assess. I did, however, find the ESE measure to be very interesting, and as the use of ESE has increased - and is steadily growing - especially in assessment studies of entrepreneurship education (Mauer et al., 2009; McGee et al., 2009), I found it important to adapt the ESE measure

to this type of practice. I therefore decided to refine and modify the measure so it would fit the needs and requirements of assessment studies which focused on students at the tertiary level. This process is presented in chapter 3.

The empirical unit of analysis

My intended focus in this research project was to assess the influence of different courses in entrepreneurship on students with different educational backgrounds. However, I quickly realized that there were many drawbacks with this design. One major challenge was to control for the students' educational background. Many courses in entrepreneurship are offered as electives at different levels of education, and the students attending these courses have very heterogeneous backgrounds, which influences the outcomes. Another problem was that many entrepreneurship courses run parallel with other courses. This makes it problematic to establish whether the effects come from the course studied or from another course which the student is currently following. Naturally, these factors can be controlled for, but they do complicate assessments that are intended to focus on a specific educational design.

I therefore shifted my focus from courses to programmes, which turned out to offer a new set of challenges. Programmes at master-level have the advantage that, in most cases, the courses which the students follow during the first year are the same for all. Furthermore, it is easier to control for educational background since all students at this level have finished their bachelor education. Programmes in entrepreneurship is, however, very uncommon. The Danish Foundation for Entrepreneurship continuously perform mappings of entrepreneurship education in the Danish education system (Moberg, Vestergaard, Jørgensen, Markussen & Hakhverdyan, 2014), so I used their reports to identify six programmes that could be suitable for my study. I interviewed the programme leaders of these six programmes and through this process two additional

entrepreneurship programmes and four programmes that could be included as a control group were identified.

The programmes were selected on the basis of their students' educational background. As different disciplines have different amounts of resources to spend on their student (compare for example an engineering student with a student of the humanities), it is important that a programme had at least one disciplinary equivalent. I also performed a literature review which focused on identifying and categorizing different approaches to entrepreneurship education (Moberg, Vintergaard & Vestergaard, 2012), which also guided the selection process. This resulted in a sample that roughly can be categorized according to its involvement of the students' prior contextual knowledge in the education process and whether or not the ownership of the entrepreneurial projects was bestowed on the students; two categories which strongly relates to the entrepreneurship as a method approach (Neck & Greene, 2011).

After the first round of pre- and post-questionnaires had been collected from the programmes, I discovered that it was more difficult than I had thought initially to match the *ex ante* and *ex post* answers of the students. In the second round of data collection I tried to remedy this by including more stable measures to match the students on, such as date of birth and identification number. It was, nevertheless, problematic to retrieve post-data from the students. Some of the programmes had an educational structure that made it impossible to hand out surveys in hard copy format, and instead these students had to be contacted via email. This resulted in a significant fall in the number of respondents. However, as I eventually got two rounds of data[10], the sample size was big enough to allow for an analysis of the effects of these programmes. In chapter 4 the results of this analysis are presented in detail.

[10] A third round of data has been collected from these programmes, but it is yet to be analysed and therefore not included in this thesis.

I have presented the research project to academics as well as practitioners at conferences and seminars and continuously published reports about the progress (see FFE-YE, 2012, 2013). This has led to an increased interest for the project and more entrepreneurship programmes in both Sweden and Finland, as well as Denmark, have been added to the project. In order to keep it manageable, I have, however, tried to limit the number of programmes included. Today, seventeen master programmes are included in the project.

Assessing the Influence of Different Approaches to Entrepreneurship Education at Lower Secondary Level

Concurrently with the initial data collection at tertiary level, I initiated the large-scale survey targeting students at lower secondary level. The quasi-experimental design that I use at tertiary level is not practicable at lower secondary level, as education in entrepreneurship at this level is more fragmented and dispersed. Instead a survey of randomly selected ninth-graders was constructed. As pupils on this level of education are far from the labour market, many of the typical variables used in assessment studies of entrepreneurship education at tertiary level could not be used. I did include measures of entrepreneurial attitudes and intentions in the survey since there is a long-standing tradition within entrepreneurship education to focus on these variables. I was, however, largely influenced by the programme evaluations performed by Nakkula, Pineda, Dray, and Lutyens (2003) which focused on how entrepreneurship education changed the students' level of connectedness to their school, their classmates and their teachers, because I discovered that these education-, rather than career-, oriented variables could offer interesting insights about the effects of different approaches to entrepreneurship education at this educational level. I therefore included the connectedness variables in my survey. My colleagues at the Danish Foundation for Entrepreneurship tested the questionnaire design by interviewing ten ninth-graders from two

different school classes, and the tests indicated that pupils at this level understood the questions and were able to assess them in a meaningful way.

In September 2011 the questionnaire was mailed in a hard copy format to 2,000 randomly selected Danish ninth-graders. The pupils were offered a cinema ticket if they completed and returned the questionnaire[11]. In total, 938 completed questionnaires were returned. Unfortunately, I had decided to measure the items on four-point Likert scales, as I was worried that the students would not be able to assess their level on a measure with a wider range. Naturally, this limited range offered little variance and it gave me a data set that proved to be very challenging to work with (see Moberg, 2012). What made matters worse was that I had only included measures of perceived educational focus as single items, so it was impossible to analyse how students interpreted these questions, which naturally should had been measured with at least three items as they are typical examples of latent constructs[12].

In the next round of data collection, which was performed exactly a year later, multiple items were included to measure the perceived educational focus and the range of the Likert scales was increased to seven-point scales. The questionnaire was in this round of data collection largely inspired by the work of Rosendahl-Huber et al. (2012), and their focus on cognitive and non-cognitive entrepreneurial skills.

Research Methodology and Limitations

All research papers included in this thesis empirically test hypotheses which are derived from existing knowledge about entrepreneurship education and entrepreneurial learning. The

[11] After the complete failure of my initial data collection I have found out that bribing the respondents and offer them the opportunity to fill out the questionnaires in a hard copy format is a good way to get high response rates. Naturally, it is a very burdensome process as mails have to be sent back and forth and the data need to be transmitted manually. I did, however, get good assistance from my colleagues at the Danish Foundation for Entrepreneurship in this process.

[12] A latent construct is a construct that cannot be observed and measured directly, and instead the researcher has to focus on measuring indicators that can be said to represent the underlying construct (Brown, 2006).

methodological approaches used are described in detail in each of the papers, but as the two research projects, which the three papers are a result of, have fairly different methodological approaches I find it important to present some background information regarding the considerations I have made.

Structural equation modelling

I have mainly used structural equation modelling (SEM) in the analyses, because I think this statistical technique has many advantages compared to "ordinary" econometrics. As I have included multiple latent constructs in both of my research projects, SEM is a natural choice. Latent constructs almost always include a high level of unobserved measurement error and it is common that similar, yet conceptually different variables (for example dimensions of ESE) experience a high level of correlation with several other variables (Brown, 2008).

The use of SEM makes it possible to account for measurement errors and simultaneous correlations between variables in a model (Little, 2013). Furthermore, SEM allows the analyst to assess important aspects such as factorial invariance[13] both between groups and over time. This must naturally be included in educational assessment studies, as we want to rule out the possibility that the respondents have understood the questions in different ways depending on their background (culture, experience, education) or that their understanding of the questions has changed as a result of their educational experience (Cheung & Rensvold, 2002; Little, 2013).

The use of longitudinal SEM also allows the analyst to not only assess in what degree the respondents have increased or decreased on a variable, but also analyse to what extent the respondents' initial level of a variable explains their post levels (Little, 2013). In educational

[13] Test for factorial invariance investigate whether the influences that change the constructs are expressed as influences on only the indicators' true score and not the unique factors (Meredith, 1964, 1993, in Little, 2013). According to Little (2013), factorial invariance is probably the most important question to address in any analysis that involves more than one group and/or more than one time point.

assessments this is of major interest as it shows to what extent the education has had an effect. If a respondent's post levels in a variable is explained to a 100 per cent by his or her initial level in this variable, then it is clear that the educational experience did not have any influence, but if this is only explained to a 50 per cent, then it is likely that to some degree the educational experience has had an effect. In chapter 4, where my analysis is based on longitudinal SEM, I will explain this type of analysis in more detail.

Tertiary level: Quasi-experimental design

The two research projects represent two rather different methodological approaches, and they both have strengths and weaknesses. In my assessment study of students at tertiary level I use a quasi-experimental research design (Campbell & Stanley, 1966; Cook & Campbell, 1979). This is a commonly used approach in programme evaluations (Mohr, 1995; Shadish, Cook & Campbell, 2002), as it allows the analyst to use pre-determined selection criteria when it comes to the programmes that will be included in the analysis and the objectives which these programmes should achieve in order to count as successful (Mohr, 1995). By collecting *ex ante* and *ex post* data and by including a control group, the analyst can account for potential threats to validity, such as *selection*, *history*, *spuriousness* and *contamination* (Mohr, 1995). By including a control group it is possible to account for general events occurring during the evaluation period (*history*), because these events also occur to respondents in the control group. And by including many control variables, the *contamination* threat can to a large degree be accounted for (Mohr, 1995). It is always problematic to control for spurious effects, but hopefully this is something the analyst has already solved with strong theoretical prediction regarding the relationships (Davidsson, 2004) and by limiting the number of indicators and constructs included in the survey (Little, Cunningham, Shahar & Widaman, 2002).

The selection problem is, however, difficult to avoid in educational assessment studies. It is seldom the case that the participants in an educational programme or course can be considered to be randomly selected (Slavin, 2002). This leads to the problem of self-selection, which according to Graevenitz et al. (2010) is especially the case for entrepreneurship education, because entrepreneurship students typically have positive attitudes towards entrepreneurship and high levels of entrepreneurial intentions already when they start their programme and classes. By only including mandatory courses in the analysis this issue can be solved to some degree (Graevenitz et al., 2010; Oosterbeek et al., 2009), but not completely.[14] Another way to solve the selection problem is to centralize the control of the educational "treatments" to the evaluator, who in this case can randomly select the participants (Mohr, 1995). This is, however, not very feasible in educational contexts as educational institutions most often are reluctant to hand over the control of their education to an evaluator (Slavin, 2002).

As my unit of analysis in the tertiary level project is master programmes, self-selection was an aspect that could not be avoided. I tried to transform the selection threats to validity into selection effects (Mohr, 1995) by including multiple control variables that are known to have an effect on entrepreneurial behaviour (such as gender, family background, participation in extracurricular activities, entrepreneurial background, et cetera). The students were also matched according to their educational backgrounds. Nevertheless, the sample does experience some problematic characteristics that can be related to a selection problem. The entrepreneurial experience is considerably higher among entrepreneurship students than among students in the control group. Students in the entrepreneurship programmes also vary significantly on this variable, as the majority of the students have entrepreneurial experience in some of the programmes.

[14] The self-selection problem regarding which students choose to enroll at the institutions where these mandatory courses are offered will still remain (Mohr, 1995).

When it comes to levels of ESE, entrepreneurial attitudes and entrepreneurial intentions, this is also a problematic issue, because the initial level on these variables varies a lot. Among other things this leads to the problem of controlling for ceiling effects for the latent constructs, as there is a limit to the level of improvement that a respondent can experience due to the established top value of a Likert-scale[15]. If the students already in the pre-test had high levels of ESE, for example, it becomes more challenging for the programme to improve them on this variable.

The use of quasi-experimental design in educational evaluations has undergone a lot of critique, as many researchers (see for example Biesta, 2007; Olson, 2004) strongly disbelieve that these types of natural science-inspired approaches are adequate for research in social science. Education does not happen in a vacuum and students are not atoms and particles that react in the same way when heated, and thus they cannot be studied in a closed and clinical experiment (Olson, 2004). According to Olson (2004), quasi-experimental evaluations of education do not account for the different ways in which students experience their education. This is, according to Lackeus (2013), especially the case for entrepreneurship education, because the teaching methods in these educational approaches often differ to a large extent compared to other types of education, and students will therefore experience entrepreneurship education in very dissimilar ways. I find this critique valid, but I would still argue that the quasi-experimental design has more benefits than drawbacks. Naturally, we need to be aware of its limitations, but if the results of an assessment study can be replicated more than once, I would argue that the effect we see does have some value[16]. Qualitative studies would obviously add to the dimensions and the validity of the studies, but this is a question of resources. In my research design I have focused on including a sufficient

[15] In most of my surveys I have used seven-point Likert scales, and a student who replies seven to one of the items in the pre-test can, consequently, not improve on this item in the post-test.

[16] I do not claim that the results presented in this thesis have been replicated a sufficient number of times, but my research design does allow for this in future, as new samples will be collected on a yearly basis.

number of educational programmes in order to make comparative analyses possible, and this has unfortunately limited the possibility of using qualitative methods.

An important problem with the use of quasi-experimental design in previous assessment studies of entrepreneurship education is that they do not distinguish between content and teaching methods (see for example Peterman & Kennedy, 2003; Soutaris et al., 2008). As most education *for* entrepreneurship use action-based teaching methods, it is to be expected that the pedagogical approach also has an important role to play in the educational outcomes. At the lower levels of education, where the educators typically do not have influence on the learning objectives, teaching methods become more important than the content. Treating the teaching methods and the content as separate variables is therefore an important aspect when evaluating the different approaches to entrepreneurship education at the lower secondary level.

Lower secondary level: Self-reported data

At the primary and lower secondary levels of education entrepreneurship is an unusual element in the curricula. Education *for* entrepreneurship is uncommon, as its focus on cognitive-oriented entrepreneurial skills is perceived as being unrelated to the needs of the students, as they are still far away from the labour market. Education *through* entrepreneurship has, however, increased in popularity, because its pedagogical approach enables it to be incorporated across the curriculum (Jones & Iredale, 2010) and its focus on non-cognitive entrepreneurial skills is well in line with the learning goals of most countries.[17] The rareness of education *for* entrepreneurship and the fragmented approach to education *through* entrepreneurship, however, makes it complicated to use

[17] The European Union has identified entrepreneurship and sense of initiative as one out of eight key competences (Mathieu, 2007), and Denmark has a clear goal of becoming a more innovative and competitive country through the encouragement of entrepreneurship and innovation in the educational system at an early level (Ministry of Science, Innovation and Higher Education, 2012).

a quasi-experimental approach at this level. Instead I decided to use a random-sample design in my research project at this level.

In order to differentiate between the effects of the different approaches to entrepreneurship education, the students were asked to indicate to which degree their education had focused on fostering cognitive entrepreneurial skills, such as knowledge about *the role entrepreneurs play in our society*, *how business ideas can be evaluated*, and *how businesses are started*, as well as non-cognitive entrepreneurial skills, such as *how to think creatively*, *how to come up with new ideas*, and *how to transform ideas into activities*. The construct which focused on cognitive entrepreneurial skills is used as a proxy for education *about/for* entrepreneurship, while the non-cognitive skills are used as a proxy for education *through* entrepreneurship. Furthermore, the students were asked to also indicate in what degree they had experienced action-oriented teaching methods, that is, whether there had been a focus on applying the knowledge, learn from failure, and active participation, as well as in what degree they felt supported by their teachers.

Naturally, there are many limitations to this approach, as it is uncertain in what degree the students have actually experienced these educational approaches. It is fairly certain that students who indicate that they have experienced education which focuses on cognitive entrepreneurial skills actually have experienced education *for* or *about* entrepreneurship, because the questions are so specific. When it comes to education *through* entrepreneurship, however, it is more uncertain that the focus on non-cognitive entrepreneurial skills is an accurate proxy. This has to be acknowledged as a weakness in the analysis. I would in any case argue that students who indicate that their education has focused on *creativity*, *idea generation, how to transform ideas into action*, and *how to start-up new activities*, have to a large extent been taught in an entrepreneurial manner.

A Brief Introduction to the Chapters

As noted in the beginning of this chapter, the thesis consists of three empirical papers (Chapter 2-4) which presents different ways to assess approaches to entrepreneurship education. The chapters should be viewed as the initial building blocks in a larger research project, and as such, their focus and design are fairly dissimilar. In the following, a brief introduction to the chapters is presented.

Chapter 2: Two approaches to entrepreneurship education: The different effects of education for and through entrepreneurship at lower secondary level.

In chapter 2 the influence of two different approaches to entrepreneurship education is analysed. A theoretical framework based on research about cognitive and non-cognitive skill development (Bowles & Gintis, 1976, 2002; Cunha & Heckman, 2006; 2007; 2010), school engagement and purposeful education (Fredricks, Blumenfeld & Paris, 2004; Illeris, 2010; Larson, 2000; Libbey, 2004), as well as adolescent education in entrepreneurship (Johannisson, 2010; Jones & Iredale, 2010; Surlemont, 2007) is developed and the differences between cognitive skill oriented education *about* and *for* entrepreneurship and non-cognitive skill oriented education *through* entrepreneurship are outlined. Building on this theoretical framework, hypotheses about the influence which these two educational approaches have on pupils' school engagement and entrepreneurial intentions at the lower secondary level are formulated and tested.

The chapter reveals that the two educational approaches have opposite effects, because education *about* and *for* entrepreneurship, which focuses on entrepreneurial content, is perceived as irrelevant by many pupils at this level of education. As a consequence, this educational approach lowers the pupils' level of school engagement but increases their entrepreneurial intentions. The opposite is true for education *through* entrepreneurship, because its pedagogical approach elevates the students' educational motivation which increases their level of school engagement. As this

approach focuses on the pupils' interests and motivations, it does, however, decrease their entrepreneurial intentions.

Furthermore, the analysis shows that education *through* entrepreneurship has a positive association with pupils' level of perceived teacher support and action-based teaching methods. The positive association between this educational approach and perceived teacher support did in fact completely explain the positive association which this educational approach had with students' school engagement. This finding indicates that the character of the skills that the educational approach focuses on fostering plays an important role in determining the student-teacher relation, which in turn plays an important role when it comes to the pupil's overall commitment to school and education.

Chapter 3: An entrepreneurial self-efficacy scale with a neutral wording: Refining the ESE measure to adapt it to programme evaluation of entrepreneurship education

This chapter focuses on the concept of entrepreneurial self-efficacy (ESE), that is, individuals' belief in their personal capability to accomplish entrepreneurial activities and tasks. ESE is often included in assessment studies of entrepreneurship education (Fayolle, 2005; Mauer et al., 2009), because it has proved to significantly relate to entrepreneurial behaviour (Krueger, 1993). The multidimensionality of the measure is clearly emphasized in the self-efficacy literature (Bandura, 1977a, 1977b; 1997; Zimmerman, 1995), but when it is used in assessments of entrepreneurship education, it is commonly treated as a one-dimensional construct (McGee et al., 2009). As the existing ESE-scales are all developed with active and practicing entrepreneurs in mind, they all focus on skill sets which are unfamiliar to students and they use a wording that is hard for non-business students to understand.

In order to adapt the measure to educational evaluation, I have in this chapter refined and modified the measure. The multidimensionality and the factorial invariance as well as the predictive validity of the measure are tested in two large-scale surveys. The relation between different dimensions in ESE and entrepreneurial intentions, depending on the individuals' background and experience, are also tested. The analysis reveals the importance of treating ESE as a multidimensional measure, because the individuals' entrepreneurial experience plays an important role in determining which are the perceived skills and competences that explain entrepreneurial intentions.

Chapter 4: The role of ownership and contextual background knowledge in entrepreneurship education

In this chapter I apply longitudinal SEM in order to analyse the role which ownership and involvement of prior contextual knowledge play in elevating entrepreneurship students' ESE and entrepreneurial behaviour. The empirical unit of analysis is eight entrepreneurship programmes which all use action-based learning methods and focus on education *for* entrepreneurship. The programmes are divided into two categories according to their focus on student ownership of the entrepreneurial project and according to the degree to which they involve and use students' prior contextual knowledge in the education process. Hypotheses about the positive effect which these dimensions have on students' entrepreneurial behaviour and transformative effects on their ESE, are developed and tested. The theoretical framework is based on the literature about entrepreneurial passion (Brännback, Carsrud, Elfving & Krueger, 2006; Cardon, Wincent, Singh & Drnovsek, 2009), entrepreneurial learning (Cope, 2005; Politis, 2005), and the influence which prior knowledge has on opportunity identification (Baron, 2006; Shane, 2000) and new venture creation (Sarasvathy, 2001, 2008).

In addition, this chapter presents an alternative approach to assessing the influence of an educational experience. By using SEM techniques I demonstrate that the educational effect on students' ESE differs to a large extent for the two categories. The students' initial level of ESE explains to a large extent their post-levels of ESE in the programmes, where the ownership of the entrepreneurial project is bestowed on a third party and where the involvement of students' prior contextual knowledge and motivations is limited. The opposite is true for programmes which focus on student ownership and involvement of prior contextual knowledge in the education process.

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2. TWO APPROACHES TO ENTREPRENEURSHIP EDUCATION: THE DIFFERENT EFFECTS OF EDUCATION FOR AND THROUGH ENTREPRENEURSHIP AT THE LOWER SECONDARY LEVEL

ABSTRACT: This paper analyses the influence of two different approaches to entrepreneurship education at the lower secondary level of education. The influence of education *for* entrepreneurship and education *through* entrepreneurship on pupils' level of school engagement and entrepreneurial intentions is analysed and assessed. It is found that the former approach, which focuses on content and cognitive entrepreneurial skills, has a positive influence on pupils' entrepreneurial intentions but a negative influence on their level of school engagement. The opposite is true for the latter approach, which has a more pedagogical orientation and focuses on fostering non-cognitive entrepreneurial skills. Furthermore, the role of supportive teaching styles and action-based teaching methods in entrepreneurship education at this level of education is investigated. The analysis is based on data from two surveys including 801 randomly selected Danish ninth-graders (aged 14-15) and 576 randomly selected Danish tenth-graders (aged 15-16).

KEY WORDS: Entrepreneurship education, educational assessment, non-cognitive and cognitive skill development, school engagement, teacher support.

INTRODUCTION

Entrepreneurship education has grown increasingly popular during the last decades and is today taught already in primary and lower secondary school to a large number of pupils (Rosendahl-Huber, Sloof, Van Praag, 2012). Its popularity stems from an increased recognition that the economy is to a large extent dependent on new venture creation in order to create growth and innovation (Landström, Harirchi & Åström, 2012). It is, however, also recognized that being able to exercise entrepreneurial skills and act in an entrepreneurial way is important to all citizens, as society has become increasingly characterized by constant change and uncertainty (Deuchar, 2006, 2007; Gibb, 2002). Being able to come up with new and innovative ideas and to carry them out in ingenious and resourceful ways is considered important within all sectors of society, regardless of whether it is organized as new venture creation or as innovation within established organizations (Foss & Klein, 2012). Typical entrepreneurial skills and abilities, such as creativity, pro-activity, and sense of initiative, are today viewed as key competences and the education system ought therefore to have a strong focus on entrepreneurship education (Humes, 2002; Pepin, 2012). Educating pupils to be able to act entrepreneurially is, however, quite different from educating them in entrepreneurship as a profession; and its implications for the education system are very different (Jones & Iredale, 2010).

Researchers within the field of entrepreneurship education have mainly focused on students at the tertiary level (Rosendahl-Huber et al., 2012). At this level, where the students are close to the labour market, the focus is mainly on new venture creation (Katz, 2008). At the lower levels of the education system, however, there is more disagreement when it comes to determining which learning goals education in entrepreneurship should have (Deuchar, 2004; Pepin, 2012), which naturally also has a major influence on how this entrepreneurship education is organized and assessed. The main disagreement revolves around whether it should be education *for* or *through*

entrepreneurship (Hannon, 2005), that is, whether the focus should be on content or pedagogy (Jones & Iredale, 2010)[18]. The proponents of the content-oriented perspective argue that we should encourage our pupils to consider a career as self-employed as early as possible and therefore we should have entrepreneurship as a school topic already in primary school. The proponents of the pedagogy-oriented perspective, on the other hand, argue that the focus on the cognitively-oriented skills of entrepreneurship should not be at a too early stage, as it will be problematic to convey the relevance of the topic when pupils are too far away from the labour market (Johannisson, 2010; Mahieu, 2006). In their view, it is however never too early to learn the "soft" entrepreneurial competences, as these are well in line with adolescents' learning processes (Pepin, 2012). Instead of teaching entrepreneurship as a sole standing school topic, proponents of the pedagogy-oriented perspective argue that entrepreneurship should be taught as a method, embedded in all school topics, and that the focus should be on personal development rather than on entrepreneurship as a profession (Johannisson, 2010; Jones & Iredale, 2006, 2010; Mahieu, 2006; Surlemont, 2007). Unfortunately, very few assessment studies of entrepreneurship education have been performed at this level of education (Jones & Iredale, 2010; Rosendahl-Huber et al., 2012).

Even though the amount of research about entrepreneurship education at the lower levels of the education system is limited, we can draw on the vast research performed within educational science in order to understand how entrepreneurship education affects adolescents. The extensive and rigorous research about school engagement (Fredricks, Blumenfeld & Paris, 2004; Libbey, 2004) and how it affects pupils' academic performance and emotional connectedness to learning is particularly crucial when analysing the implication and impact of entrepreneurship education. Another theoretical perspective that is necessary to our understanding of entrepreneurship education

[18] Education *through* entrepreneurship is sometimes understood as education *for* entrepreneurship taught through action-based teaching methods (see for example Lackeus, 2013; O'Connor, 2013) or as education for practicing small business owners (Kirby, 2004). In this article, education through entrepreneurship is understood in the way it is described by Hannon (2005) and Blenker, Korsgaard, Neergaard and Thrane (2011), or as what Pittaway and Edwards (2012) describe as embedded enterprise education.

is the pioneering research by James Heckman about cognitive and non-cognitive skills (Rosendahl-Huber et al., 2012). This research stream has during the last decade changed our view on how education and schooling affect students and pupils and has had a major influence on educational science (Levin, 2011) and school policy (Tough, 2012).

In this paper I apply these two theoretical perspectives in order to analyse how education *for* entrepreneurship, which focuses on fostering cognitive entrepreneurial skills, and education *through* entrepreneurship, which focuses on fostering non-cognitive skills, affect pupils' school engagement and intention of pursuing a career as self-employed. I use structural equation modelling in my analysis, and the results are based on data from two surveys including 801 randomly selected Danish ninth-graders (aged 14-15) and 576 randomly selected Danish tenth-graders (aged 15-16). The results indicate that education focusing on fostering cognitive and education focusing on fostering non-cognitive entrepreneurial skills have the opposite effect of one another. The pedagogy-oriented approach to entrepreneurship education has a positive association with the pupils' level of school engagement but a negative association with their level of entrepreneurial intentions; whereas the content-oriented approach to entrepreneurship education has the opposite associations.

THEORETICAL BACKGROUND

In this part of the article I will briefly summarize research on skill development, cognitive and non-cognitive skills and school engagement and how this relates to different approaches to entrepreneurship education.

Cognitive and Non-cognitive Skills

It has long been acknowledged that the early school years play an important role in individuals' subsequent lives (Cunha & Heckman, 2007, 2008; Finn, 1989). How these years are experienced and which abilities and skills are acquired have a major impact on both health (Blum & Rinehart, 2001) and socio-economic status (Gensowski, Heckman & Savelyev, 2011; Heckman, Humphries, & Mader, 2001). Cognitive ability, usually defined as the individual's intellectual capacity, has for many years been regarded as the most important determinant of labour market outcomes (Levin, 2011; Lindqvist & Vestman, 2011). However, longitudinal studies of early educational interventions, for example, the Perry Preschool Program, show that these programmes only have a marginal effect on participants' cognitive ability, yet they have a major impact on their success as adults (Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005). What really affected their subsequent success was the effect that these programmes had on non-cognitive skills and abilities, that is, social and character skills such as attentiveness, perseverance, impulse control, sociability, motivation, self-esteem, self-control, and forward-thinking behaviour (Cunha & Heckman, 2010). Even though researchers for many years have focused on the effect that non-cognitive skills have on labour market outcomes (e.g. Bowles & Gintis, 1976), it is only during the last decade that they have come to play a prominent role in the debate (Lindqvist & Vestman, 2011; Tough, 2012).

One example of this is the prominent role which non-cognitive skills have recently been given by researchers in economics (Borghans, Duckworth, Heckman, & Ter Weel, 2008). Heckman, Humphries and Mader (2001) found that there was a significant difference in economic success between individuals who dropped out of high school and instead got a GED certificate (a high school equivalency credential test) and individuals with a high school degree. These two groups were on the same level regarding their cognitive abilities, but they differed regarding their level of non-cognitive skills (see also Heckman, Hsee & Rubinstein, 2000; Heckman & Rubinstein, 2001).

A similar study was performed by Bowen, Chingos and McPherson (2009), who investigated which factors were able to predict whether or not an individual would graduate from college. They found that the individuals' elementary school grades had a much higher prediction power than their SAT or ACT scores (two standardized college-admission tests). Faced with these results, they concluded that non-cognitive skills played a much more prominent role than cognitive skills, as the SAT and ACT scores are considered as a qualified measure of cognitive ability, whereas the elementary grades are seen as a combination of both non-cognitive and cognitive skills. Also within the field of entrepreneurship education there has been an increased focus on non-cognitive skills, as it has been shown that education in the topic at the primary level significantly increases the pupils' non-cognitive entrepreneurial skills but has a minimal and insignificant effect on the cognitive entrepreneurial skills[19] (Rosendahl-Huber, et al., 2012).

Cunha and Heckman (2007) have developed a model of skill formation, which shows that there are dynamic complementarities between cognitive skills and non-cognitive skills as well as important skill multipliers at different stages of an individual's life[20]. During the early stages of childhood parental influences, rather than schools, are seen as key factors governing child development, and if suboptimal investments are made at early stages, it will be costly to remedy their consequences later (Cunha, Heckman, Lochner & Masterov, 2006). It is, however, important to follow up early investments with quality education during primary and secondary school, and here investments in non-cognitive skills and abilities become more important as they are easier to affect than cognitive abilities (Cunha & Heckman, 2007, 2008, 2010; Heckman, 2011). Even

[19] Understood here as the participants' level of declarative knowledge about entrepreneurship.

[20] Cunha and Heckman (2007) criticize research by, for example, Aiyagari, Greenwood and Seshadri (2000), Becker and Tomes (1986), and Benabou (2002) for neglecting the role which dynamic complementarity, self-productivity, and multiplier effects play in the skill development of individuals, as these researchers treat the childhood and adolescents as a single stage and education in different time periods as perfect substitutes. In the single stage-approach it would be more rational to invest in education during later stages since the investment has a diminishing return. In the multistage-approach, which considers the role of self-productivity (skills acquired in one period persist into future periods) and dynamic complementarities (skills produced at one stage raise the productivity of investment at subsequent stages), it is evident that investments should be distributed more equally over the stages, as there are multiplier effects that increase the value of investment made in one period if they are followed up in the next.

though skills are often understood as individual qualities, Cunha & Heckman (2007) emphasize the importance of the context, as the environment is highly important when it comes to the development of skills and to which types of behaviour are encouraged and stimulated. A long line of research has shown that the pupils' level of school engagement plays a major role in how they experience their education (see for example Demanet & Van Houtte, 2012a, 2012b; Fredricks et al., 2004; Libbey, 2004). Below, I will therefore briefly summarize the research about school engagement and how it relates to academic performance and future labour market success. I will specifically present the way in which school engagement is related to purposeful education, as this is a central aspect of entrepreneurship education, in particular when viewed from the pedagogy-oriented perspective.

School engagement and purposeful education

Researchers within the field of educational psychology have been successful in predicting students' drop-out rates (Finn, 1993) and academic performance (Klem & Connell, 2004) by focusing on their level of school engagement. School engagement stems from the interaction between the context and the individual (Finn & Rock, 1997) and is a measure of to what degree the pupils engage in their educational process and develop positive relations with actors in school, both academically and emotionally (Libbey, 2004). It can thus be influenced to a greater extent than personal traits (Fredricks et al., 2004). According to Finn (1989), the relationship between identification (with school) and participation (in school activities) is of a reciprocal nature, since the one strengthens the other in a cyclical process, and in this way they can be viewed as a dynamic complementarity. The most important factors to foster school engagement is whether or not the pupils perceive their education as purposeful (Connell, Gambone & Smith, 2000; Whitlock, 2006) and whether or not the learning climate is supportive and encouraging (Battistich, Solomon, Kim, Watson & Schaps, 1995).

According to Simmons and Blyth (1987), it is important for adolescents that the school environment is both intellectually challenging and protected at the same time. New opportunities for growth are important, but these should be provided within a zone of comfort. This has to do with the fact that during adolescence the pupil's self-focus is heightened and the desire for control and influence is increased. It is therefore problematic that higher levels of the school system are characterized by an increase in competition and social comparison and a decrease in choice and decision making (Simmons & Blyth, 1987). This mismatch between the needs and the opportunities provided is according to researchers behind the *stage-environment fit theory* (Eccles, Midgley, Wigfield, Miller-Buchanan, Reuman, Flanagan & MacIver. 1993) the reason why we experience a high level of drop-out rates during the secondary level of education. According to Newman (1991), educational tasks should meet five requirements in order to promote engagement in learning: they should be (1) fun; (2) authentic; (3) collaborative; (4) provide opportunities for pupils to assume ownership of their conception; and (5) permit diverse forms of talents. Illeris (2009) has translated this into two simple questions that all education must answer in order to be perceived as purposeful: *what does this mean to me?* and *what can I use this for?*

The most commonly used teaching approach in lower secondary education focuses on repetition and memorization as the main learning method (Larson, 2000). This teaching approach, which focuses on cognitive skills, can in an educational setting be translated to education focusing on *declarative* knowledge, i.e., transmitting information. In order for students to learn skills, it is however *functional* teaching methods which are most often required (Biggs & Tang, 2007). Practice-based pedagogy, which links abstract knowledge to concrete applications, has been shown to be an effective way to make pupils understand the purpose and importance of their education (Loyens, Magda & Rikers, 2008). The relationship between the pupil and the educator plays an important role here as support and trust are vital ingredients in adolescents' learning processes

(Fraser & Fisher, 1982; Ryan & Patrick, 2001; Stipek, 2002; Trickett & Moos, 1973). It is therefore important that the teaching methods applied encourage supportive engagement rather than mutual distrust (Demanet & Van Houtte, 2011a; Kaplan, Patrick & Ryan, 2007).

Entrepreneurship Education

The main idea of education *through* entrepreneurship and entrepreneurial pedagogy is to focus on the pupils' own interests and motivation as the basis for their learning process (Deuchar, 2004; Jones & Iredale, 2010; Twiddle & Watt, 1995). The main teaching methods used are practice-based with a specific focus on reflective action (Jones & Iredale, 2010; Pepin, 2012) and student-centred with a specific focus on ownership of and responsibility for the learning process (Deuchar, 2004; Surlemont, 2007). According to Helme and Clarke (2001), these pedagogical approaches are essential if we seek to promote school engagement, as cognitive commitment typically occurs when pupils work on authentic and challenging tasks, which are novel and have personal meaning. The focus on fostering non-cognitive skills has traditionally been strong within the field of entrepreneurship education, as the focus of education *through* entrepreneurship is on teaching methods that promote creativity, pro-activity, and sense of initiative (Caird, 1990; Pepin, 2012). It is active citizenship and the ability to function and thrive in an uncertain and increasingly competitive and complex world that is the main learning goal of this type of educational approach (Deuchar, 2006, 2007). The teaching methods applied when using entrepreneurial pedagogy are particularly well suited for establishing supportive teacher-pupil relationships, as it is the pupils' ideas and interests that are the focal-point of the teaching. According to this approach the teachers have the role of facilitators who are to encourage the pupils and support them in realizing their ideas and interests, but also challenge them to leave their comfort zones and improve their projects with input from external actors (Jones & Iredale, 2010; Surlemont, 2007).

Educational research focusing on competences generally use Waters and Sroufe's (1983) definition of a competent person (Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011) as an individual who has the abilities ''to generate and coordinate flexible, adaptive responses to demands and to generate and capitalize on opportunities in the environment'' (Waters & Sroufe, 1983: 80). This definition clearly indicates that a focus on fostering these types of skills cannot come too early in the educational process, as Waters and Sroufe derived their results from research on infants. Entrepreneurship education has, thus, predominantly been viewed as a teaching approach in primary and lower-secondary school (OECD, 1989), but this has changed in the last decades during which the promotion of self-employment as an attractive career option was viewed as increasingly important (Jones & Iredale, 2010; Landström, 2005). This change of focus has led to growing demands on the education system to focus at an earlier stage on cognitive entrepreneurial skills such as knowledge about how to start a company, how to evaluate a business idea, and business legislation. This has had the effect that many schools today teach entrepreneurship as a sole standing school topic with a clear focus on self-employment (Johannisson, 2010).

When the main goal is to foster cognitive rather than non-cognitive skills, the focus is on transferring declarative knowledge from the educator to the pupil (Biggs & Tang, 2007). The teaching method most commonly used is lecture-based education (Mwasalwiba, 2010), which makes repetition and memorization important learning strategies for the pupils (Larson, 2000). These teaching strategies typically do not foster cognitive engagement as the link to practice and applicability becomes unclear (Newman, 1991), and the relevance of the knowledge can be questioned as the pupils at primary and lower-secondary level are far away from the labour market (Johannisson, 2010; Surlemont, 2007).

This short review of different approaches to entrepreneurship education and its roots in the educational literature clearly indicates that we can expect different outcomes depending on whether

the focus is on fostering cognitive or non-cognitive entrepreneurial skills. In the next part of the paper I will elucidate this with hypotheses which are grounded in the theoretical perspectives presented above.

Hypotheses

Drawing on theory of school engagement and skill development I hypothesize that education focusing on *cognitive* entrepreneurial skills and education focusing on *non-cognitive* entrepreneurial skills have completely opposite effects on the dependent variables *school engagement* and *entrepreneurial intentions*. As research about school engagement emphasizes the importance of supportive teaching styles (Ryan & Patrick, 2001; Stipek, 2002) and authentic learning experiences (Connell, Gambone & Smith, 2000; Newman, 1991; Whitlock, 2006), I have also included *perceived teacher support* and *action-based teaching methods* in my theoretical model. In figure 1 the hypothesized associations for the variables are presented.

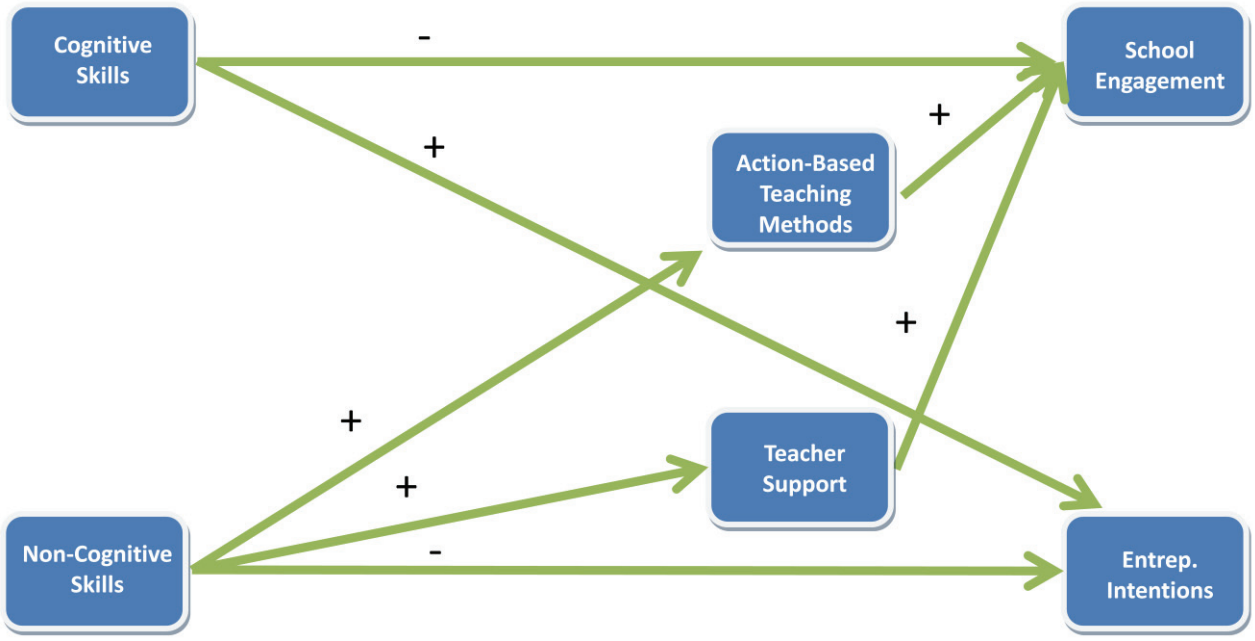


Figure 1: Theoretical Model

As the purpose of education *through* entrepreneurship is to create authentic and relevant learning experiences by focusing on the pupils' own interests and ideas, it is hypothesized that this approach will have a positive association with the pupils' level of school engagement. Action-based teaching methods and supportive teaching styles are, therefore considered as internal dimensions of this approach. Previous research has shown that teacher support and action-based teaching methods have a major influence on pupils' level of school engagement however, essential and indivisible dimensions in this process (Jones & Iredale, 2010; Surlemont, 2007) and (Newman, 1991; Stipek, 2002; Whitlock, 2006). It is therefore hypothesized that the positive association between education focusing on fostering non-cognitive entrepreneurial skills and school engagement is explained by these two variables. Since the educational approach is to a large extent guided by the pupils' own interests and ideas, which at this level of education seldom have anything to do with self-employment and new venture creation (Johannisson, 2010), it is likely that this approach increases the pupils' commitment to pursue their dream jobs. To pupils at this age level the dream job is most commonly associated with "standard professions" such as lawyer, policeman, nurse, pilot, and veterinarian (Csikszentmihalyi & Larson, 1984). It is therefore likely that this approach's focus on the pupils' own interests and ideas will have a negative association with entrepreneurial intentions.

Education focusing on fostering cognitive entrepreneurial skills, on the other hand, is not dependent on supportive teaching styles and action-based teaching methods, inasmuch as declarative knowledge can be transmitted in many different ways (Biggs & Tang, 2007). Perceived teacher support and action-based teaching methods are therefore theoretically considered to be external variables to this approach (Jones & Iredale, 2010). Since the focus of this approach is on entrepreneurial content rather than on pedagogy, it is hypothesized to have a negative association with pupils' level of school engagement, because most pupils at this age view knowledge about self-employment and firm formation as irrelevant (Johannisson, 2010). However, as educational

content about entrepreneurship is likely to increase the pupils' awareness of entrepreneurship as a potential career choice, this educational approach is expected to have a positive association with entrepreneurial intentions. In the following, these hypotheses will be formulated and described.

School engagement and purposeful education

Education that focuses on fostering non-cognitive entrepreneurial skills requires that the pupils' own interests and ideas drive the learning process (Deuchar, 2004; Jones & Iredale, 2010). The main pedagogical idea is to teach the pupils how to transform their ideas into action by working in teams and using the team members' different strengths and talents (Surlemont, 2007). In its focus on teaching the pupils *through* rather than *for* entrepreneurship, the emphasis of this approach is on fostering non-cognitive entrepreneurial skills such as creative thinking, pro-activity, sense of initiative, coping with ambiguity and uncertainty, establishing and managing relationships, et cetera (Jones & Iredale, 2010; Mahieu, 2006; Surlemont, 2007). This educational approach thus includes educational dimensions that according to Newman (1991) are required in order to spur cognitive engagement, that is, the learning is: (1) fun; (2) authentic; (3) collaborative; (4) providing opportunities for pupils to assume ownership of their conception; and (5) permitting diverse forms of talents. As an effect, the pupils will understand the relevance and purpose of education, which is important in explaining school engagement (Connell, Gambone & Smith, 2000; Whitlock, 2006).

When the learning goal is to foster cognitive entrepreneurial skills, the focus is on content rather than teaching methods. This content-oriented approach suffers from at least two major problems when it comes to engaging the pupils in their education process. One the one hand, self-employment is not regarded as a likely career by most of the pupils (Johannisson, 2010), which greatly reduces the perceived purpose and relevance of this type of education. One the other hand, the teaching methods used tend to be traditional and lecture-based (Jones & Iredale, 2010).

Techniques such as memorization and repetition, which are commonly used in educational approaches that focus on declarative knowledge (Biggs & Tang, 2007), have been proven to have a negative effect on cognitive commitment (Larsson, 2000). If education is practiced with these types of traditional teaching methods, it becomes hard for pupils to understand the purpose, inasmuch as the application and usefulness of the learning is not practically exemplified (Newman, Wehlage & Lamborn, 1992). The two first hypotheses will therefore be the following:

H1a: Pupils' perceived level of the extent to which they are educated in non-cognitive entrepreneurial skills has a positive association with their level of school engagement.

H1b: Pupils' perceived level of the extent to which they are educated in cognitive entrepreneurial skills has a negative association with their level of school engagement.

Entrepreneurial intentions

Numerous studies on university students have shown that entrepreneurship education that focuses on self-employment as a career option has a positive effect on students' entrepreneurial intentions (e.g. Fayolle, Gailly & Lassas-Clerc, 2006; Krueger, 1993; Krueger & Carsrud, 1993; Krueger, Reilly & Carsrud, 2000; Souitaris, Zerbinati & Al-Laham, 2007; Tkachev & Kolvereid, 1999). Fewer studies have been performed at the lower levels of the educational system, and the influence of entrepreneurship education on pupils' entrepreneurial intentions at these levels is therefore inconclusive (Rosendahl-Huber et al., 2012). At least three well-performed quasi-experimental studies have shown divergent results. Peterman and Kennedy (2003), who studied a venture creation programme at the secondary level in Australia, showed that it had a positive effect on the pupils' intentions to become self-employed, and that this was especially associated with the effect

that the programme had on the pupils' attitudes towards entrepreneurship. Oosterbeek, Van Praag and Ijsselstein (2009), on the other hand, showed that a similar programme in the Netherlands actually decreased the pupils' entrepreneurial intentions. In a study on pupils at the primary level in the Netherlands, Rosendahl-Huber with colleagues (2012) showed that the entrepreneurship programme affected neither the pupils' intentions to pursue a career as self-employed nor their perceived knowledge about entrepreneurship, but the programme did, however, increase their perceived competence in many non-cognitive skills related to entrepreneurship.

These quasi-experimental studies do not, however, differentiate between the effects caused by the educational content and the effects caused by the teaching methods, or whether the programmes mainly focused on fostering cognitive or non-cognitive skills. When it comes to future career ambitions, it is likely that the educational content has a strong effect. Even though traditional and declarative teaching methods, such as memorization and repetition, make the link to practice unclear, it is safe to say that the more a specific education relates to a certain topic, the more likely it is that it will influence the future career choice of the pupils, as they receive detailed knowledge about a particular field or profession (Biggs & Tang, 2007). It can therefore be expected that an educational approach focusing on teaching pupils the cognitive skills in entrepreneurship will increase the likeliness that they will consider self-employment as an attractive career option.

We cannot expect the same effect of education focusing on fostering non-cognitive entrepreneurial skills, as these are of a more general use within many different fields and professions. It should be underlined that this type of educational approach typically does not focus on self-employment (Jones & Iredale, 2010, Surlemont, 2007). In general, pupils view a career in established organizations as more attractive than self-employment (Blenker, Dreisler & Kjeldesen, 2006). As education that focuses on fostering non-cognitive entrepreneurial skills takes its focal point in the pupils' own interests and ambition, which generally do not include starting up a

company (Johannisson, 2010), it can be expected that self-employment will increasingly be viewed as an unlikely career choice. The following two hypotheses about education focusing on fostering cognitive or non-cognitive entrepreneurial skills can therefore be constructed:

H2a: Pupils' perceived level of the extent to which they are educated in non-cognitive entrepreneurial skills has a negative association with their intention to pursue a career as self-employed.

H2b: Pupils' perceived level of the extent to which they are educated in cognitive entrepreneurial skills has a positive association with their intention to pursue a career as self-employed.

Perceived teacher support and action-based teaching methods

According to the *schools-as-communities* perspective, it is meaningful relations with actors within the school system that determine the pupils' sense of belonging in school (Battistich et al., 1995). A long line of research has also shown that the classroom environment greatly influences the pupils' academic performance (Ames, 1992; Anderman & Maehr, 1994; Finn & Rock, 1997; Kaplan et al., 2007; Nicholls, 1984). The choice of educational approach can greatly affect the classroom environment as well as the relationships between its actors (Fredricks et al., 2004). Functional teaching methods require that the teacher moves away from the role as instructor and instead becomes a co-learner (Biggs & Tang, 2007). Because the focal point of education that focuses on fostering non-cognitive entrepreneurial skills is the pupils' own interests and ideas, it is required that the teacher-pupil relationship is more personal than in traditional educational approaches (Jones & Iredale, 2010). As the use of entrepreneurial pedagogy changes the teacher-pupil relationship (Jones & Iredale, 2010; Surlemont, 2007), and the relationship with teachers is an important

determinant for pupils' educational motivation (Fraser & Fisher, 1982; Ryan & Patrick, 2001; Stipek, 2002; Trickett & Moos, 1973) it can be expected that pupils' perceived teacher support explains the positive association between education focusing on fostering non-cognitive entrepreneurial skills and pupils' level of school engagement.

The action-oriented teaching methods also have an important role to play in this process, as they contribute to the pupils' understanding of the applicability and purpose of the education (Illeris, 2009; Simmons & Blyth, 1987; Whitlock, 2006). In order to create authentic and relevant learning experiences, it is important that pupils get the opportunity to practice and apply their knowledge (Helme & Clarke, 2001; Loyens, Magda & Rikers, 2008). As education *through* entrepreneurship has a strong focus on the practical aspects of education, which is an element that has been shown to increase pupils' understanding of their education and, consequently, their commitment to the educational process, it can also be expected that the use of action-based teaching methods explains the positive association between education focusing on fostering non-cognitive entrepreneurial skills and pupils' level of school engagement. The following two hypotheses can therefore be constructed:

H3a: The positive association between pupils' perceived level of education in non-cognitive entrepreneurial skills and pupils' level of school engagement is partly explained by their perceived teacher support.

H3b: The positive association between pupils' perceived level of education in non-cognitive entrepreneurial skills and pupils' level of school engagement is partly explained by their perceived level of the extent to which they are educated with action-oriented teaching methods.

METHOD

Educational programmes are commonly evaluated with a quasi-experimental research design, in which the educational content (the treatment) is fixed and centralized, as this research design requires that the programme evaluator has full control over the activities included in the experiment and is able to distribute these randomly (Slavin, 2002). This approach is, however, often very problematic to implement as educational programmes are typically ongoing and most educational actors are reluctant to be included in experiments in which they are assigned the educational activities (ibid). The experimental approach to programme evaluation in education has also been criticized for not taking into account the fact that the educational content will be experienced in different ways by the pupils, which makes the assumption that we can find a "true treatment effect" dubious (Olson, 2004). Pupils have different personal characteristics and backgrounds which influence how they experience and interact with the context, which in return greatly influences the types of effects which the education has on them (Ames, 1992; Maehr, 1984).

Educational programmes in entrepreneurship can be structured in numerous different ways. This is true for programmes focusing on fostering cognitive skills in entrepreneurship, but it is especially true for programmes that focus on fostering non-cognitive skills, as the focus here is on the teaching methods rather than the content (Jones & Iredale, 2010; Pepin, 2012). It is therefore difficult to codify this approach and "assign" it as a "treatment", as it is usually embedded in a large number of different school topics. One way to solve this problem is by investigating how the pupils experience their educational context and by focusing on the teaching methods and educational content, that is, the cognitive and the non-cognitive skills that the two approaches to entrepreneurship education aim to foster. Naturally, there are limitations, as we cannot be sure that the pupils have actually been targeted by the educational approaches which we are interested in analysing (Rideout & Gray, 2013). However, since previous research has demonstrated that there

are more individual differences within groups than between groups within the school context, both when it comes to pupils' perception of their school environment (Kaplan et al., 2007) and school engagement (Ma, 2003), it makes good sense to focus on the pupils' perception of the educational content rather than treating it as a fixed treatment (see Zhao, Seibert & Hills, 2005, for an example of how this method has been used in assessment studies of entrepreneurship education).

In order to analyse how education in entrepreneurial cognitive and non-cognitive skills relates to the pupils' school engagement and entrepreneurial intentions, I constructed a survey that was sent to randomly selected pupils at lower-secondary level. The surveys were sent to the pupils' homes, so their parents would be able to assist them. In order to ensure that the pupils understood the questions the survey instrument was pretested on ten ninth-graders from two different school classes before it was implemented. In the following, the sample and the data collection process is presented, followed by a presentation of the measures included in the survey.

The Sample

The data collection started in September 2011. By this time questionnaires were sent to 2000 randomly selected Danish ninth-graders born in 1996. In order to ensure a high response rate the pupils were awarded a cinema ticket if they replied to the questionnaire. This resulted in 938 responses (47 per cent). Non-response tests based on gender, geography and age were performed which showed that there was no significant difference between respondents and non-respondents. In this questionnaire, questions about the pupils' school engagement as well as a single item measuring entrepreneurial intentions were included, but there were no questions about perceived teacher support and only single item measures of educational content. In September/October 2012, 2000 randomly selected ninth-graders born in 1997 were included in the survey and the 938 respondents from the first round of data collection were contacted again. As in the first round, the

pupils were promised a cinema ticket if they participated in the survey. This resulted in 801 responses from the students born in 1997 (40 per cent), of which 671 were fully completed and used in the survey. 576 responses were collected from pupils born in 1996 (61 per cent), of which 514 were fully completed and used in the analysis.

Non-response tests were performed based on gender, geography, and age for the pupils born in 1997. The tests showed that there were no significant differences between the respondents and non-respondents regarding these variables. For the pupil born in 1996, non-response tests were performed based on these variables as well as their initial responses on variables included in the first questionnaire. The tests showed that there were no significant differences between respondents and non-respondents, except that there were a significantly higher number of females who had stayed in the survey. Since the analysis in this paper relies on multiple questions about educational content and perceived teacher support, only data collected in the second round were included in the analysis. In table 1 below the descriptive statistics of the two samples are presented.

Variables	**1996**	**1997**
Total number of questionnaires sent out	938	2000
Number of responses	576	801
Response rate	61,4 %	40,1 %
Screened out due to incomplete responses	62	130
Total sample size in the analysis	514	671
Descriptive statistics of the respondents who are used in the analysis		
Proportion of female	59,8 %	57,2 %
Region:		
- Capital Region of Denmark	24,9 %	23,4 %
- Central Denmark Region	26,0 %	24,4 %
- North Denmark Region	10,3 %	10,4 %
- Region of Southern Denmark	24,0 %	23,4 %
- Region Zealand	14,8 %	18,4 %
Proportion whose parents or grandparents have roots in another culture	21,9 %	21,8 %
Proportion whose parents had an academic education	23,7 %	26,4 %
Proportion whose parents, one or both, were self-employed	25,2 %	26,8 %

Table 1: Demographics and descriptive statistics

Measures

The measures included in the survey come from validated scales that were all extensively used in previous research, except for the scale measuring educational focus on cognitive and non-cognitive entrepreneurial skills and action-based teaching methods, which were constructed specifically for this research project. The *entrepreneurial intention* scale is a three item construct derived from the Linan, Urbano and Guerrero (2011) scale, but the items were slightly adjusted in order to suit the age of the respondents. The *school engagement* scale is composed of six items and comes from the *Hemingway Measure of Adolescent Connectedness* (Karcher, 2003) and the *perceived teacher support* was captured with the six item version of the *learning climate questionnaire* (Williams, Wiener, Markakis, Reeve & Deci, 1994). All items in the survey have been measured on a scale ranging from 1 to 7, where 1 equalled "strongly disagree" and 7 equalled "agree completely".

In structural equation models it is preferable to have only three indicators per construct, because the use of multiple indicators increases the risk of spurious correlations (Little, Cunningham, Shahar & Widaman, 2002). In order to reduce the amount of indicators I parcelled the items in the constructs which included six items. The items were parcelled into pairs, starting with the indicator with the highest loading, which was parcelled with the indicator with the lowest, and then the indicator with the second highest loading was parcelled with the indicator with the second lowest, etc., as recommended by Little (2013). As the scales which focus on teaching approaches were specifically constructed for the research project, I will describe them in a bit more detail.

Teaching approaches

In order to ensure the face validity of the scales, two educational experts, who worked with designing and implementing entrepreneurship education at all levels of education in the Danish education system, were consulted. Together with the author these experts came up with an initial

item pool of 22 items for the scale measuring cognitive and non-cognitive entrepreneurial skills. Each of these 22 items was then assessed by the two experts on the basis of its importance and commonality in entrepreneurship education. The item pool was by this process reduced to the eight most important items, four which measure cognitive entrepreneurial skills, and four which measure non-cognitive entrepreneurial skills. The same procedure was used in order to come up with a measure of action-based teaching methods. Here the initial items pool contained 14 items, which were reduced to six.

As this was the first time these questions were used, a principal component analysis with oblique rotation was performed in order to investigate the loadings. The analysis showed that the items loaded on their intended constructs, and that there were no problematic cross-loadings. As the measure of action-based teaching methods included six items, the parcelling technique, described above, was used in order to reduce the number of indicators to three. All the items included in the survey are presented in Appendix A. In table 2 below the internal consistency as well as the descriptive statistics for the measures are presented for the two samples. All the values for the 1997 sample are presented within parentheses.

Variable	No. of Items	M	SD	Skewness	α
Cognitive Skills	4	2.32 (2.42)	1.15 (1.19)	+.97 (+.93)	.84 (.83)
Non-Cognitive Skills	4	3.82 (3.97)	1.39 (1.32)	+.02 (+.01)	.87 (.86)
Action-based teaching methods	3[6]	4.80 (4.99)	.93 (.84)	-.27 (-.34)	.69 (.68)
Teacher Support	3[6]	4.85 (4.97)	1.20 (1.10)	-.53 (-.48)	.87 (.84)
School Engagement	3[6]	5.39 (5.32)	.91 (.94)	-.82 (-.74)	.73 (.76)
Entrepreneurial Intentions	3	4.08 (3.88)	1.74 (1.72)	-.07 (+.13)	.90 (.90)

Table 2: Descriptive statistics and internal consistency

As we can see in table 2, all measures except action-based teaching methods have an internal consistency above .70, which is usually considered the critical level (Nunnally, 1978). It is, however, very close to the critical level in both of the samples (.69, .68) and can therefore be viewed as acceptable.

ANALYSIS

In order to test the hypotheses, structural equation modelling was used, as it is particularly suitable in an analysis which includes latent constructs and multiple dependent variables (Kline, 2011; Little, 2013). The analysis is structured in three steps. First, a confirmatory factor analysis is performed in order to investigate the properties of the measures and their convergent and discriminant validity, which are assessed with the Fornell and Larcker-test (Fornell & Larcker, 1981). This is followed by a model in which the hypotheses about the association between the kind of education (whether it focuses on *cognitive* or *non-cognitive* entrepreneurial skills) and pupils' *school engagement* and *entrepreneurial intentions* are tested. In the third and final step, the variables *perceived teacher support* and *action-oriented teaching methods* are included as indirect pathways, testing hypothesis 3a and 3b. It was also tested whether the results were affected, when the four control variables *gender*, *ethnicity*, *entrepreneurial family background* and *educational family background* were included in the models. As these variables did not affect the results of the hypotheses testing, they were dropped from the analysis. The results are, however, presented in Appendix B.

Confirmatory Factor Analysis

In order to test the convergent and discriminant validity of the measures, a confirmatory factor analysis was performed. This analysis, as well as the following structural equation analyses, was performed with Mplus 6.11. I used the effects coding method of scaling proposed by Little, Slegers and Card (2006), and in order to control for heteroscedasticity, I also used the robust option for the maximum likelihood estimator (Brown, 2006). Indicators of absolute fit (the standardized root mean square residual), parsimony correction (the root mean square error of approximation), and comparative fit (the comparative fit index and the Tucker-Lewis index) were used to provide

information about model fit. The Hu and Bentler (1998, 1999) values for adequate fit were followed.

The confirmatory factor analysis demonstrated an excellent model fit for both of the samples with x^2=330.92 (df:155), RMSEA=.047(.040-.054), CFI=.962, TLI=.953, SRMR=.046 for the pupils born in 1996, and x^2=358.87 (df:155), RMSEA=.044(.038-.050), CFI=.963, TLI=.955, SRMR=.047 for the pupils born in 1997. In table 3 below the standardized loadings for each item of the scales are presented. All results for the 1997 sample are presented within parentheses.

The Fornell and Larcker-test (1981) was performed in order to assess the convergent and discriminant validity as well as the composite reliability. Both composite reliability and convergent reliability are determined by the construct's standardized item loadings and their corresponding error terms. The composite reliability (CR) value should be greater than .70 in order to demonstrate internal consistency, and the average variance extracted (AVE) value should be greater than .50 in order for the construct to demonstrate convergent validity. Discriminant validity is established, if the AVE value is greater than the construct's highest squared correlation. In table 3 the CR and AVE values as well as their highest unstandardized construct correlation, both squared and un-squared, are presented.

Variable	Item 1	Item 2	Item 3	Item 4	CR	AVE	Highest Corr.
Cognitive	.78 (.74)	.67 (.71)	.86 (.81)	.74 (.77)	.88	.59	.57 [.33] (.60) [.36]
Non-cognitive	.81 (.73)	.84 (.82)	.80 (.84)	.74 (.73)	.88	.64	.75 [.56] (.70) [.49]
Action-based TM	.62 (.61)	.62 (.64)	.73 (.74)		.66	.43	.75 [.56] (.70) [.49]
Teacher Support	.82 (.77)	.79 (.75)	.89 (.89)		.87	.69	.66 [.44] (.67) [.45]
School Engagement	.56 (.60)	.87 (.90)	.97 (.96)		.86	.68	.39 [.15] (.55) [.30]
Ent. Intentions	.79 (.79)	.89 (.88)	.90 (.94)		.90	.75	.08 [.01] (.08) [.01]

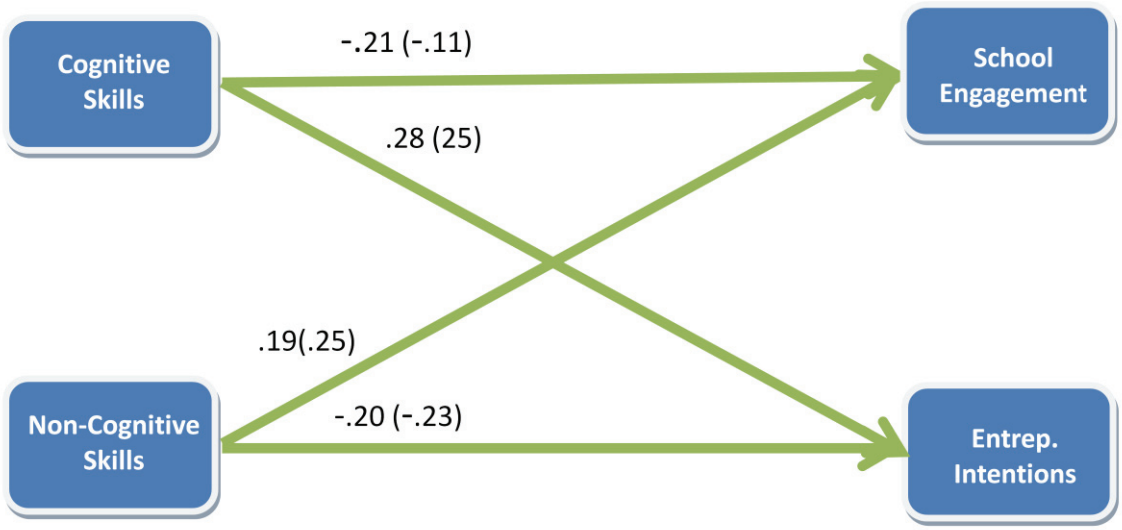
Table 3: Convergent and discriminant validity of the measures

As we can see in table 3, the items have loading estimates between .56 and .97 on their individual constructs for the 1996 sample and between .60 and .96 for the 1997 sample. All constructs, except action-based teaching methods, have a sufficiently high composite reliability in both samples, well above the cut-off value of .70. The action-based teaching methods-construct was also the only construct for which there were problematic values for convergent and discriminant validity. It is not surprising that this construct is highly correlated with the measure of non-cognitive entrepreneurial skills, but the lack of convergent and discriminant validity should be taken into account when deciding whether or not this measure should be used in the analysis. However, all other measures showed excellent levels of both convergent and discriminant validity, well above acceptable levels, and as the action-based teaching methods-construct is close to acceptable levels, I decided to keep it in the analysis.

Testing the Hypotheses

The first hypotheses concern the association between the two educational approaches (whether the focus is on fostering cognitive or non-cognitive entrepreneurial skills) and the pupils' level of school engagement and entrepreneurial intentions. In the first model, only these two educational constructs and the two dependent variables are included. The model fit indicators in the confirmatory factor analysis (CFA) for this model show an excellent fit with x^2=175.95 (df:71), RMSEA=.054(.044-.064), CFI=.967, TLI=.957, SRMR=.038 for the pupils born in 1996, and x^2=160.82 (df:71), RMSEA=.043(.034-.052), CFI=.977, TLI=.970, SRMR=.039 for the pupils born in 1997. The results of the structured model are presented in figure 2 below. The results clearly show that the pupils' perceived level of being educated in non-cognitive entrepreneurial skills has a positive association with their school engagement and a negative association with their entrepreneurial intentions. The pupils' perceived level of being educated in cognitive

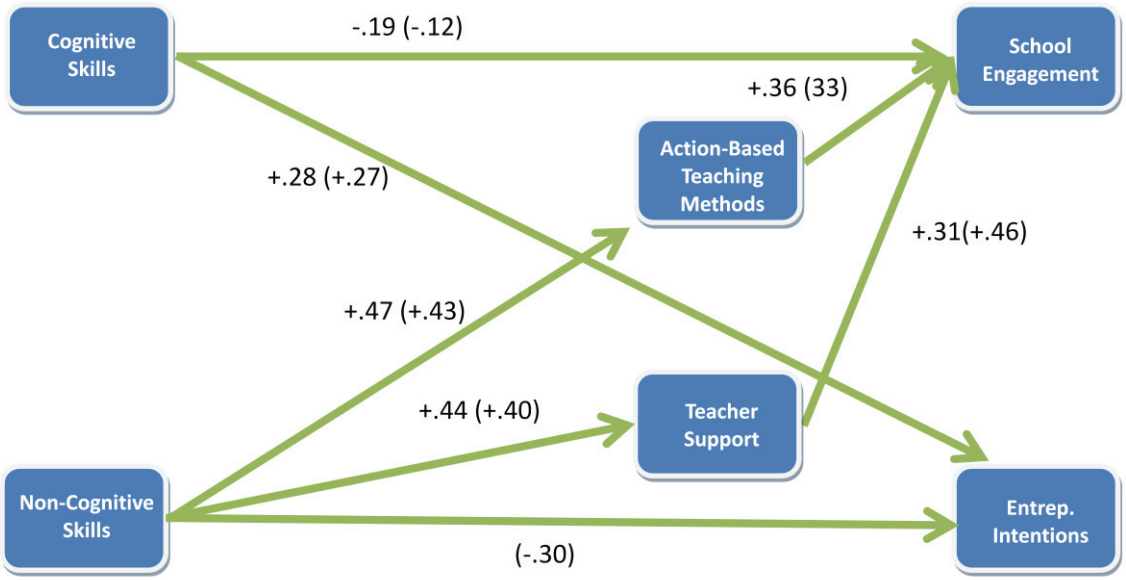
entrepreneurial skills has the opposite associations and negatively influences their school engagement but positively influences their level of entrepreneurial intentions.



*Only associations that have a p-value of .05 or lower are presented
**The results for the younger pupils born in 1997 are presented within parentheses
1996: X^2=175.95(df:71) RMSEA=.054(.044;.064) CFI=.967 TLI=.957 SRMR=.038
1997: X^2=160.82 (df:71) RMSEA=.043(.034;.052) CFI=.977 TLI=.970 SRMR=.039

Next, the variables *perceived teacher support* and *action-based teaching methods* were included as indirect pathways. The results of the model are presented in figure 3 below. We can see that the association between the *non-cognitive skills* variable and *school engagement* disappears from both samples, when the variables *perceived teacher support* and *action-based teaching methods* are included in the model. The strong positive association between the pupils' perception of being educated in *non-cognitive* entrepreneurial skills and these two variables, which are in turn strongly associated with the pupils' level of *school engagement*, demonstrates that the influence of this approach on pupils' level of *school engagement* is explained by its focus on *supportive teaching styles* and *action-based teaching methods*. The associations between these two variables and the pupils' level of *school engagement* are stronger for the younger pupils in the sample, which

indicates that educational variables are of greater importance at the lower levels of the education system. Furthermore, we can see that the negative association between pupils' level of *entrepreneurial intentions* and the *non-cognitive* skill variable becomes insignificant for the older pupils, when these two variables are included in the model.



*Only associations that have a p-value of .05 or lower are presented
**The results for the younger pupils born in 1997 are presented within parentheses
1996: X^2=379.33(df:158) RMSEA=.052(.045;.059) CFI=.952 TLI=.942 SRMR=.056
1997: X^2=433.65 (df:158) RMSEA=.051(.045;.057) CFI=.951 TLI=.941 SRMR=.059

Figure 3: Full model

The non-existing association between education focusing on *cognitive* entrepreneurial skills and the variables *perceived teacher support* and *action-based teaching methods* was also tested. The results demonstrated that there were no significant associations between the variables. When these two variables were included in the model the association between this educational approach and the two outcome variables was only marginally changed. The results of the two models are presented in Appendix B in more detail.

Summary of the hypotheses testing

The analysis shows that education focusing on *cognitive* and education focusing on *non-cognitive* entrepreneurial skills has completely opposite associations with *school engagement* and *entrepreneurial intentions*. Education focusing on *non-cognitive* skills has a positive association with *school engagement*, whereas education in *cognitive* entrepreneurial skills has a negative association, which supports H1a and H1b. When it comes to *entrepreneurial intentions*, the associations are reversed, which supports H2a and H2b. However, the negative association between perceived level of education in non-cognitive entrepreneurial skills and entrepreneurial intentions disappears for the older students when *perceived teacher support* and *action-based teaching methods* are included in the model. The association between education in *non-cognitive* entrepreneurial skills and *school engagement* also disappeared when these two variables were included. As there were strong positive associations between education in *non-cognitive* entrepreneurial skills and *perceived teacher support* and *action-based teaching methods*, and these two variables had a strong influence on the pupils' level of *school engagement*, it indicates that the positive association between education in *non-cognitive* entrepreneurial skills and *school engagement* is explained by these two variables; this supports H3a and H3b. In table 4 the results of the hypotheses testing are summarized.

H1a	*Pupils' perceived level of the extent to which they are educated in non-cognitive entrepreneurial skills has a positive association with their level of school engagement.*	Strong Support
H1b	*Pupils' perceived level of the extent to which they are educated in cognitive entrepreneurial skills has a negative association with their level of school engagement.*	Strong Support
H2a	*Pupils' perceived level of the extent to which they are educated in non-cognitive entrepreneurial skills has a negative association with their intention to pursue a career as self-employed.*	Weak Support
H2b	*Pupils' perceived level of the extent to which they are educated in cognitive entrepreneurial skills has a positive association with their intention to pursue a career as self-employed.*	Strong Support
H3a	*The positive association between pupils' perceived level of education in non-cognitive entrepreneurial skills and pupils' level of school engagement is partly explained by their perceived teacher support.*	Strong Support
H3b	*The positive association between pupils' perceived level of education in non-cognitive entrepreneurial skills and pupils' level of school engagement is partly explained by their perceived level of the extent to which they are educated with action-oriented teaching methods.*	Strong Support

Table 4: Summary of hypotheses testing

DISCUSSION AND IMPLICATIONS

In this paper I have demonstrated that education which focuses on cognitive respectively non-cognitive entrepreneurial skills has completely different effects. The question we need to ask ourselves is which types of outcomes are most important. If our goal with entrepreneurship education is strictly to increase the pupils' intentions to pursue a career as self-employed, then the content-oriented approach should be our choice and we should invest in education *for* entrepreneurship. It should be noticed, however, that we know very little about the effects which entrepreneurial intentions have on adolescents' consecutive career choices (Rosendahl-Huber et al., 2012). If our goal is instead to foster creative and proactive pupils with a high level of school engagement, a measure that has proven to have a significant effect on pupils' academic performance (Goodenow, 1993; Klem & Connell, 2004), pro-social behaviour (Dornbusch, Erickson, Laird & Wong, 2001) and drop-out rates (Finn, 1993), then our choice should be the pedagogy-oriented approach – education *through* entrepreneurship – and we should invest in education which embeds entrepreneurial teaching methods in all school topics. Naturally, we can also combine the two perspectives and teach content-oriented entrepreneurship with entrepreneurial teaching methods. With this approach to entrepreneurship education, we would, however, still have the problem of conveying the relevance because pupils at this age are far away from the labour market. The analysis also shows the important role which school teachers play and how they affect pupils' school engagement. The results clearly show that it is the increase in perceived teacher support and the action-oriented teaching methods, which explains the positive association between education in non-cognitive entrepreneurial skills and school engagement.

Methodologically this paper also contributes to the field as the applicability and robustness of a new scale which measures cognitive and non-cognitive entrepreneurial skills have been presented. This scale is based on contemporary research in skill development (Cunha & Heckman, 2010) and

entrepreneurship (Sarasvathy & Venkataraman, 2011) as well as educational perspectives, both general (Biggs & Tang, 2007) and entrepreneurship specific (Jones & Iredale, 2010; Pepin, 2012). Previous assessment studies of entrepreneurship education have not differentiated between the effects of the educational content respectively the teaching methods. The scale developed for this research project can be used to further our understanding about this, and its robustness has been demonstrated inasmuch as the results hold for two different samples.

Furthermore, I have demonstrated the importance of using multiple dependent variables in order to nuance educational programme evaluations. The tradition of using entrepreneurial intentions as the variable of interest, which is strong within the field of entrepreneurship education (Krueger, 2009), can be unfortunate, since we only get a fraction of the effects the educational treatments have on the pupils.

Limitations and Suggestions for Future Research

As the data used in this analysis are cross-sectional we cannot be sure that the associations which we observe between the variables are causal and therefore the directionality could be questioned. In order to assess this, we would need access to longitudinal data. However, as I have demonstrated in this paper, we do have strong theoretical reasons to believe that the hypothesis and tested relations are accurate. Nevertheless, intensive qualitative studies would further our understanding of the mechanisms behind these associations and longitudinal data would allow us to establish causality.

Furthermore, it should be recognized that even if self-reported data has many advantages when it comes to educational assessment, as it is recognized that it is the subjective experience rather than the actual design of the educational "treatment" that matters (Olsen, 2004), it would be preferable to also have objective information about the educational "treatments". In order to assess the impact of education focusing on cognitive respectively non-cognitive entrepreneurial skills the

study could be structured as a quasi-experiment including educational programmes that solely focus on cognitive respectively non-cognitive skills as well as those that focus on both, while at the same time self-reported data about how the pupils experience the educational treatment are included.

CONCLUDING REMARKS

In this paper I have demonstrated that the theories of skill formation when it comes to cognitive and non-cognitive skills as well as school engagement are essential when we analyse the effects of different approaches to entrepreneurship education on pupils at the lower secondary level of education. It was shown that education focusing on cognitive entrepreneurial skills and education focusing on non-cognitive entrepreneurial skills have the opposite effect of one another. Whereas education focusing on non-cognitive entrepreneurial skills has a positive association with the pupils' level of school engagement, it has a negative association with their intentions of pursuing a career as self-employed. The opposite is true for education focusing on cognitive-oriented entrepreneurial skills. Furthermore, I demonstrated that supportive teaching styles and action-based teaching methods play an important role when it comes to education in non-cognitive entrepreneurial skills, as the positive association between this approach and pupils' school engagement is explained by these two variables.

As the interest for entrepreneurship education has increased much over the last decades (Katz, 2008), it is important that we understand the different effects that different types of entrepreneurship education have on pupils. If we want entrepreneurship education to be aligned with the contemporary goals of the education system, which is to create educationally motivated pupils who continue further up in the education system (Biggs & Tang, 2007), then we should invest in education *through* entrepreneurship which is structured as a pedagogical approach embedded in all school topics and which focuses on non-cognitive entrepreneurial skills such as

creativity, pro-activeness and sense of initiative. If we are only interested in raising the pupils' intentions to pursue a career as self-employed, then we should invest in entrepreneurship education which is structured as a sole standing school topic and which focuses on the content and cognitive entrepreneurial skills such as how to evaluate a business idea and how to start a company. The question we need to ask ourselves is which outcome do we find most important when it comes to pupils at the lower secondary level of education.

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APPENDIX A

Non-cognitive entrepreneurial skills

In school…

I have been taught creative thinking
I have been taught to come up with ideas
I have been taught to transform ideas into action
I have been taught to initiate new activities

Cognitive entrepreneurial skills

In school…

I have been taught how to create a business
The role of the entrepreneur in society has been emphasized
I have been taught how to evaluate business ideas
I have been taught how to become self-employed

Action-based teaching methods

In school…

I have worked in groups
The teaching encourages discussion and debate in class.
I am being encouraged to use what I have learnt for practical tasks.
It is emphasized that being able to do things is more important than being able to tell about things.
Pupils are invited to participate actively in class.
It is emphasized that one must learn from one's own mistakes.

School Engagement

I work hard at school.
I enjoy being at school.
I get bored a lot in school.
I do well in school.
I feel good about myself when I am at school.
Doing well in school is important to me.

Perceived Teacher Support

My teachers give me options in school
I feel that my teachers understand me
My teachers believe that I can do well in school
My teachers encourage me to ask questions
My teachers listen to me when I tell how I want to do things
My teachers seek to understand how I view things before they suggest new ways of doing things

Entrepreneurial Intentions

I would like to start a business
I prefer to be self-employed rather than employed
A career as self-employed would suit me well

Demographical Variables

Gender: Boy/Girl
Have you, your parents (mother or father/both) or grandparents roots in another culture than the Danish?
How long education do your parents have (the one with the longest education)?
Do your parents have their own business? (both, mom, dad, no)

APPENDIX B

MODEL 1 School Engagement ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value	Entrepreneurial Intentions ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value
Cognitive	-.206 (-.135)	.051 (.044)	-4.032 (-3.068)	.000 .000	Cognitive	.279 (.274)	.097 (.091)	2.865 (3.012)	.004 (.003)
Non-Cognitive	.192 (.248)	.042 (.041)	4.629 (6.115)	.000 (.000)	Non-Cognitive	-.195 (-.248)	.082 (.080)	-2.393 (-3.089)	.017 (.002)
Cognitive WITH Non-Cognitive	.786 (.804)	.079 (.069)	10.010 (11.693)	.000 (.000)	**Ent. Intentions WITH School Engagement**	.037 (.141)	.067 (.058)	.554 (2.421)	.580 (.015)
1996: x^2=175.95 (df:71), RMSEA= .054(.044;.064), CFI=.967, TLI=.957, SRMR=.038 1997: x^2=160.82 (df:71), RMSEA= .043(.034-.052), CFI=.977, TLI=.970, SRMR=.039									

MODEL 2 School Engagement ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value	Entrepreneurial Intentions ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value
Cognitive	-.171 (-.113)	.050 (.035)	-3.419 (-3.201)	.001 (.001)	Cognitive	.281 (.277)	.102 (.092)	2.756 (2.994)	.006 (.003)
Non-Cognitive	-.123 (-.075)	.081 (.062)	-1.520 (-1.202)	.128 (.229)	Non-Cognitve	-.174 (-.307)	.190 (.154)	-.916 (-1.992)	.360 (.046)
Teacher Support	.312 (.461)	.049 (.045)	6.372 (10.141)	.000 (.000)	Teacher Support	-.085 (-.048)	.096 (.086)	-.891 (-.557)	.373 (.577)
Action-based teaching	.359 (.333)	.116 (.090)	3.105 (3.684)	.002 (.000)	Action-based teaching	.020 (.175)	.246 (.213)	.080 (.825)	.936 (.410)
Teacher Support ON					**Action-based ON**				
Cognitive	-.082 (-.073)	.058 (.050)	-1.410 (-1.458)	.159 (.145)	Cognitive	-.072 (-.028)	.038 (.036)	-1.888 (-.790)	.059 (.430)
Non-Cognitive	.488 (.441)	.049 (.045)	9.971 (9.708)	.000 (.000)	Non-Cognitive	.507 (.443)	.032 (.032)	15.788 (13.646)	.000 (.000)
Cognitive WITH Non-Cognitive	.787 (.809)	.078 (.067)	10.114 (12.159)	.000 (.000)	**Ent.Intentions WITH School Engagement**	.076 (.149)	.061 (.052)	1.252 (2.846)	.210 (.004)
1996: x^2=357.33 (df:156), RMSEA= .052(.046-.059), CFI=.952, TLI=.942, SRMR=.055 1997: x^2=430.88 (df:156), RMSEA= .051(.045-.057), CFI=.951, TLI=.940, SRMR=.059									

MODEL 2 with controls **School Engagement ON**	**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**	**Entrepreneurial Intentions ON**	**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**
Cognitive	-.168 (-.122)	.050 (.037)	-3.334 (-3.295)	.001 (.001)	Cognitive	.234 (.266)	.101 (.092)	2.328 (2.889)	.020 (.004)
Non-Cognitive	-.141 (-.082)	.080 (.064)	-1.757 (-1.266)	.079 (.206)	Non-Cognitve	-.147 (-.249)	.187 (.152)	-.787 (-1.646)	.431 (.100)
Teacher Support	.301 (.439)	.048 (.046)	6.327 (9.547)	.000 (.000)	Teacher Support	-.080 (-.020)	.093 (.082)	-.860 (-.246)	.390 (.806)
Action-based teaching	.384 (.338)	.117 (.094)	3.284 (3.614)	.001 (.000)	Action-based teaching	.022 (.094)	.246 (.214)	.091 (.438)	.928 (.661)
Ethnicity	.217 (.081)	.089 (.075)	2.441 (1.070)	.015 (.285)	Ethnicity	.200 (.345)	.181 (.167)	1.106 (2.074)	.269 (.038)
Parents have university education	.132 (.162)	.074 (.070)	1.793 (2.329)	.073 (.020)	Parents have university education	.334 (.434)	.163 (.141)	2.057 (3.072)	.040 (.002)
Parents are self-employed	-.131 (-.118)	.083 (.069)	-1.572 (-1.702)	.116 (.089)	Parents are self-employed	.190 (.574)	.165 (.145)	1.149 (3.970)	.251 (.000)
Male	-.083 (.036)	.073 (.058)	-1.142 (.616)	.253 (.538)	Male	.578 (.277)	.144 (.123)	4.009 (2.257)	.000 (.024)
Teacher Support ON					**Action-based ON**				
Cognitive	-.073 (-.067)	.057 (.051)	-1.279 (-1.297)	.201 (.195)	Cognitive	-.065 (-.026)	.038 (.036)	-1.714 (-.729)	.086 (.466)
Non-Cognitive	.478 (.433)	.049 (.047)	9.741 (9.283)	.000 (.000)	Non-Cognitive	.502 (.446)	.032 (.033)	15.724 (13.552)	.000 (.000)
Ethnicity	.020 (-.020)	.120 (.095)	.167 (-.208)	.867 (.836)	Ethnicity	-.068 (.018)	.077 (.064)	-.881 (.281)	.378 (.778)
Parents have university education	.149 (.065)	.106 (.086)	1.407 (.757)	.159 (.449)	Parents have university education	.120 (.013)	.068 (.060)	1.765 (.215)	.078 (.830)
Parents are self-employed	.096 (-.101)	.099 (.094)	.973 (-1.077)	.330 (.281)	Parents are self-employed	.156 (.136)	.076 (.064)	2.060 (2.143)	.039 (.032)
Male	-.144 (-.073)	.090 (.071)	-1.599 (-1.033)	.110 (.302)	Male	-.099 (-.078)	.060 (.050)	-1.637 (-1.554)	.102 (.120)
Non-Cognitive WITH Cognitive	.787 (.818)	.078 (.068)	10.112 (12.109)	.000 (.000)	**Ent.Intentions WITH School Engagement**	.078 (.168)	.058 (.050)	1.337 (3.345)	.181 (.001)
Ethnicity	.036 (-.001)	.024 (.021)	1.500 (-.067)	.134 (.947)	**Cognitive WITH** Ethnicity	.054 (.051)	.021 (.020)	2.545 (2.578)	.011 (.010)
Parents have university education	.014 (.010)	.024 (.022)	.588 (.451)	.557 (.652)	Parents have university education	-.006 (-.028)	.021 (.019)	-.268 (-1.487)	.789 (.137)
Parents are self-employed	-.018 (-.052)	.025 (.021)	-.729 (-2.436)	.466 (.015)	Parents are self-employed	.017 (-.018)	.020 (.019)	.830 (-.976)	.407 (.329)
Male	-.037 (-.035)	.027 (.023)	-1.340 (-1.527)	.180 (.127)	Male	.029 (.008)	.022 (.021)	1.343 (.403)	.179 (.687)
1996: x^2=505.75 (df:212), RMSEA= .052(.046-.058), CFI=.939, TLI=.922, SRMR=.049 1997: x^2=578.36 (df:212), RMSEA= .051(.046-.056), CFI=.937, TLI=.920, SRMR=.053									

3. AN ENTREPRENEURIAL SELF-EFFICACY SCALE WITH A NEUTRAL WORDING: REFINING THE ESE MEASURE TO ADAPT IT TO PROGRAMME EVALUATIONS OF ENTREPRENEURSHIP EDUCATION[21]

ABSTRACT: In this paper a refined ESE scale, adapted to educational assessment studies of entrepreneurship education, is presented. It is based on three established ESE scales but includes fewer indicators and constructs which makes it suitable for assessment studies of entrepreneurship education. The predictive validity, dimensionality, and statistical properties are tested in two steps and the results are based on two student samples including a total of 970 respondents. Since many assessment studies of entrepreneurship education have shown ambiguous results regarding the influence of ESE on entrepreneurial intentions, it is in this paper analysed in what way entrepreneurial experience influences this relationship. It was found that when it came to students who lack entrepreneurial experience their perceived level of evaluation skills had a significantly positive influence on their entrepreneurial intentions while their perceived level of exploitation skills had a negative influence on their entrepreneurial intentions, whereas the opposite was true for students with entrepreneurial experience.

KEY WORDS: Entrepreneurial self-efficacy, entrepreneurship education, assessment studies, theory of planned behaviour, entrepreneurial intentions, non-cognitive skills

[21] This paper is an updated version of a paper previously published in: Fayolle, A., Kyrö, P., Mets, T., & Venesaar, U. (eds.) *Conceptual richness and methodological diversity in entrepreneurship research: Entrepreneurship research in Europe,* Edward Elgar, 2013*,* under the title "An Entrepreneurial Self-Efficacy Scale with a Neutral Wording". New data have been collected which has made it possible to replicate the results of the analysis made in the previously published paper. As there are some variations between the two papers when it comes to categorizations, the analyses in the papers will be different.

INTRODUCTION

Entrepreneurial activities require many different types of skills and abilities (Kuratko & Hodgetts, 2004), both cognitively-oriented skills and skills of a more non-cognitive character (Rosendahl-Huber, Sloof & Van Praag, 2012). Different stages in entrepreneurial ventures entail different challenges (Shane & Venkataraman, 2000; Stevenson, Roberts & Grousbeck, 1985), which makes it necessary for the entrepreneur to be a jack-of-all trades (Lazear, 2005). Since individuals will not perform activities that are perceived to be beyond their capabilities, regardless of whether there is an apparent social demand for those kinds of behaviour (Bandura, 1991; Boyd & Vozikis, 1994), the education system has an important role to play in increasing young pupils' and students' perceived beliefs and confidence in their own entrepreneurial abilities (Mauer, Neergaard & Kirketerp, 2009). Because entrepreneurial activities require multiple skill sets it is important that education in entrepreneurship takes a holistic approach and teaches a wide range of skill sets important at different stages of a venture project (Mwasalwiba, 2010; Pittaway & Cope, 2007; Vesper & Gartner, 1997). There are, however, many different views regarding which types of skills entrepreneurship education should predominantly focus on (Fayolle, 2013).

Since entrepreneurship education has undergone a massive expansion during the last decades (Katz, 2003; Kuratko, 2005), it has become increasingly important that we increase our understanding of the different approaches within the field and especially their effects on students (Fayolle, 2013; Pittaway & Cope, 2007). The concept of self-efficacy has become an increasingly popular area of focus in assessment studies of entrepreneurship education (Mauer et al., 2009). Self-efficacy is a theoretical concept that has its roots in Bandura's social learning theory (Bandura, 1977a, 1977b, 1997) and it is used in assessment studies in order to assess to what extent the educational experience changes participants' perception that they can perform different domain specific activities (Zimmerman, 1995). The multidimensional character of the measure is crucial

since it allows for the evaluation of many different educational initiatives and approaches within the field, even if their focus and objectives may vary extensively.

Task-specific self-efficacy, which within the field of entrepreneurship is translated into the individuals' perceived ability to perform entrepreneurial activities, is commonly referred to as entrepreneurial self-efficacy (henceforth ESE) (Mauer et al., 2009). ESE provides us with the link between the effects of education on students' perceived knowledge and skills and how these perceptions influence entrepreneurial behaviour (Wilson, Kickul & Marlino, 2007). Numerous surveys have shown that ESE has a positive effect on entrepreneurial intentions and behaviour (Barbosa, Gerhardt & Kickul, 2007; Krueger, 1993; Krueger & Brazeal, 1994; Krueger, Reilly & Carsrud, 2000; McGee, Peterson, Mueller & Sequeira, 2009; Scherer, Adams, Carley & Wiebe, 1989), and that entrepreneurship education can function as an effective way to increase students' ESE (Barakat, Mclellan, Winfield & Vyakarnam, 2010; Mclellan, Barakat & Winfeld, 2009; Peterman & Kennedy, 2003; Sanches, 2013; Zhao, Seibert & Hills, 2005). However, there are also many studies which show inconclusive results regarding the influence of ESE - or the related concept *perceived behaviour control* (Ajzen, 2002) - on students' level of entrepreneurial intentions as well as regarding the effect of entrepreneurship education on this variable (Cox, Mueller & Moss, 2002; Graevenitz, Harhoff & Weber, 2010; Oosterbeek, Praag & Iksselstein, 2009; Soutaris, Zerbinati & Al-Laham, 2007).

These inconclusive results indicate that there is a problem with how ESE is measured today. Even if theory clearly states that self-efficacy should be treated as a multidimensional measure (Bandura, 1977a, 1977b, 1997, Zimmerman, 1995) there is unfortunately a practice of measuring ESE as a one-dimensional construct (McGee et al., 2009). Another problem, which is related to the multidimensionality issue, concerns the effects which prior experience may have on ESE (Mauer et al., 2009; McGee et al., 2009), and how prior entrepreneurial experience influences the students'

educational experience (Fayolle & Gailly, 2013). Since ESE is a measure of an individual's perceived competence to engage in entrepreneurial activities, it is likely that entrepreneurial experience will affect not only the level of ESE, but also the importance of different dimensions of ESE, when it comes to predicting entrepreneurial behaviour (Cox et al., 2002; Gist & Mitchell, 1992). Finally, there is the problem of jargon-bias in the present ESE measures. ESE scales have typically been developed with active and practicing entrepreneurs in mind. This makes the language used heavily jargon-based and hard for non-entrepreneurs to understand. As entrepreneurship education today is offered to students of many different disciplines, not just business school students (Katz, 2003; 2008; Pittaway & Edwards, 2012), it is important that these measures address activities that can be assessed by students in a meaningful way, and that the wording of the items is clear and understandable, even to students who do not have any experience with business or entrepreneurship.

In this paper an ESE scale that focuses on these issues is presented. The goal is to refine the ESE measure and adapt it to the world of the students so that it can be effectively used in assessment studies of entrepreneurship education. The focus has therefore been on the wording of the items in order to ensure that students from different disciplines are able to understand the questions as well as to assess their own ability to perform the activity. Furthermore, the focus has been on the multidimensionality of the measure, as this has proven to be an important but problematic aspect of ESE. Because entrepreneurial activities require many different competences, it is important to ensure that several different skill sets are included in an ESE measure. It is, however, also important that these skill sets can be measured in an adequate and practical way that does not strain the analysis. The focus has therefore also been on developing a dimensionality structure which limits the number of dimensions but at the same time includes the full scope of skill sets which previous ESE scales have focused on. This dimensionality structure focuses on the

different types of skill sets that are needed in the *exploration*, *evaluation*, and *exploitation* stages of an entrepreneurial project. In addition, the focus has also been on the practical issues related to assessment studies so the number of items included in the scale has been limited to three per construct.

It was also investigated how prior entrepreneurial experience affects the relationship between the different dimensions of ESE and an individual's level of entrepreneurial intentions. It was found that the level of entrepreneurial intentions of students with entrepreneurial experience is positively influenced by their perceived level of exploitation skills but negatively influenced by their perceived level of evaluation skills, whereas the opposite is true for students who lack this experience. The results are based on two large-scale surveys including 970 students from sixteen master programmes at five universities in three countries.

The text is divided into five sections. The first section presents a short overview of the theoretical background of ESE and a discussion regarding the need for an ESE scale with a more discipline-neutral wording. This is followed by a presentation of a refined ESE measure which builds on three established ESE scales. The third section presents the initial tests of the scale and is followed by a section in which the results are replicated in a different sample. This fourth section also includes an analysis of the influence that prior entrepreneurial experience has on ESE and entrepreneurial intentions. Structural equation techniques have been used to test the validity and the statistical properties of the items in the scale, because this allows for both group analysis (known-group validation) and structured path analysis. The chapter ends with a discussion of the results and the limitations of the analyses as well as suggestions for future research.

THEORETICAL BACKGROUND

The popularity of focusing on ESE in assessment studies follows from the increased recognition of entrepreneurship education and the consequential increased need to evaluate educational initiatives in the field (Fayolle, 2013; Mauer et al., 2009). It has proven to be difficult to use the number of students who become self-employed as a consequence of their educational experience as an outcome measure, since the discrepancy between the age at which individuals typically finish their education and the age at which individuals generally transfer to a career as self-employed is significant (Bird, 1988; Boyd & Vozikis, 1994; Delmar & Davidsson, 2000; Lent, Brown & Hackett, 1994). Many researchers have therefore turned to the field of cognitive psychology in order to access theories and methods that can be used to improve our understanding of the short-term effects of various approaches to entrepreneurship education (Krueger, 2009). The concept of self-efficacy, which is derived from social learning theory (Bandura, 1977b, 1997), has been found to be especially suitable, since the multidimensionality of the measure allows for assessments of various educational initiatives with different focuses and objectives (Chen et al., 1998; Mauer et al., 2009; McGee et al., 2009).

Simply put, self-efficacy can be defined as a person's belief in his or her own capability to perform a task (Gist, 1987), and it has been demonstrated to influence choices and aspirations since, by nature, individuals will not act in ways which they perceive to be beyond their capabilities, regardless of whether there is an apparent social demand for such kinds of acts (Bandura, 1991; Boyd & Vozikis, 1994). ESE thus functions as an effective bridge between educational interventions and actual behaviour (Wilson et al., 2007), because it explains whether or not the students will apply the skills they have acquired (Bandura, 1983). Intention models, such as the *theory of planned behaviour* (Ajzen, 1991, 2002) and *social cognitive career theory* (Lent, Brown

& Hacket, 1994, 2000), have for similar reasons become increasingly used in assessment studies of entrepreneurship education (Fayolle, 2005; Krueger, 2009; Vanevenhoven & Liguori, 2013).

The focus of these intention models is, however, more on the respondents' attitudes towards the specific behaviour and how the respondents perceive that individuals close to them view the behaviour (Krueger & Carsrud, 1993). Yet, self-efficacy is central to these intention models (Krueger, 2009; Krueger & Brazeal, 1994). In the theory of planned behaviour *perceived behaviour control* is viewed as a factor that influences both the individual's intention to exhibit a specific behaviour as well as whether or not the individual actually exhibits that specific behaviour (Ajzen, 1991). Perceived behaviour control is according to Ajzen (2002) a combination of an individual's perceived ability to carry out activities associated with the specific behaviour (self-efficacy) and the extent to which the performance (of the activities) is up to the individual (perceived controllability). In a meta-analysis performed by Cheung and Chen (2000) it was demonstrated that the self-efficacy measures were associated with both intentions and behaviour, whereas controllability was associated with behaviour but that it only predicted intentions when combined with the self-efficacy measure. Furthermore, the analysis showed that the average alpha for the measures was .65 (.70 is the level for sufficient internal consistency recommended by Nunnally, 1978), and that the combination of the two measures reduced the internal consistency (Cheung & Chen, 2000).

These results have led Ajzen to argue that perceived behaviour control should be treated as a higher order construct and that self-efficacy and controllability should be assessed by different indicators (Ajzen, 2002). This structure complicates the assessment of self-efficacy, since in itself it is a multidimensional construct (Bandura, 1977a, 1997; Zimmerman, 1995). This multidimensionality also characterizes ESE which has typically been assessed with scales that focus on multiple bundles of skill sets (Chen et al., 1998; DeNoble et al., 1999; Lucas & Cooper, 2004; McGee et al., 2009). Since most assessment studies of educational programmes and courses in

entrepreneurship, which apply the theory of planned behaviour, treat perceived behaviour control as a one-dimensional construct (see for example Fayolle, Gailly & Lassas-Clerc, 2006; Graevenitz, Harhoff & Weber, 2010; Krueger & Carsrud, 1993; Peterman & Kennedy, 2003; Souitaris, Zerbinati & Al-Laham, 2007; Tkachev & Kolvereid, 1999), it is not surprising that this construct's association with entrepreneurial intentions varies across the studies. When it comes to different kinds of entrepreneurial behaviour, there are typically only few factors outside of the individual's control that are not related to his or her perceived capacity to perform the various tasks associated with the behaviour (Mauer et al., 2009). This limits the necessity to include a measure of controllability in assessment studies.

Established ESE-scales

According to Mauer et al. (2009) the scales developed by Chen, Greene, and Crick (1998) (henceforth the Chen scale) and DeNoble, Jung, and Ehrlich (1999) (henceforth the DeNoble scale) are the most recognized ones within the field. The latest addition to the field published in an academic journal is the ESE scale by McGee, Peterson, Mueller, and Sequeira (2009) (henceforth the McGee scale). The McGee-scale has a solid theoretical foundation that is structured in line with Stevenson, Roberts, and Grousbeck's (1985) theory of the different stages in an entrepreneurial project. Unfortunately, the dimensionality of this scale can be questioned as the constructs show poor discriminant validity. One of the constructs has a positive correlation of .94 and .91 with two other constructs (see also Karlsson & Moberg, 2013; Stromayer, Miller, DeMartino and Murthy, 2012, for a discussion about this).

The multidimensionality of the other two scales can also be questioned, because, as with the McGee-scale, other researchers have treated the Chen scale and the DeNoble scale as one-dimensional constructs when including them in their studies (for examples of this use of the Chen

scale see Fitzsimmons & Douglas, 2011, for the DeNoble scale see Sanches, 2013, for the McGee scale see Vanevenhoven & Liguoris, 2013). This use of the ESE measure as a one-dimensional construct is problematic, because many factors, such as experience, education, and context are very likely to play a role when it comes to the kind of ESE dimensions that explain entrepreneurial behaviour. To an individual who is thinking about launching a biotech venture, an increased level of perceived skill in finance and planning might be more important than for example creativity, whereas the opposite may be the case for an individual who is considering an artistically oriented venture. The multidimensionality is also important when assessing outcomes of different educational initiatives, as they may have very different goals and focus on different entrepreneurial skill sets.

Another serious problem that all these scales have in common is that they use a wording that is highly biased towards business and start-up activities. The scales all include complex and discipline-specific questions such as: *How much confidence do you have in your ability to develop contingency plans to backfill key technical staff* (DeNoble et al., 1999); *establish position in product markets* (Chen et al., 1998)*;* and *determine a competitive price for a new product or service* (McGee et al., 2009). Although these skills can be regarded as important to active entrepreneurs, it is hard to see that students are able to evaluate their ability regarding this in a meaningful way, particularly non-business students. The use of technical jargon is a problem which many scales experience (Peterson, 2000; Spector, 1992). For ESE scales, the use of technical jargon is critical for at least three reasons.

1) The growing demand of programme evaluations within entrepreneurship education has made the use of propensity score matching and control groups very common. In order to measure effects of a treatment, we want to make sure that these effects are caused by this treatment and not by other external effects, such as, for example, institutional change, changes in the economy or

simply the maturity process of young students (Mohr, 1995). In order to do this, we need to use a control group, that is, a group that has very similar characteristics as those of the experiment group, except that they are not targeted by the treatment, which in our case would be entrepreneurship education. This group cannot be expected to understand the technical jargon of entrepreneurship, especially if it is biased towards business and start-up activities.

2) The second reason has to do with the learning of students who are subject to a specific treatment. In programme evaluations with longitudinal design, it should be expected that students in the treatment group will develop an understanding of the technical jargon of the field (Shepherd, 2004). The next time they take the test it will be difficult to assert whether effects of the treatment are real or just a result of an increased understanding of the field's terminology. This might especially be the case when it comes to entrepreneurship students outside business schools, since they often do not have any previous experience of the language used within the field.

3) The third issue has to do with goals of entrepreneurship education. Many entrepreneurship researchers (for example Gibb, 2002; Hannon, 2005, 2006; Neck & Greene, 2011; Sarasvathy & Venkataraman, 2011) argue that entrepreneurship education has many positive effects other than an increased number of start-ups. These researchers argue that changes in society during the last decade have made the capacity to act entrepreneurially a necessary ability for all individuals. The effects of entrepreneurship education should also be measurable when it comes to students who choose to pursue a career as employees and engage in strategic and corporate entrepreneurship. Examples are measurements of whether or not entrepreneurship students experience higher income levels, get positions with more responsibility, or work within sectors with higher innovation activities (see Charney and Libecap, 2000, for examples of this), or simply whether they increase their perceived entrepreneurial ability. Such learning would not be captured by a scale that only

focuses on venture creation activities. We can, thus, clearly see that there are at least three good reasons why an ESE scale with a neutral wording is needed.

REFINING THE ESE MEASURE TO ADAPT IT TO STUDENTS

The first step in refining the ESE measure was to review the literature on existing scales in detail. The goal of this detailed review was to identify what specific skill sets previous scales have been focusing on. When the three scales presented above were compared, it was clear that the theoretical foundation of the McGee scale was strongest. The skill dimensions in the McGee scale are based on skills that are needed in different stages of entrepreneurial projects and therefore function well with the development process which takes place in an educational programme, at least in programmes with a process-oriented approach. They are also more general compared to the other two, which include very specific constructs such as "establish core purpose" (DeNoble et al., 1999) and "marketing skills" (Chen et al., 1998). It was therefore decided that the McGee scale should be used as a base for comparing what skill sets the three scales are focusing on. The three scales have a significant overlap in focus, and many items were fairly similar. The main difference between the McGee scale and the two other scales is that it lacks a construct that focuses on uncertainty. In table 1 below, the focus of the three ESE scales is presented.

Focus:	**Chen et al. (1998)**	**De Noble et al. (1999)**	**McGee et al. (2009)**
Search/Creativity	Strong	Strong	Strong
Planning/Management	Strong	Strong	Strong
Resource marshalling	No	Strong	Strong
Human Resources	Weak	Strong	Strong
Financial Literacy	Strong	Weak	Strong
Marketing	Strong	No	Weak
Managing Ambiguity	Strong	Strong	No

Table 1: A comparison of the focus in three ESE scales

It is clear that a new scale based on a comparison of the three scales should include the following six constructs: *Creativity*; *Planning/Management*; *Marshalling of Resources*; *Human Resource Management*; *Financial Literacy* and *Managing Ambiguity*. An initial item pool based on items in the three scales belonging to these six constructs was constructed. When reviewing the items it became clear that it would be problematic for most students, especially non-entrepreneurship students, to assess their ability in a meaningful way when it came to items in the human resource management construct, which previous tests of the McGee scale have also indicated (Karlsson & Moberg, 2013). It was therefore decided to omit items related to this construct. Programme leaders of six master programmes in entrepreneurship were invited in this development phase to give feedback on the scale. The response from the programme leaders was positive, as they viewed the skills and competences that were included in the scale as important to entrepreneurs and entrepreneurial activities, and none of them had any objections to the wording of the items. There were now 25 items in the item pool, and four new ones were added at the recommendation of the educators.

The five constructs and the 29 items (see Appendix A) included in the scale are well in line with different views of entrepreneurship education. The "classic" discovery view of entrepreneurship with its roots within strategic management has a strong focus on planning skills and financial knowledge, that is, cognitive-oriented entrepreneurial skills (Honig, 2004), whereas the newer creation view has a focus on marshalling skills and how to manage ambiguity, that is, non-cognitive entrepreneurial skills (Alvarez & Barney, 2007, 2010; Neck & Greene, 2011). Creativity is seen as equally important in both of these strands (Alvarez and Barney, 2010).

We can also see that the skill sets covered by the dimensions identified in the review above are well in line with Kuratko and Hodgett's (2004) holistic view of entrepreneurship as: "... a dynamic process of vision, change, and creation. It requires an application of energy and passion

towards the creation and implementation of new ideas and creative solutions. Essential ingredients include the willingness to take calculated risks in terms of time, equity, or career; the ability to formulate an effective venture team; the creative skill to marshal needed resources; and the fundamental skill of building a solid business plan; and, finally, the vision to recognize opportunity where others see chaos, contradiction, and confusion" (Kuratko & Hodgetts, 2004; 30).

The five skill sets can also be categorized according to which stage in the entrepreneurial project they focus on. The cognitively-oriented entrepreneurial skills "planning" and "financial knowledge" are most important during the *evaluation* phase (Kirby, 2004; Mwasalwiba, 2010), and these two skill sets can be viewed as being interrelated, as a high level of entrepreneurial planning requires a high level of financial skill, and vice versa. Furthermore, these two cognitively-oriented skill sets are both easy to codify and teach in a classroom setting; which might explain their popularity in entrepreneurship education (Honig, 2004). "Managing ambiguity" and "resource marshalling", both of which are entrepreneurial skill sets with a non-cognitive character, are however challenging to teach as they are hard to codify and require practice to learn (Neck & Greene, 2011). These two skill sets are also conceptually related in the sense that they are important in the *exploitation* phase (Blenker, Korsgaard, Neergaard & Thrane, 2011; Neck & Greene, 2011), and that in order to acquire a high level of skill in resource marshalling a high level of skill in managing ambiguity is required.

Creativity is viewed as a non-cognitive skill, both by entrepreneurship researchers (Rosendahl-Huber et al., 2012) and by economists and psychologists (Csikszentmihalyi, 1996; Cunha & Heckman, 2007). Conceptually, however, it is not related to any of the other skill sets, because a high level of creative ability does not determine the level of any of the other skill sets, or vice versa. Although creativity can be viewed as an important ability in all the phases of an entrepreneurial project, it is first and foremost during the exploration phase that a high level of

creativity is needed (McGee et al., 2009; Stevenson et al., 1985). The five dimensions of ESE which were identified in the review above can thus conceptually be categorized into three dimensions: cognitive and non-cognitive entrepreneurial skills which are exercised to different degrees during the *exploration*, *evaluation*, and *exploitation* stages of an entrepreneurial project.

TESTING THE SCALE

The properties of the items and constructs of the ESE scale are tested in two steps with two different samples. In the first step principal component and confirmatory factor analysis are used in order to reduce the number of items per construct to three, since it is important that a measure intended for use in assessment studies is not too extensive. Three items, however, is the minimum requirement in order for a construct to be identified, because this entails that there are as many estimates made as there are unique observed pieces of information available (Brown, 2006; Little, 2013). The statistical properties of the items are naturally important in this process; however, they should not be followed blindly, as this tends to lead to items with a high level of similarity, that is, items which only measure a part of the theoretical concept that they are intended to measure (Davidsson, 2004).

Both the five-construct version and the three-construct version of the scale, which were presented above, will be tested. The five-construct version allows a more specific analysis of the different dimensions; how they are affected by external factors and how they associate with other variables. The three-construct version is, however, a more manageable measure that still includes all the skill sets that are important in order to adequately measure ESE, but it does not strain the analysis with too many dimensions. A limited number of variables is important in assessment studies which involve longitudinal data, because the amount of constructs and items included in this type of surveys can quickly add up to unmanageable numbers, which also increases the risk of spurious correlations (Little, Cunningham, Shahar & Widaman, 2002).

In the second step the statistical properties of the scale are tested in a new sample. In this analysis additional measures of *entrepreneurial attitudes*, *social norms* and *entrepreneurial intentions* are included, which makes it possible to analyse how entrepreneurial experience influences the associations between the different dimensions in the ESE scale and the students' level of entrepreneurial experience. This analysis is based on the framework used in the *theory of planned behaviour* by Ajzen (1991, 2002). In the following the different tests of the scale will be presented.

Testing the Scale - Step One

In August 2011 curriculum designers of six master's programmes with a focus on entrepreneurship at three different universities in Denmark and one university in Sweden agreed to participate in the survey. They were asked to suggest other master's programmes that could function as suitable control groups to their students. In order to decide whether these programmes were suitable for the study, the programme leaders were interviewed about their curriculum design and characteristics of the students. Out of eight recommended programmes, six were included in the survey, two of these in the experiment group, four as a control group.

In the beginning of the programme's first semester, in September 2011, the questionnaires were distributed in hard copy to the students of the twelve programmes. A total of 491 hard copies were distributed, which generated 454 usable responses. In addition to the 29 ESE questions, which were all measured on a 7-point Likert scale, ranging from *Do not agree* (= 1) to *Agree* (= 7), demographic variables such as age, gender, and country of origin were included in the survey. In addition, variables that are known to be related to entrepreneurial behaviour, such as work experience, extracurricular activities, and whether or not the respondent had any relatives who had

currently started a business, were also included. Three questions were used to assess the students' entrepreneurial experience: 1) have they started a business in the past, 2) are they currently operating a business, or 3) are they for the moment trying to start a business. In order to test the reliability of the items in the refined ESE scale, the order of the 29 ESE items was scrambled (see Appendix A). In table 2 the descriptive statistics of the sample are presented.

Variable	
The total number of respondents	491
The total number of respondents used in the analysis	454
Gender	
- Men	51,1 %
- Women	48,9 %
Age (mean)	25,4 year
Exchange students	36,3 %
Have close family members (parents, siblings, uncles/aunts) who are self-employed	58,4 %
Have taken a course or training program that focuses on entrepreneurship / self-employment in the past	31,9 %
Have participated in an extra-curricular activity that focuses on entrepreneurship / self-employment	28,2 %
Part-time work experience (mean)	5,7 years
Full-time work experience (mean)	3,0 years
Have alone or together with others, started a business in the past	22,3 %
Are today by themselves or together with others, operating a business	12,3 %
Are trying to start a business for real	25,8 %

Table 2: Descriptive statistics

Initial analysis

A principal components analysis[22] with Varimax rotation was conducted. Five factors had an Eigen-value greater than 1 (10.38, 2.30, 1.55, 1.23, 1.06), demonstrating that five was the suitable number of factors when all 29 items were included. Loadings of .50 or greater were considered as meaningful, which led to nine items (q1, q8, q15, q19, q20, q23, q24, q28, q32, see Appendix A) being left out of further analysis. Twenty items loaded greater than .50 on five factors, which all demonstrated Eigen-values greater than 1. A Kaiser-Meyer-Olkin (KMO) test was performed in order to measure sampling adequacy and assess if there were any items demonstrating too high

[22] Principal component analysis is closely related to exploratory factor analyses, but it incorporates fewer domain specific assumptions about the underlying structure of the items (DeVellis, 2012).

multicollinearity. The results showed that each item had a KMO statistic above the recommended threshold of .60 (Hair, Black, Babin, Anderson & Tatham, 2006). The overall KMO statistic was .91 with a range of .82 to .95.

Confirmatory factor analysis

The next step was to test the statistical properties of the items by using confirmatory factor analysis (CFA). CFA has many advantages, because it takes into account the measurement error of each item. This makes it possible to compute modification indices and to test for weak and strong factorial invariance in a multi-group analysis (Little, 2013). It should, however, be noted that CFA tends to over-factor and that it generates better fit indices, if a greater number of factors are used than those which can be found in the principal components analysis (DeVellis, 2012). It is therefore important that there is a sound theoretical backing for the constructs in a CFA (Little, 2013).

A confirmatory factor analysis including the 20 items was performed. Maximum likelihood (ML) was used as estimator and Bentler's (1990) criteria for good model fit[23] were followed. The 5-factor model had the following model fit: x2=475.09 (df: 160), CFI=.915, TLI=.899, RMSEA=.066 (.059;.073), SRMR=.057. The Tucker Lewis-index is just below acceptable level, but as the other indices met Bentler's (1990) criteria, the model can be accepted. All items loaded significantly on their constructs ($p < .001$), with standardized loadings ranging from .51 to .93. In table 3 the separate loadings of the items are presented.

As three of the constructs were set to explain more than three items, the next step of the analysis was to decide which of these items to drop. In the case of the *creativity* construct this was not a difficult task, since two of its items (**q2**: *Identify ways to combine resources in new ways to*

[23] According to Bentler (1990) a model should have a comparative fit index (CFI) and a Tucker Lewis Index (TLI) above .90; a root mean square error of approximation (RMSEA) and a standardized root mean square residual (SRMR) below .08 in order to demonstrate acceptable fit.

achieve goals, and **q31**: *Identify creative ways to get things done with limited resources*) had relatively low loadings, and when reviewing the wording of these items it was clear that they were formulated in a more difficult manner than the other three. Furthermore, dropping these two items would not significantly limit the scope of the measure as both of them could be viewed as versions of **q29**: *Identify opportunities for new ways to conduct activities*.

It was more challenging to decide which items to drop in the *financial literacy* and *managing ambiguity* constructs. By reviewing the modification indices it was clear that the financial literacy construct had one pair of items (q9 and q18) with strongly correlated error terms. This indicated that these two items measured one specific aspect of the construct. As a consequence, it lowered the factor loadings of the two other items, which measured other dimensions of the construct. Since the items that are set to reflect a construct should cover all the dimensions that this construct is intended to be a measure of (Davidsson, 2004), it was decided that one of the two items that experienced strongly correlated error terms should be dropped. When reviewing the wording of these items it was clear that **q18**: *perform financial analysis* focused on a specific skill uncommon to most students, whereas **q9**: *read and interpret financial statements* could be viewed as an activity with which most students have experience. Q18 was therefore dropped from the analysis.

The CFA did not provide much guidance for deciding which items in the *managing ambiguity* construct to drop, because they all, more or less, experienced similar loadings, and no problematic error term correlation could be identified. Here the wording of the items and which dimensions of the construct they should capture needed to be investigated. Q**3**: *Improvise when I do not know what the right action/decision might be in a problematic situation* was dropped because this item is ambiguously formulated and can be viewed as reflecting a person's creative ability rather than his ability to manage uncertainty. Furthermore, **q14**: *Persist in the face of setbacks* was dropped since

this ability is reflected in **q25**: *Work productively under continuous stress, pressure and conflict* (see Appendix A).

After dropping these five items, each construct in the analysis was just-identified, as they only reflected three items each. The CFA was re-run, and the model fit increased slightly as the RMSEA fell to .65 (.55;.75), the SRMR to .50, and the CFI increased to .933 and the TLI to .912. All items loaded significantly on their constructs ($p < .001$), with standardized loadings ranging from .52 to .82. The *marshalling of resources* construct correlated highly with both the *managing ambiguity* construct (.74) and the *planning* construct (.71), whereas the *financial literacy* construct only had moderate levels of standardized correlations with the other constructs (the highest was with planning: .52).

The three-construct version of the scale was then tested. The items in the *marshalling of resources* and the *managing ambiguity* constructs were parcelled in order to represent a measure of exploitation-oriented entrepreneurial skills, and the items in the *planning* and *financial literacy* constructs were parcelled in order to represent evaluation-oriented entrepreneurial skills. The items were parcelled two and two, starting with the indicator with the highest loading, which was parcelled with the indicator with the lowest, and then parcelling the indicator with the second highest loading with the indicator with the second lowest, etc., as recommended by Little et al., (2002). The model fit improved regarding CFI (.962) and TLI (.943) and stayed at the same level of SRMR (.05). However, the RMSEA demonstrated a poorer fit, as it increased to .077 (.06;.095), which is above Bentler's (1990) recommended level. Models which include few constructs often perform badly when it comes to the RMSEA value (Little, 2013), and as the other fit indices demonstrated an improved and sufficient model fit, the three-construct model can still be accepted. All items loaded significantly on their constructs ($p < .001$) with standardized loadings ranging

from .67 to .82, and the highest standardized correlation was between the evaluation-oriented and the exploitation-oriented skills constructs, which experienced a correlation of .68.

The next step was to calculate the composite reliability of the measures, and the convergent as well as divergent validity, by performing the Fornell and Larcker test (Fornell & Larcker, 1981). The Fornell and Larcker test calculates both the composite reliability (CR) and the average variance extracted (AVE), based on the standardized loadings of the items and their corresponding error terms. The structure of the test makes the CR, which is a measure of internal consistency, sensitive to the number of items in the construct (with the existence of more items the CR tends to be increased), whereas this is not the case with the AVE, which is used to determine convergent and divergent validity (Fornell & Larcker, 1981). In order to demonstrate a sufficient level of internal consistency the CR should be above .70, and in order to demonstrate a sufficient level of convergent validity the AVE value should be above .50. Divergent validity is obtained if the AVE value is higher than the construct's highest squared standardized correlation. In table 3 the results for both of the versions of the scale are presented.

Variable	Item 1	Item 2	Item 3	CR	AVE	Highest Corr.
Creativity	.67	.82	.79	.80	.58	.65 (.42)
Planning	.52	.71	.77	.71	.46	.71 (.50)
Financial literacy	.68	.70	.81	.78	.54	.59 (.35)
Marshalling	.67	.74	.57	.70	.44	.74 (.55)
Managing ambiguity	.61	.75	.60	.69	.43	.74 (.55)
Model fit: X2=232.44(df:80), RMSEA=.065(.055;.075), CFI=.933, TLI=.912, SRMR=.050						
Exploration	.67	.82	.78	.80	.58	.65 (.42)
Evaluation	.78	.75	.81	.82	.61	.68 (.46)
Exploitation	.75	.77	.73	.79	.56	.68 (.46)
Model fit: X2=88.87(df:24), RMSEA=.077(.060;.095), CFI=.962, TLI=.942, SRMR=.050						

Table 3: Convergent validity, discriminant validity, and internal consistency

As we can see in table 3, there are three constructs in the five-construct version (planning, marshalling of resources, and managing ambiguity) that experience low levels of convergent and discriminant validity, which indicates that this level of dimensionality is problematic for the

measure, even if the model fit of the CFA demonstrates sufficient levels. In the three-construct version all constructs experienced sufficient levels of convergent and divergent validity as well as excellent levels of internal consistency. This is not surprising because parcelling techniques typically make the items more similar to continuous measures, and as they are averages of two items they become more normally distributed (Little et al., 2002; Little, 2013). These are two features which typically improve the model fit and AVE values. In the next step the predictive validity of the two versions of the scale is tested.

Predictive validity and factorial invariance

In order to test the predictive validity and the factorial invariance of the constructs, two group analyses were performed. In the first group analysis it was tested whether the items were understood in the same way by students in the control group and students in the entrepreneurship group, so the sample was divided accordingly. Testing for weak factorial invariance means that the loadings of the indicators are constrained to be equal and, when testing for strong factorial invariance, it is the intercepts that are constrained (Little, 2013). In order to establish that the indicators pass the tests of weak and strong factorial invariance, the CFI should not change more than .01 when the constraints are added (Cheung & Rensvold, 2002). These tests were also performed in the group analysis where the sample was divided according to whether or not the students had any entrepreneurial experience. In order to investigate the predictive validity of the scale, a "known-group" analysis (DeVellis, 2012) was performed and it was tested whether students with entrepreneurial experience also had significantly higher levels of ESE. In table 4 the results of the analyses for both the five-construct version and the three-construct version of the scale are presented. The models with constraints for both strong and weak factorial invariance are used as the base-line in the mean-difference tests.

Entrepreneurs / Non-entrepreneurs	Latent mean	Mean diff.	CFI	Δ CFI	X^2	ΔX^2	Δdf	Significant difference
Five constructs								
Configural			.943		280.54			
Weak			.938	.005	302.46	21.92	10	No
Strong			**.936**	.002	**315.66**	13.2	10	No
Omnibus test			.915	.021	364.95	49.29	5	Yes***
Creativity	5.45 / 4.83	.62	.919	.017	354.37	38.71	1	Yes***
Planning	4.99 / 4.81	.18	.935	.001	320.04	4.38	1	Yes*
Financial literacy	4.31 / 3.89	.42	.930	.006	329.59	13.93	1	Yes***
Marshalling	5.04 / 4.62	.42	.928	.008	334.45	18.79	1	Yes***
Managing ambiguity	5.10 / 4.67	.43	.926	.010	338.31	22.65	1	Yes***
Three constructs								
Configural			.963		106.82			
Weak			.964	.001	111.54	4.72	6	No
Strong			**.962**	.002	**120.83**	9.29	6	No
Omnibus test			.936	.026	165.35	44.52	3	Yes
Exploration	5.45 / 4.83	.62	.938	.024	159.54	38.71	1	Yes***
Evaluation	4.64 / 4.35	.29	.955	.007	132.64	11.81	1	Yes***
Exploitation	5.07 / 4.64	.43	.945	.017	148.93	28.10	1	Yes***
Entrepreneurship / Control								
Five constructs								
Configural			.927		323.35			
Weak			.929	.002	329.59	6.24	10	No
Strong			**.929**	.000	**340.45**	10.86	10	No
Omnibus test			.924	.005	356.24	15.79	5	Yes**
Creativity	5.19 / 4.86	.33	.924	.005	351.88	11.43	1	Yes***
Planning	4.95 / 4.79	.16	.928	.001	343.98	3.53	1	No
Financial literacy	4.15 / 3.89	.26	.926	.003	346.84	6.39	1	Yes*
Marshalling	4.83 / 4.69	.14	.928	.001	342.46	2.01	1	No
Managing ambiguity	4.91 / 4.70	.21	.927	.002	346.19	5.74	1	Yes*
Three constructs								
Configural			.959		116.77			
Weak			.960	.001	121.54	4.77	6	No
Strong			**.960**	.000	**126.67**	5.13	6	No
Omnibus test			.953	.007	141.14	14.47	3	Yes*
Exploration	5.19 / 4.86	.33	.954	.006	138.00	11.33	1	Yes***
Evaluation	4.55 / 4.34	.21	.956	.004	134.11	7.44	1	Yes**
Exploitation	4.88 / 4.69	.19	..958	.002	131.77	5.1	1	Yes*
***=.001 **=.01 *=.05								

Table 4: Factorial invariance and latent mean differences between students with and without entrepreneurial background, and between entrepreneurship students and students in the control group.

As we can see in table 4, the indicators in both versions of the scale pass the tests of weak and strong factorial invariance in both of the group analyses. This indicates that students in the entrepreneurship group and in the control group, as well as students with and without entrepreneurial experience, understand the questions in the same way. This is a crucial feature because it makes it possible to compare differences between groups in a meaningful way, because we do not have to worry whether or not these differences result from dissimilar interpretations of the questions. We can also see that students with entrepreneurial experience have significantly higher levels of ESE in every dimension, which demonstrates a predictive validity for the measure.

Students with an entrepreneurial background have a higher perceived level of skills primarily in *creativity*, followed by *managing ambiguity* and *marshalling of resources*, whereas the differences between the student groups when it comes to their perceived skill level in *planning* are close to being insignificant. This indicates which dimensions of the ESE measure best explain entrepreneurial activities, and as we can see, there is a strong emphasis on non-cognitive entrepreneurial skills. Furthermore, the results indicate that the students with entrepreneurial experience explain the differences between entrepreneurship students and students in the control group, since the levels of ESE of students in the control group and students without entrepreneurial experience are very similar.

Summary of the initial tests of the scale

The initial tests of the scale have shown promising results. The principal component analysis indicated that 20 of the 29 items in the initial item pool loaded above .50 on five separate constructs. The confirmatory factor analysis demonstrated a sufficient model fit when all of the 20 items were included, but it also showed that the model fit increased significantly when the number of items was reduced to fifteen. In the Fornell and Larcker test, however, it was discovered that three of the constructs (planning, marshalling of resources, and managing ambiguity) demonstrated insufficient levels of convergent and discriminant validity. When the items in the constructs were parcelled according to their focus on specific stages in an entrepreneurial project (exploration/evaluation/exploitation) as well as their focus on cognitive and non-cognitive entrepreneurial skills, the problematic levels of convergent and discriminant validity vanished. The analysis further demonstrated that, regardless of the students' entrepreneurial and/or educational background, the items were understood in the same way, as both weak (loadings) and strong (intercepts) factorial invariance was established. Most importantly, the measure demonstrated a

high level of predictive validity, because students with an entrepreneurial background had significantly higher levels of perceived skill in all of the dimensions.

In order to increase our confidence in the measure it is, nevertheless, important that the results can be demonstrated more than once. In the second step of the analysis, the scale will be tested in a new sample. Measures of *entrepreneurial intentions*, *entrepreneurial attitudes*, and *social norms* are also included in this analysis. This makes it possible to use the theory of planned behaviour (Ajzen, 1991; 2002) as the conceptual framework and to test how previous experience with entrepreneurial activities affects the relations between entrepreneurial intentions and different dimensions of ESE.

Testing the Scale: Step Two

Besides the fifteen ESE items, a three-item *entrepreneurial attitude* scale from McGee et al. (2009) and a three-item *entrepreneurial intention* scale inspired by the work of Krueger and Brazeal (1994) were included in the analysis. The entrepreneurial attitude scale is structured as a dichotomous scale with items such as "In general, starting a business is Worthless = 1, Worthwhile = 7. The entrepreneurial intention scale is structured in the same way as the ESE scale, and the students were asked to indicate on a seven-point Likert scale in what degree they agreed to statements such as "I strongly consider setting up my own business". In addition to these two scales a scale which focuses on the students' perceived social norms was included. The most common way of measuring social norms, when applying the theory of planned behaviour, is to ask the respondent to indicate in what degree significant others would characterize the specific behaviour as positive or negative, and in what degree this would matter to the respondent (Ajzen, 1991). This way of measuring social norms has been criticized because it is difficult to determine in what way significant others exercise their influence (Belchior & Linan, 2013). Moreover, it is a kind of measuring that is problematic to use in

educational assessment studies because the educational experience typically does not change this variable. It was thus decided to instead focus on the attitudes and values of individuals in the students' networks, which is a more dynamic variable. The students were asked to indicate in what degree they agreed to statements such as "Many people in my network are interested in entrepreneurship". All items of the measures are presented in Appendix A.

The sample

In the second round of data collection four additional entrepreneurship programmes were included. Two of these are engineering programmes and one is offered to bio science students. In addition to these programmes, all of which are Danish, a Finish programme open to both business management students and engineering students was included. This increases the variety of the sample, which in the first round of data collection was dominated by Danish business school students (even if 36% were exchange students). 479 questionnaires were distributed, which generated 452 usable responses. In table 5 the descriptive statistics of the sample are presented.

Variable	
The total number of respondents	479
The total number of respondents used in the analysis	452
Gender	
- Men	56,9 %
- Women	43.1 %
Age (mean)	25,7 years
Exchange students	34,5 %
Have close family members (parents, siblings, uncles/aunts) who are self-employed	59,1 %
Have taken a course or training program that focuses on entrepreneurship / Self-employment in the past	38,7 %
Have participated in an extra-curricular activity that focuses on entrepreneurship / Self-employment	29,0 %
Part-time work experience (mean)	6,0 years
Full-time work experience (mean)	2.7 years
Have alone or together with others, started a business in the past	21,3 %
Are today by themselves or together with others, operate a business	13,4 %
Are you trying to start a business for real as opposed to just evaluating an….	30,1 %

Table 5: Descriptive statistics

Testing the statistical properties of the scale

The tests in stage one indicated that the statistical properties of the scale improved when the indicators were parcelled to only loading on three constructs, but both the three-construct version and the five-construct version of the scale will be tested also in this second step of the analysis. In the following the results of the confirmatory factor analysis (CFA) and the Fornell and Larcker test of the two versions of the scale will be presented.

The confirmatory factor analysis for the five-construct version had the following model fit indices: x2=291.21 (df:80), CFI=.904, TLI=.874, RMSEA=.076 (.067;.086), SRMR=.060. Compared to the sample used in the first step of the analysis, this model fit is somewhat poorer but still at sufficient levels. The TLI is, however, at a critically low level, which raises concerns regarding the reliability of the measure. Both the CFI and the TLI did, however, increase significantly in the three-construct version of the scale, which had the following model fit: x2=132.79 (df: 24), CFI=.936, TLI=.903, RMSEA=.100 (.084;.117), SRMR=.063. Similar to the first analysis the RMSEA demonstrated too high values in this analysis, which, as noted earlier, probably has to do with the limited number of constructs included in the model. Next, the Fornell and Larcker test was performed. Table 6 presents the standardized loadings of the indicators, the constructs' average value extracted (AVE) and their composite reliability (CR), as well as their highest squared standardized correlation.

Variable	Item 1	Item 2	Item 3	CR	AVE	Highest Corr.
Creativity	.66	.82	.71	.77	.54	.74 (.55)
Planning	.49	.60	.76	.65	.39	.73 (.53)
Financial literacy	.53	.82	.83	.78	.55	.60 (.36)
Marshalling	.67	.77	.61	.73	.47	.71 (.50)
Managing ambiguity	.51	.73	.59	.64	.38	.74 (.55)
Model fit: X2=291.21(df:80), RMSEA=.076(.067;.086), CFI=.904, TLI=.874, SRMR=.060						
Exploration	.67	.83	.69	.78	.54	.69 (.48)
Evaluation	.83	.75	.73	.81	.59	.74 (.55)
Exploitation	.74	.75	.76	.79	.56	.74 (.55)
Model fit: X2=132.79(df:24), RMSEA=.100(.084;.117), CFI=.936, TLI=.903, SRMR=.063						

Table 6: Convergent validity, discriminant validity and internal consistency.

The results in table 6 indicate that the same three constructs in the five-construct version (planning, marshalling of resources, and managing ambiguity), which demonstrated problematic levels of convergent and discriminant validity in the first analysis, also demonstrated too low levels of convergent and discriminant validity in this analysis. Every construct did, however, demonstrate sufficiently high levels in the three-construct version. Similar to the first analysis, both the confirmatory factor analysis and the Fornell and Larcker test of the second analysis demonstrate that the three-construct version of the scale has superior statistical properties compared to the five-construct version of the scale. I therefore decided to use the three-construct version when analysing the association between the dimensions in the ESE scale and the students' level of entrepreneurial intentions.

Theory of planned behaviour

Since the students' intentions to start a company are central to an analysis which uses the theory of planned behaviour as its conceptual framework, it was, in this analysis, necessary to drop those students who indicated that they were already operating a business. However, the students who had indicated that for the moment they were trying to set up a company were kept in the analysis, because they could answer questions such as "I am willing to work hard to set up my own business" and "I have been preparing to set up my own business" in a meaningful way, which was not the case for students who already operated a business. The sample was thus reduced from 452 to 389 in this analysis.

The first step of the analysis was to investigate how the ESE dimensions function together with the additional constructs: *social norms*, *entrepreneurial attitudes*, and *entrepreneurial intentions*. Two CFAs were performed; both including and excluding the 63 students who were

operating businesses. The CFA for the full sample had the following model fit indices: x2=323.40 (df:120), CFI=.944, TLI=.929, RMSEA=.061 (.053;.069), SRMR=.054, and the CFA which excluded the 63 students had the following: x2=380.44 (df:120), CFI=.921, TLI=.899, RMSEA=.075 (.066;.083), SRMR=.066. Compared to the CFA that only included the three ESE constructs, the RMSEA improved significantly, which indicates that it was the limited number of constructs that increased its RMSEA. The "known-group" analysis in which the mean differences between students who have entrepreneurial experience and students who lack it, presented in table 7, again demonstrated the predictive validity of the measure, as students with entrepreneurial experience had significantly higher values in each of the dimensions. The scale also passed the test of weak and strong factorial invariance, which the results in table 7 demonstrate.

Entrepreneurs / Non-entrepreneurs	**Latent mean**	**Mean diff.**	**CFI**	**Δ CFI**	**X^2**	**ΔX^2**	**Δdf**	**Significant difference**
Configural			.933		154.15			
Weak			.931	.002	163.55	9.4	6	No
Strong			**.927**	.004	**176.75**	13.2	6	No
Omnibus test			.899	.028	224.30	47.55	3	Yes***
Exploration	5.33 / 4.74	.59	.903	.024	215.62	38.87	1	Yes***
Evaluation	4.69 / 4.30	.39	.913	.014	199.39	22.64	1	Yes***
Exploitation	4.99 / 4.58	.41	.911	.016	202.33	25.58	1	Yes***
***=.001 **=.01 *=.05								

Table 7: Factorial invariance and latent mean differences between students with and without entrepreneurial background.

The next test of the scale's predictive validity was to investigate the influence of the ESE dimensions on students' level of entrepreneurial intentions. This analysis is based on the conceptual framework of the theory of planned behaviour (Ajzen, 1991, 2002). Measures of the students' *entrepreneurial attitudes* and *social norms* were therefore also included. In figure 1 the results of this test are presented. See Appendix B for a more detailed analysis.

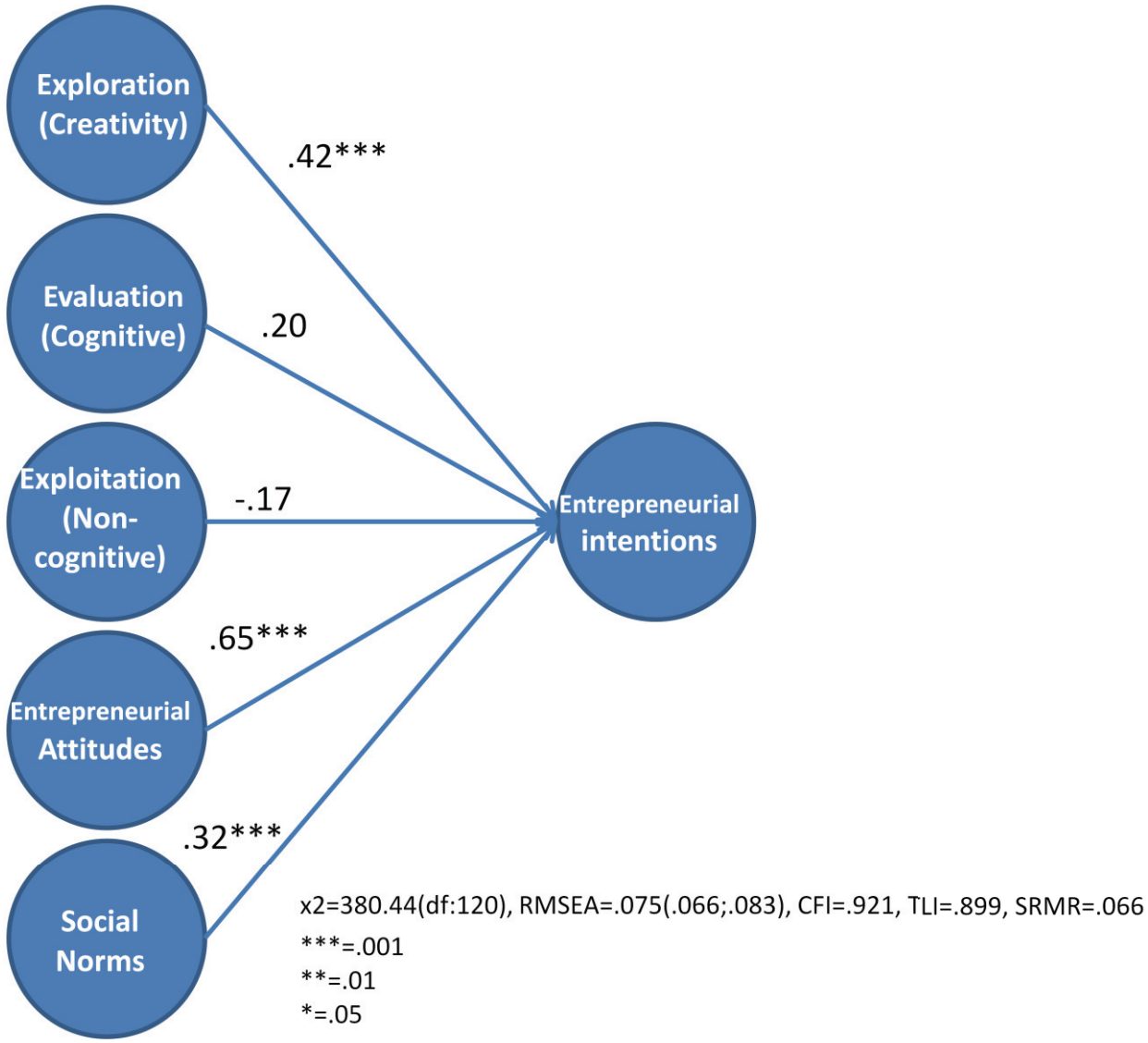

Figure 1: The structured association between ESE, social norms, and entrepreneurial attitudes with entrepreneurial intentions.

As we can see in figure 1, both social norms and entrepreneurial attitudes have a significant influence on the students' level of entrepreneurial intentions. When it comes to the dimensions of the ESE scale, it is only the students' perceived level of exploration skills that has a significant association with the students' level of entrepreneurial intentions. This indicates that the evaluation and the exploitation oriented entrepreneurial skill sets in the ESE scale have a poor predictive validity. This result is a bit puzzling, as it has been demonstrated in both samples that students with

entrepreneurial experience have a significantly higher level in each of the ESE dimensions compared to students who lack entrepreneurial experience (see table 4 and table 7). However, it can be expected that these two skill sets will be differently related to entrepreneurial intentions depending on whether or not the students have previous experience of starting up a business. The more novel the given task is, and the less experience the individuals have of performing the given task, the greater is the possibility that their efficacy judgments will be inaccurate (Gist & Mitchell, 1992). Even if Ajzen (1991, 2002) states that the influence on an individual's intention to perform a specific behaviour is mediated through three antecedents (social norms, attitudes, and perceived behaviour control), he does not state whether or not other variables affect the degree to which these three variables influence the individual's level of intention.

Previous entrepreneurial experience can affect the importance that different skill sets play in at least two ways. Individuals who have entrepreneurial experience have per definition experienced the often burdensome process of setting up a company, and they have therefore exercised skills that are necessary in the exploitation phase, such as coping with ambiguity and resource marshalling. These individuals will therefore have a better understanding of their actual skill level as well as a better understanding of the value of these skills when it comes to performing entrepreneurial activities. It is therefore likely that for individuals with entrepreneurial experience it is their perceived level of exploitation skills that determines their level of entrepreneurial intentions. Individuals who lack this experience will have to rely on other sources than personal experience when it comes to assessing which skills are important when performing entrepreneurial activities. As there is an overt focus on the business plan in the media and in most entrepreneurship programmes (Fayolle, 2013; Gibb, 2002; Honig, 2004), it is likely that students who have to rely on these sources of information will tend to believe that evaluation skills such as planning and financial literacy are more important than exploration skills. It is therefore likely that for individuals

who lack entrepreneurial experience it is their perceived level of evaluation skills that determines their level of entrepreneurial intentions.

The analysis was re-run, but this time the sample was divided according to whether or not the students had any entrepreneurial experience. In figure 2 the results of this analysis are presented. The results for the 120 students who have entrepreneurial experience are presented within parentheses. As we can see in figure 2, the associations between evaluation and exploration skills and the students' level of entrepreneurial intentions are completely opposite for the two groups. It is only the level of entrepreneurial attitudes and the perceived level of exploitation skills that explain the level of entrepreneurial intentions for students with entrepreneurial experience. The perceived level in evaluation skills is actually close (p-value=.052) to having a significantly negative effect on these students' entrepreneurial intentions. The opposite is true for students who lack entrepreneurial experience. For these students the level of entrepreneurial intentions is positively associated with perceived creative ability, perceived evaluation skills, social norms and entrepreneurial attitudes. For this group there is in fact a significantly negative association between perceived exploitation skills and level of entrepreneurial intentions. The divergent influence that these two skill sets have on the two groups' level of entrepreneurial intentions explains the insignificant influence that they had on entrepreneurial intentions in the first analysis (figure 1).

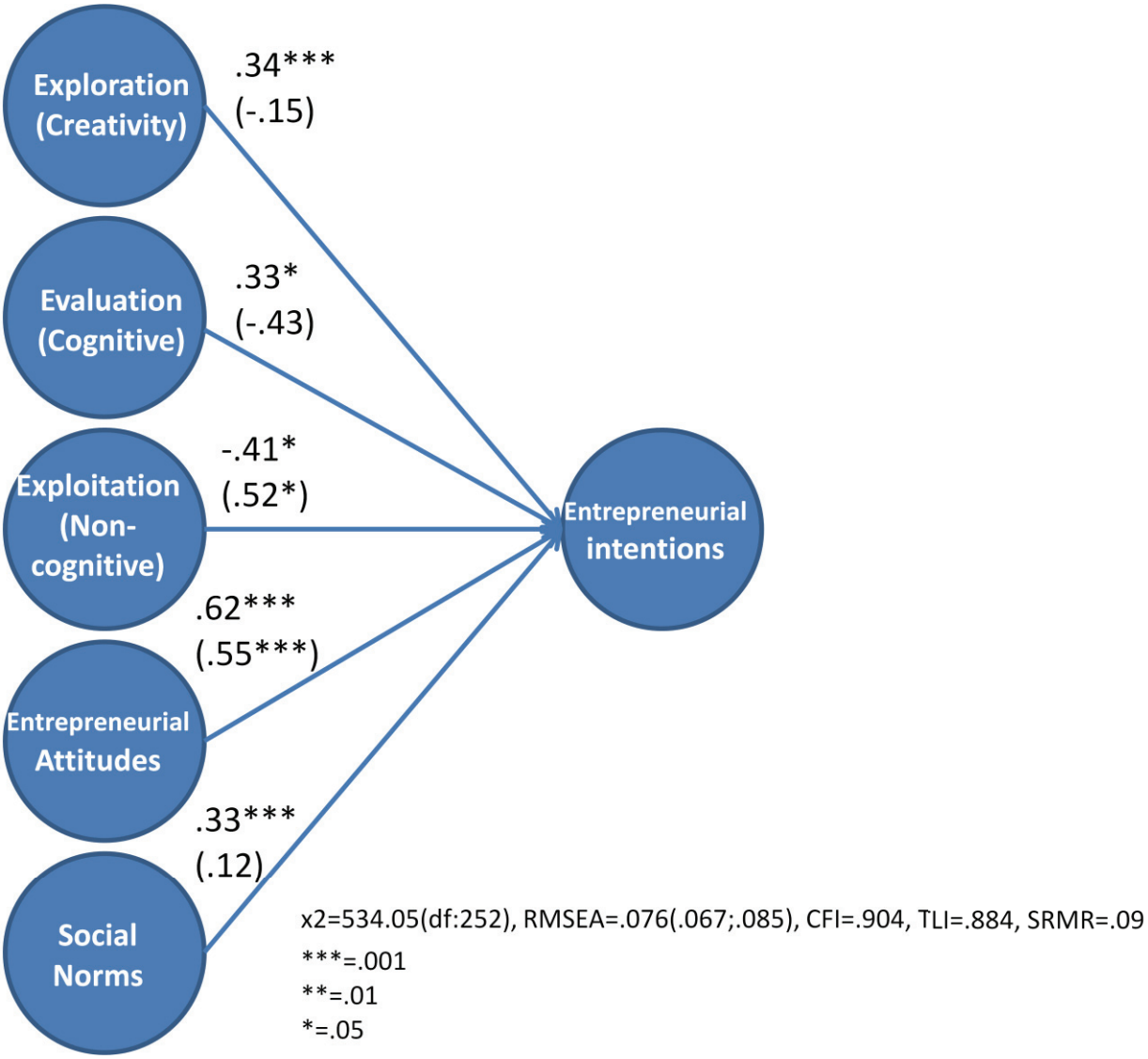

Figure 2: The structured association between ESE, social norms, and entrepreneurial attitudes with entrepreneurial intentions for students with and without entrepreneurial experience.

DISCUSSION AND IMPLICATIONS

The inclusion of ESE in assessment studies of entrepreneurship education has become increasingly popular during the last decades (Mauer et al., 2009). This makes good sense since an increase in the perceived level of competence in various entrepreneurial skills can be viewed as an important educational outcome, and it also offers important feedback to the educators and the programme

designers. Entrepreneurship education is, however, a heterogeneous field (Blenker et al., 2011; Neck & Greene, 2011), and different educational approaches have different objectives (Fayolle, 2013). It is therefore important that a measure that is intended for educational evaluations includes a wide scope of skills, so that the different influences of the various initiatives in the field may be assessed and analysed.

Popular ESE scales such as the ones developed by Chen et al. (1998), DeNoble et al. (1999), and McGee et al. (2009) all focus on a wide range of entrepreneurial skills, but unfortunately their dimensionality is questionable and the wording of their items is heavily jargon-biased. Jargon-biased scales are problematic to use in educational assessment studies, which often include students of various educational backgrounds and control groups, because it is naturally important that all respondents understand the questions and are able to assess their perceived skill levels in a meaningful way. It has also been problematic to replicate the dimensionality of the measures in subsequent studies, and, as a consequence, these scales have often been treated as one-dimensional measures in other researchers' analyses. The analysis in this paper demonstrates that the use of ESE as a one-dimensional construct is unfortunate, because the respondent's background influences the various dimensions of ESE in different ways. If the multidimensionality is not accounted for, it is likely that the diverging influence of the respondents' backgrounds on the measure will cancel out some, or all, of its effects.

The multidimensionality of an ESE scale is thus crucial, but the analyses in this paper also show that a focus on too many dimensions can be unwanted and counterproductive. Since previous ESE scales focused on multiple dimensions, the initial version of the refined scale presented in this paper focused on five dimensions. This version of the scale showed a high level of predictive validity and it was demonstrated that its items did not suffer from jargon-bias, as both entrepreneurship students and students in the control group understood the questions in the same

way, as did students with and without entrepreneurial experience. However, the convergent and discriminant validities of the constructs in this version of the scale were questionable. The lack of divergent validity can be explained by the specific focus of the skill sets and by their usefulness in different stages of an entrepreneurial project. Accordingly, the relatedness of some of the skill sets makes it difficult to empirically treat these skill sets as separate dimensions, even if they are conceptually different. A different conceptualisation of the dimensionality of the scale was therefore used and the indicators were structured according to their specific focus on the separate stages of an entrepreneurial project (exploration/evaluation/exploitation). In this version of the scale, which only included three conceptual dimensions, all constructs demonstrated sufficient levels of convergent and divergent validity.

Limiting the number of dimensions has several benefits since many assessment studies of entrepreneurship education have a limited number of respondents[24] and use a longitudinal design. The inclusion of multiple dimensions may strain the analysis and increase the risk of spurious correlations, because the number of indicators and constructs can quickly add up to unmanageable numbers when several rounds of data are collected (Little et al., 2002). On the other hand, it makes the analysis less nuanced to have a limited number of dimensions. However, since the skill sets that are especially useful in the separate stages of an entrepreneurial project differ to a high degree - as evaluation skills are typically cognitively-oriented and exploitation skills typically of a non-cognitive character - the overall differences, which these skill sets entail, can still be effectively captured and analysed with a limited number of dimensions.

The importance of treating ESE as a multidimensional measure was demonstrated in the analysis which applied the conceptual framework of the theory of planned behaviour (Ajzen, 1991, 2002). Neither perceived evaluation skills nor perceived exploitation skills seemed to influence the

[24] Many courses and programmes in entrepreneurship use action-based teaching methods, which limits the number of students that can be enrolled.

students' level of entrepreneurial intentions at first glance. However, when the variable *entrepreneurial experience* was included in the analysis it became clear that it had a diverging effect when it came to these two skill sets. It was actually only the perceived level of exploration skills and entrepreneurial attitudes that explained a high level of entrepreneurial intentions for students with entrepreneurial experience, whereas the perceived level of evaluation skills were close to having a significantly negative influence on their entrepreneurial intentions. The opposite was true for students who lacked entrepreneurial experience: their level of entrepreneurial intentions was positively influenced by their perceived level of exploration and evaluation skills as well as by social norms and entrepreneurial attitudes, whereas their perceived level of exploitation skills had a significantly negative influence on their entrepreneurial intentions.

It is not surprising that the perceived levels of evaluation skills and exploration skills have different degrees of influence on entrepreneurial intentions for students with and without prior entrepreneurial experience. Individuals with the experience of setting up a new venture have a better understanding of which types of skills are important in this process, whereas individuals who lack entrepreneurial experience need to rely on other sources to evaluate such a process. Since there is an overt focus on the business plan in many entrepreneurship programmes and in the media (Fayolle, 2013; Gibb, 2002; Honig, 2004; Neck & Greene, 2011), it is natural that students who lack entrepreneurial experience will perceive evaluation skills to be of the uppermost importance.

It is, however, somewhat puzzling that skill sets which entrepreneurship theory states are important to possess in order to effectively perform entrepreneurial activities - and which the analyses in this paper (table 4 and table 7) have demonstrated are characteristic for students with entrepreneurial experience - actually have a negative influence on entrepreneurial intentions. The negative association between non-cognitive entrepreneurial skills and the level of entrepreneurial intentions for students who lack entrepreneurial experience is a bit tricky to explain. The ability to

manage ambiguity and to be able to marshal resources has, however, become increasingly sought-for abilities in the labour market (Gibb, 2002; Humes, 2002). Many students attend courses in entrepreneurship in order to increase their entrepreneurial abilities and to become more attractive on the labour market rather than to further their career possibilities as self-employed (Blenker et al., 2011; Hannon, 2005). It is likely that this is typically the case for students who perceive that they have high levels of non-cognitive entrepreneurial skills.

What does this finding imply? First of all, I would argue that it points to the need of including hands-on entrepreneurial activities in entrepreneurship education because this would provide students with the opportunity of increasing their understanding of the kind of skills that are important when performing entrepreneurial activities. Most entrepreneurship researchers agree that entrepreneurship can only be learnt through practice (Fayolle, 2013; Gibb, 2002, 2011; Johannisson, 1991; Lackeus, 2013; Neck & Greene, 2011). Practice is important not only because it is an efficient way of learning entrepreneurial skills, but also because it offers students the opportunity to develop empathy with the life-world of the entrepreneur and to get an understanding of the uncertainty and intricacy which often characterize a career as self-employed (Gibb, 2011; Pittaway & Cope, 2007; Pittaway & Edwards, 2012; Pittaway & Thorpe, 2012; Shepherd, 2004).

Given this consensus about the importance of practice in entrepreneurship education, it is somewhat puzzling that the majority of initiatives within the field focus on preparation rather than on execution (Honig, 2004; Mwasalwiba, 2010; Pittaway & Edwards, 2012). There are, however, natural explanations for this. Non-cognitive skills are difficult to teach and assess (Cunha & Heckman, 2006). This makes it challenging to include entrepreneurial exploitation skills in educational settings (Honig, 2004; Kyrö, 2005; Lackeus, 2013; McMullan & Long, 1987). Even if we do see some improvement regarding assessment methods in entrepreneurship education, there is still a long way to go in this field (Pittaway & Edwards, 2012).

Secondly, I would argue that cognitively-oriented evaluation skills still have an important role to play. Even if there is consensus about the importance of hands-on experience we should not abandon the focus on other types of skills, especially not those that are easily codified and taught in a classroom setting. Since there is a strong focus on business planning skills in the media and at business schools (Honig, 2004), it is not surprising that students who perceive they have a low level of planning and financial skills are doubtful as to whether they are capable of pursuing a career as self-employed. It is important to change these students' skewed image of what entrepreneurship is and their idea of which skills are important, but a suggestion could also be to actually focus on teaching these students cognitively-oriented evaluation skills. The analyses in this paper showed that students perceive that they have low levels of financial literacy. This is a skill with which many students are unfamiliar but which can easily be taught in a classroom setting. When it comes to increasing self-efficacy, mastery experience is the most important aspect (Bandura, 1977a, 1977b, 1997). A short class in how to estimate a budget for a new project may very well take away the mystery of financial calculations and bring down the barriers that many students seem to have when it comes to finance.

In a sense, this leads us to a catch 22. On the one hand, it is important to convey to the students which types of skills are most important when it comes to executing entrepreneurial activities, but, on the other hand, we need to be careful not to downplay the role which evaluation skills play in this process, as they are important to students who lack entrepreneurial experience but who are considering a career as self-employed. However, the analyses in this paper also show that students with entrepreneurial experience do in fact perceive that they have higher levels in all the skill sets included in the scale compared to students without entrepreneurial experience. This implies that somewhere along the road they acquired the evaluation skills, so that even if their commitment and dedication to a career as self-employed is better explained by their perceived level

of exploitation skills, this does not mean that the former skills are unimportant. Education in entrepreneurship should thus focuses on fostering both cognitive and non-cognitive entrepreneurial skills. It is, however, important that we account for both the experience which the students have already and the experience they are provided with during their education, when we evaluate educational initiatives in the field of entrepreneurship.

Limitations and Recommendations to Future Research

The ESE scale presented in this paper has been demonstrated to have sufficient statistical properties and predictive validity in two different samples. This is an improvement compared to the three scales that the scale builds upon, since these were only tested in single sample analyses. Unlike the testing of the statistical properties of the measure, the analysis of what influence entrepreneurial experience has on the ESE dimensions when it comes to explaining entrepreneurial intentions only relied on a single sample, and in order to confirm the findings replication studies are needed. Furthermore, the analyses presented in this paper all rely on cross-sectional data, which limits the conclusions that can be made, as only associations have been identified, not causal relationships. In order to increase the robustness of the findings longitudinal data are needed.

As it has been the focus of this paper to adapt the ESE measure to educational assessment studies of entrepreneurship education, it is natural that students (with and without entrepreneurial experience) have been used in the samples. However, it would be desirable to also test the scale with samples including practicing entrepreneurs, intrapreneurs, and nascent entrepreneurs, who are not enrolled at universities. This would increase the robustness of the predictive validity of the measure as well as allow for further investigations of the effects which previous entrepreneurial experience and other types of backgrounds and contextual settings may have on the dimensions of the measure. It would also be interesting to longitudinally follow students who are enrolled in

different types of entrepreneurship programmes and analyse how the influence of the different dimensions in the ESE scale on the students' entrepreneurial intentions and behaviour changes during this process, as well as to compare which approaches and which skills are most important in the long term.

Concluding Remarks

In this paper a refined ESE scale adapted to educational assessment studies of entrepreneurship education was presented. The predictive validity, dimensionality, and statistical properties of the scale were tested in two student samples including a total of 970 respondents. It is based on three established ESE scales but it includes fewer indicators and constructs, which makes it suitable to assessments studies of entrepreneurship education, which typically include longitudinal data and few respondents. The skill sets included in the scale are structured according to their focus on different stages in an entrepreneurial project (exploration/evaluation/exploitation) and consequently according to whether they are cognitive or non-cognitive. Students with entrepreneurial experience had significantly higher perceived levels in all of the skill sets included in the scale, which demonstrates the predictive validity of the scale. Furthermore, by testing the factorial invariance of the constructs in the scale, it was demonstrated that the respondents understood the questions in the same way regardless of their educational and entrepreneurial background.

Since many assessment studies have shown inconclusive results when it comes to the association between ESE and entrepreneurial intentions, it was analysed in what way entrepreneurial experience influences this relationship. It was found that only the perceived level of exploitation skills and entrepreneurial attitudes had a positive influence on the entrepreneurial intentions of students with entrepreneurial experience, whereas the perceived level of evaluation skills was close to having a significantly negative influence on this variable. For students who lack

entrepreneurial experience, it was the perceived level of evaluation skills that, together with the perceived level of exploration skills, social norms, and entrepreneurial attitudes, had a strong positive influence on the entrepreneurial intentions, whereas the exploitation skills had in fact a negative influence on this variable. This finding underlines the importance of treating ESE as a multidimensional variable, but it also gives us an insight into how different students perceive entrepreneurship, and which skills they perceive as most important during different stages in their entrepreneurial processes, as well as how we should design courses and programmes in the field in order to address these different needs.

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APPENDIX A

Search/Creativity	**Scale(s)**
2. Identify ways to combine resources in new ways to achieve goals	The Chen
6. Brainstorm (come up with) new ideas	The McGee-scale
26. Think outside the box	Own
29. Identify opportunities for new ways to conduct activities	The Chen-scale/The DeNoble-Scale
31. Identify creative ways to get things done with limited resources	The DeNoble-scale
Planning/Management	
4. Manage time in projects	The Chen-scale
8. Conduct analysis for a project that aims to solve a problem	The Chen-scale
17. Set and achieve project goals	The McGee-scale
22. Design an effective project plan to achieve goals	The McGee-scale
Marshalling	
1. Lead and manage a team	The DeNoble-scale
7. Put together the right group/team in order to solve a specific problem	The DeNoble-scale
10. Form partnerships in order to achieve goals	The DeNoble-scale
15. Identify potential sources of resources	The DeNoble-scale
16. Network (i.e. make contact with and exchange information with others)	The McGee-scale
20. Get others to identify with and believe in my visions and plans	The McGee-scale
24. Clearly and concisely explain verbally/in writing my ideas in everyday terms	The McGee-scale
32. Proactively take action and practically apply your knowledge	Own
Managing Ambiguity	
3. Improvise when I do not know what the right action/decision might be in a problematic situation	Own
5. Tolerate unexpected change	The DeNoble-scale
14. Persist in face of setbacks	The DeNoble-scale
19. Learn from failure	Own
21. Manage uncertainty in projects and processes	The Chen-scale/The DeNoble-scale
23. Exercise flexibility in complicated situations when both means and goals are hard to establish	The DeNoble-scale
25. Work productively under continuous stress, pressure and conflict	The Chen-scale/The DeNoble-scale
28. Make decisions in uncertain situations when the outcomes are hard to predict	The Chen-scale
Financial Knowledge	
9. Read and interpret financial statements	The McGee-scale
18. Perform financial analysis	The Chen-scale
27. Control costs for projects	The Chen-scale
30. Estimate a budget for a new project	The McGee-scale

Entrepreneurial attitudes	The McGee-scale
In general, starting a business is…	
WORTHLESS - WORTHWHILE	
DISAPPOINTING - REWARDING	
NEGATIVE-POSITIVE	
Entrepreneurial intentions	Krueger & Brazeal (1994)
Strongly consider setting up my own business	
Am willing to work hard to set up my own business	
Have been preparing to set up my own business	
Social norms	Own
I know many people that would be useful if I wanted to start a company	
Many people in my network are interested in entrepreneurship	
I would get good support from my network if I wanted to start a company	

APPENDIX B

MODEL 1 Entrepreneurial intentions ON	**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**		**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**
Entrepreneurial Attitudes	.654	.109	6.022	.000	**Entrepreneurial Attitudes WITH**				
Social norms	.322	.086	3.719	.000	Social norms	.386	.067	5.784	.000
Exploration (creativity)	-.173	.159	-1.088	.277	Exploration (creativity)	.209	.054	3.884	.000
Evaluation (Cognitive)	.195	.140	1.389	.165	Evaluation (Cognitive)	.232	.046	4.988	.000
Exploitation (Non-cognitive)	.423	.112	3.771	.000	Exploitation (Non-cognitive)	.194	.044	4.412	.000
Social norms WITH					**Exploration (creativity) WITH**				
Exploration (creativity)	.418	.066	6.319	.000	Evaluation (Cognitive)	.288	.049	5.898	.000
Evaluation (Cognitive)	.287	.056	5.075	.000	Exploitation (Non-cognitive)	.400	.049	8.246	.000
Exploitation (Non-cognitive)	.351	.056	6.319	.000	**Evaluation WITH Exploitation**	.403	.043	9.299	.000
x^2=380.44 (df:120), RMSEA= .075(.066-.083), CFI=.921, TLI=.899, SRMR=.066									

MODEL 2 No experience (N=269) Entrepreneurial intentions ON	**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**		**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**
Entrepreneurial Attitudes	.617	.129	4.791	.000	**Entrepreneurial Attitudes WITH**				
Social norms	.325	.094	3.466	.001	Social norms	.337	.070	4.792	.000
Exploration (creativity)	.335	.102	3.274	.001	Exploration (creativity)	.139	.056	2.470	.014
Evaluation (Cognitive)	.332	.146	2.272	.023	Evaluation (Cognitive)	.164	.047	3.478	.001
Exploitation (Non-cognitive)	-.408	.171	-2.395	.017	Exploitation (Non-cognitive)	.157	.044	3.549	.000
Social norms WITH					**Exploration (creativity) WITH**				
Exploration (creativity)	.357	.078	4.544	.000	Evaluation (Cognitive)	.199	.055	3.608	.000
Evaluation (Cognitive)	.280	.066	4.242	.000	Exploitation (Non-cognitive)	.335	.054	6.152	.000
Exploitation (Non-cognitive)	.346	.070	4.792	.000	**Evaluation WITH Exploitation**	.345	.047	7.310	.000
With experience (N=120) Entrepreneurial intentions ON	**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**		**Estimate**	**S.E.**	**Est./S.E.**	**Two-tailed P-Value**
Entrepreneurial Attitudes	.549	.127	4.336	.000	**Entrepreneurial Attitudes WITH**				
Social norms	.121	.128	.942	.346	Social norms	.302	.124	2.437	.015
Exploration (creativity)	-.153	.317	-.483	.629	Exploration (creativity)	.110	.082	1.341	.180
Evaluation (Cognitive)	-.425	.218	-1.946	.052	Evaluation (Cognitive)	.242	.094	2.583	.010
Exploitation (Non-cognitive)	.552	.262	2.111	.035	Exploitation (Non-cognitive)	.154	.089	1.738	.082
Social norms WITH					**Exploration (creativity) WITH**				
Exploration (creativity)	.222	.083	2.667	.008	Evaluation (Cognitive)	.240	.066	3.654	.000
Evaluation (Cognitive)	.107	.092	1.169	.242	Exploitation (Non-cognitive)	.316	.066	4.812	.000
Exploitation (Non-cognitive)	.182	.089	2.049	.040	**Evaluation WITH Exploitation**	.404	.076	5.304	.000
x^2=534.05(df:252), RMSEA= .076(.067-.085), CFI=.904, TLI=.884, SRMR=.090									

4. THE ROLE OF OWNERSHIP AND CONTEXTUAL BACKGROUND KNOWLEDGE IN ENTREPRENEURSHIP EDUCATION

ABSTRACT: This paper analyses the influence which the involvement of students' prior contextual knowledge and student ownership of the entrepreneurial project in entrepreneurship programmes have on students' entrepreneurial self-efficacy and their entrepreneurial behaviour. 220 students in eight entrepreneurship programmes have been followed over a year. In four of these programmes the students are the initiators of their entrepreneurial projects, and the focus on involving the students' prior contextual knowledge in the education process is high. These programmes are categorized as belonging to the individually-centred approach to entrepreneurship education. In the other four programmes the focus is on teaching cognitively-oriented entrepreneurial skills, and here the students are engaged in innovation projects within established organizations. These programmes are categorized as belonging to the instrumentally-oriented approach to entrepreneurship education. By applying longitudinal structural equation modelling the influence which these two approaches have on students' entrepreneurial self-efficacy and entrepreneurial behaviour is assessed.

KEY WORDS: Entrepreneurship education, programme evaluation, entrepreneurial self-efficacy, non-cognitive skills

INTRODUCTION

The economy has experienced a significant change during the last decades. As an effect of the globalization process the economy, the labour markets as well as societies and social structures are increasingly characterized by constant change and dynamic transformation (Lundvall, 1992). To cope with this constant change it has become increasingly important to have the competence to act entrepreneurially in many different situations, not just in the act of new venture creation (Gibb, 2002a, 2002b; Jones & Iredale, 2010). This has increased the interest in fostering entrepreneurial abilities and skills through education (Hannon, 2005). There are, however, many ways to teach these entrepreneurial abilities and skills (Blenker, Korsgaard, Neergaard & Thrane, 2011; Heinonen & Hytti, 2010; Neck & Greene, 2011).

Collaboration with tech transfer offices and project assignments which involve hands-on experience with innovation projects in established organizations are increasingly viewed as important components in entrepreneurial programmes and courses (Laukkanen, 2000; Rasmussen & Sørheim, 2006). This approach to entrepreneurship education provides students with the opportunity to work with entrepreneurial ventures of high innovative potential, while at the same time making it possible for the universities to perform their "third assignment", that is, to actively engage in and create value for the surrounding society (Etzkowitz, Webster, Gebhardt & Terra, 2000; Heinonen & Hytti, 2010). Although this approach has many benefits it can, however, be argued that it lacks elements which are central in entrepreneurial learning. Much research in entrepreneurship focuses on ownership as a central ingredient in entrepreneurial activities (see for example Foss & Klein, 2012; Klein, 2008) as well as in entrepreneurial learning (Cardon, Zietsma, Saparito, Matherne & Davis, 2005; Cope, 2003; 2005; Politis, 2005). Furthermore, the role which prior experience plays in new venture creation processes has become increasingly recognized (Baron, 2006; Sarasvathy, 2001, 2008; Shane, 2000; Shane & Venkataraman, 2000). If the

educational approach does not focus on these elements it is questionable to what extent actual entrepreneurial learning can take place (Gibb, 2002b).

Little is known about the effects which different approaches to entrepreneurship education have on students' learning process, as very few studies have been performed in which the focus is on the learning outcomes of different types of programmes and curricular designs (Fayolle, 2013; Kickul, Wilson & Marlino, 2004; Pittaway & Cope, 2006). In order to remedy this, this paper presents a survey involving eight different entrepreneurship programmes. Four of these programmes have a curricular design which focuses on teaching entrepreneurship by engaging the students in innovation projects owned by a third party. The other four programmes have a curricular design which focuses on new venture creation by involving the students' own contextual background knowledge in the entrepreneurial projects, which the students themselves initiate during the educational process. The effects of these different types of programmes are measured by the programmes' impact on students' entrepreneurial activities and entrepreneurial self-efficacy (ESE). ESE is a measure that has been proven to be a good indicator of entrepreneurial learning as it is multidimensional and focuses on the students' perceived ability to perform various entrepreneurial activities (Mauer, Neergaard & Kirketerp, 2009). A quasi-experimental design using pre and post tests is used. In all, the survey includes ex ante and ex post responses of 220 students. Structural equation is used in order to investigate the effects of the programmes.

The paper starts with a brief review of research in entrepreneurship and entrepreneurial learning, which focuses especially on the role which ownership and prior contextual knowledge play in entrepreneurial processes as well as in entrepreneurial learning. This is followed by a presentation of the theoretical model and the hypotheses, which are then tested and analysed. The paper ends with a discussion of the results and the implications as well as with a discussion of the limitations of the survey design.

THEORETICAL BACKGROUND

In this section two approaches to entrepreneurship education are presented. Building on theory about entrepreneurial passion (Cardon, Wincent, Singh & Drnovsek, 2009), entrepreneurial learning (Cope, 2005; Politis, 2005), ownership (Foss & Klein, 2012; Gibb, 2002a), and the use of prior contextual knowledge (Baron, 2006; Sarasvathy, 2008; Shane, 2000), the two approaches are contrasted, especially on two dimensions where they differ: the role of ownership and the involvement of prior contextual knowledge. The approaches which focus on supplying students with business embryos by collaborating with third parties such as tech transfer offices and ongoing innovation projects in established organizations will be presented first. Since these approaches have a strong focus on monitoring the venture process and the learning process, these approaches are called *instrumentally-oriented* approaches in this paper. When the focus is more on including the students' prior contextual knowledge and interests in the entrepreneurial venture process, which the students initiate and have ownership of, the individuals and their personal characteristics have a more central role in the learning process. Educational approaches which focus on these elements are therefore called *individually-centred* approaches in this paper.

Instrumentally-oriented Approaches to Entrepreneurship Education

Entrepreneurship education has during the last decades become increasingly popular at institutions of higher education since it has become recognized as an efficient means to develop entrepreneurial skills and abilities and to increase the students' understanding of how to apply and create value with their knowledge (Gibb, 2002a, 2002b; Hannon, 2005; Kuratko, 2005). The increased interest in the discipline can be viewed as a natural development since the pressure on universities to create growth and to commercialize university research has increased (Fayolle & Redford, 2014; Heinonen & Hytti, 2010). Many lecturers are, however, worried about the quality of students'

venture ideas and whether these will have a too low innovation potential; since the innovation potential to a large degree determines the usefulness of the ideas, both when it comes to the learning process and when it comes to the potential to create real value (Rasmussen & Sørheim, 2006). According to Laukkanen (2000), this should be remedied by providing the students with readymade "business embryos", which allows the lecturers to focus more on the value creation and to control the students' entrepreneurial processes. These business embryos may come from the universities' tech transfer offices, but they can also be found in established organizations, which have become increasingly common due to the increasing recognition of strategic entrepreneurship, that is, new venture creation within established organizations (Foss & Lyngsie, 2012).

The main idea with these types of industry collaboration is to give students the opportunity to get hands-on experience with the knowledge they obtain in the classroom and to experience the ambiguity and contingency that characterise entrepreneurial activities (Laukkanen, 2000), at the same time that they become acquainted with the entrepreneurial ecosystem and its actors (Klofsten, 1998). Entrepreneurial activities are indeed novel and unfamiliar to many students, and as it has been recognized that learning most effectively takes place when activities are recognized as moderately novel and correspond to existing cognitive schemas (McNally, 1973; Piage, 1950), it could be argued that an approach which is more apprenticeship-like is preferable over an approach where new venture approaches are created from scratch (Hindle, 2007). This combination of real life projects and academic instructions makes it possible for the students to incrementally increase their entrepreneurial skills and capabilities, and to step-wise develop their familiarity with the entrepreneurial practice.

Collaboration with third parties, such as tech transfer offices and established organizations, does, however, require a high level of trust between the actors involved. It is often necessary to abide by the professional values and beliefs that are practiced by the partnering organizations, and

since established innovation projects are typically resource insensitive, the room for failures is limited and predictive methods are often favoured over trial and error procedures (Gibb, 2002b). It is also important that the projects which the students engage in are aligned with what they are taught in the classroom and that it is possible for the lecturers to be arbiters of the learning process. This does, however, create a situation where both the learning process and the venture activities performed by the students are closely monitored.

These types of entrepreneurship education are thus close to what Neck and Greene (2011) characterize as process-oriented approaches, since the need to control the learning process typically leads to a strong focus on analytical and cognitively-oriented skills which, according to Heckman, Stixrud, and Urzua (2006), are easy to teach and assess by educational institutions, but which give the impression that the entrepreneurial process is linear in its character (Gibb, 2002b; Honig, 2004). The strong focus on the generic venture process, on codifiable knowledge, taken together with the limited room for failures, makes these approaches somewhat instrumental in their character. Henceforth these approaches will therefore be referred to as instrumentally-oriented.

Even if these instrumentally-oriented approaches have many advantages, especially when it comes to their applicability in educational settings, they do lack important elements that are necessary in order to develop an understanding and empathy for the entrepreneurial life world (Gibb, 2002b). By focusing on existing innovation projects, these approaches disregard advances made in research on entrepreneurial learning and how such learning unfolds as a distinctive result of ownership (Cope, 2005; Cope & Watts, 2000; Gibb, 2002a, 2002b) as well as the role which prior contextual knowledge plays in this process (Baron, 2006; Shane, 2000). In the following these research perspectives will therefore be outlined in more detail, since they are central in the more individually-centred approaches to entrepreneurship education.

The Role of Ownership in Entrepreneurial Learning

Entrepreneurs commit significant personal resources and expose themselves and the people close to them to financial, emotional and social risks (Cardon, et al., 2005; Cope, 2003). As there is an intimate relationship between the entrepreneur and his/her company, entrepreneurial learning typically unfolds as results of reflection on critical incidents that spur emotional distress and turbulence (Cope & Watts, 2000). This learning perspective is in line with the views of learning as an experiential process (Kolb, 1984; Politis, 2005; Wolf & Kolb, 1984) as well as a transformational experience (Mezirow, 1991). The key ingredient in this learning process is ownership (Cope, 2003). The interrelationship between the entrepreneur and his or her company results in the consecutive intense emotional feelings, both disturbing (Cope & Watts, 2000) and affirmative (Cardon et al., 2005), and increased intrinsic motivation (Ruohotie & Karanen, 2000; Gagné & Deci, 2005).

The research on emotional turbulence and its affect on entrepreneurial learning has mainly focused on crises and negative critical events (Cope 2003, 2005). There is, however, also a long line of research about the role entrepreneurial passion plays in the venture creation process (Cardon et al., 2009). Entrepreneurial passion can fuel motivation and increase both willingness to work long hours and persistence in the face of setbacks (Bierly, Kessler & Christensen, 2000; Bird, 1989; Brännback, Carsrud, Elfving & Krueger, 2006; Lackeus, 2013; Smilor, 1997). The ability to manage and cope with failure and its emotional effects is an important part of entrepreneurship education (Shepherd, 2004), but so is instilling passion for the entrepreneurial venture process (Cardon et al., 2009). The financial and emotional exposure is rarely of the same degree for students as for entrepreneurs (Pittaway & Thorpe, 2012), but when students are initiators and owners of their own entrepreneurial projects, this kind of exposure will increase (Pittaway & Cope, 2006) and will at the same time affect their entrepreneurial passion and motivation for performing the projects

(Souitaris, Zerbinati & Al-Laham, 2007). By using the students' ownership of their venture project as the focal point of learning, students will have the opportunity to learn how it is to act as an entrepreneur, including the responsibility, loneliness and liability of newness that accompany new venture creation (Gibb, 2002b).

Prior Contextual Knowledge

Experience and contextual knowledge are central in all entrepreneurial learning processes (Cope & Watts, 2000; Politis, 2005). In the view of Sarasvathy (2001, 2008), the first step in an entrepreneurial process is for the potential venture creator to start by asking: *Who am I?, What do I know?,* and *Whom do I know?* The answers to these questions should to a large extent determine what type of venture process the entrepreneur ought to engage in, as it affects the enthusiasm and motivation he/she will bring to the project as well as his/her suitableness to engage in it (Sarasvathy, 2008). The individuals' prior contextual knowledge has also been demonstrated to have a significant effect on how they approach and exploit entrepreneurial opportunities (Politis, 2005).

By investigating how completely different venture ideas could stem from the same technology, Shane (2000) demonstrated the role which past experience - both practical and educational - plays in the process of opportunity identification, evaluation and exploitation. Depending on the background of the entrepreneurs their contextual knowledge of for example markets, customer preferences, or delivery methods differs to a large degree, which influences the kind of applications and functions they are likely to see in, for example, a new generic technology (Aldrich, 1999; Johnson, 1986; Shane, 2000; Shane & Venkataraman, 2000).

Also Baron (2006) recognizes the role which previous experience and contextual knowledge play in entrepreneurial processes. In his theory of how entrepreneurs use pattern recognition in the

process of discovering entrepreneurial opportunities, the use of prior contextual knowledge is a central element. Highly successful entrepreneurs have been found to seek information about new business opportunities in more unique and context specific sources, such as their networks, and in sector specific publications rather than in public information, such as newspapers and trade publications (Hills & Shrader, 1998; Shane, 2003). Fiet, Clouse and Norton (2004) found that this active search was performed within areas where the entrepreneurs possessed substantial knowledge. By using their contextual knowledge, successful entrepreneurs are able to "connect the dots" between new general trends and developments and the markets which they have a background in and, thus, identify patterns that are not visible to others (Baron, 2006, 2012; Busenitz & Barney, 1997). The breadth of the entrepreneurs' social network is of vast importance in this process as it opens up for a larger pool of contextual knowledge and input (Davidsson & Honig, 2003; Hills, Lumpkin & Singh, 1997).

Individually-centred Approaches to Entrepreneurship Education

As the brief review above demonstrates, ownership is a central aspect of entrepreneurship and in entrepreneurial learning. In order to develop empathy for the life world of entrepreneurs it is therefore important that students feel a high level of psychological ownership over the venture projects they engage in (Gibb, 2002b; Pittaway & Cope, 2006). Furthermore, the research by Sarasvathy (2001, 2008), as well as by Baron (2006, 2012) and Shane (2000, 2003), demonstrates that it is important to involve the students' prior contextual knowledge and specific interests in the educational process. These two elements can easily be combined by allowing the students to be the initiators of the venture projects. In order to instil passion for the venture projects (Cardon et al., 2009; Cardon et al., 2005) it is, however, important that the activities are not only aligned with the students' interests and prior contextual knowledge, but also that the students understand how they

can create value for others with these means (Sarasvathy, 2008). In this sense, it is important that entrepreneurship students become re-attached in their relationship to knowledge and understand the role it plays in their everyday lives, but also how it relates to other people's everyday problems (Blenker, et al., 2011; Spinosa, Flores & Dreyfus, 1997).

The exploration phase is thus of high importance in individually-centred approaches to entrepreneurship education, but rather than using predictive management methods which are commonly practiced by large corporations, these approaches typically focus on exploitation activities as an important input in the moulding of the venture ideas (Sarasvathy, 2008; Spinosa et al., 1997). The focus in these non-linear approaches is therefore predominantly on skills such as creativity, how to manage ambiguity, and how to marshal resources (Neck & Greene, 2011), which are typically recognized as non-cognitive entrepreneurial skills (Rosendahl-Huber, Sloof & Van Praag, 2012). Naturally, cognitively-oriented entrepreneurial skills are also important in these approaches. In order to be perceived as credible by stake-holders, the students need to be literate in business planning, but entrepreneurial finance and planning are also necessary skills to possess in order to understand and fully grasp the value creation process and how this affects all partners involved (Delmar & Shane, 2003, 2006; Stevenson, Roberts & Grousbeck, 1985). However, since the focus of these approaches is more on re-attaching the students to the knowledge they possess and developing a competence in understanding how they can create value with this knowledge (Blenker et al., 2011), while at the same time they are developing empathy for the life world of the entrepreneur (Gibb, 2002b), the focus is mainly on exploitation activities and non-cognitive entrepreneurial skills (Neck & Greene, 2011).

This brief review of different approaches to entrepreneurship education and how the focus on ownership and prior contextual knowledge separates them clearly indicates that we can expect different effects of these approaches on students' entrepreneurial behaviour and entrepreneurial

self-efficacy. In the next section the theoretical model and the hypotheses about the effects of different approaches to entrepreneurship education are presented.

Theoretical Model and Hypotheses

The brief review presented above about the role which ownership and prior contextual knowledge play in entrepreneurial learning indicates that we can expect different results, both regarding learning and entrepreneurial activities, depending on the extent to which programmes in entrepreneurship include and focus on these dimensions.

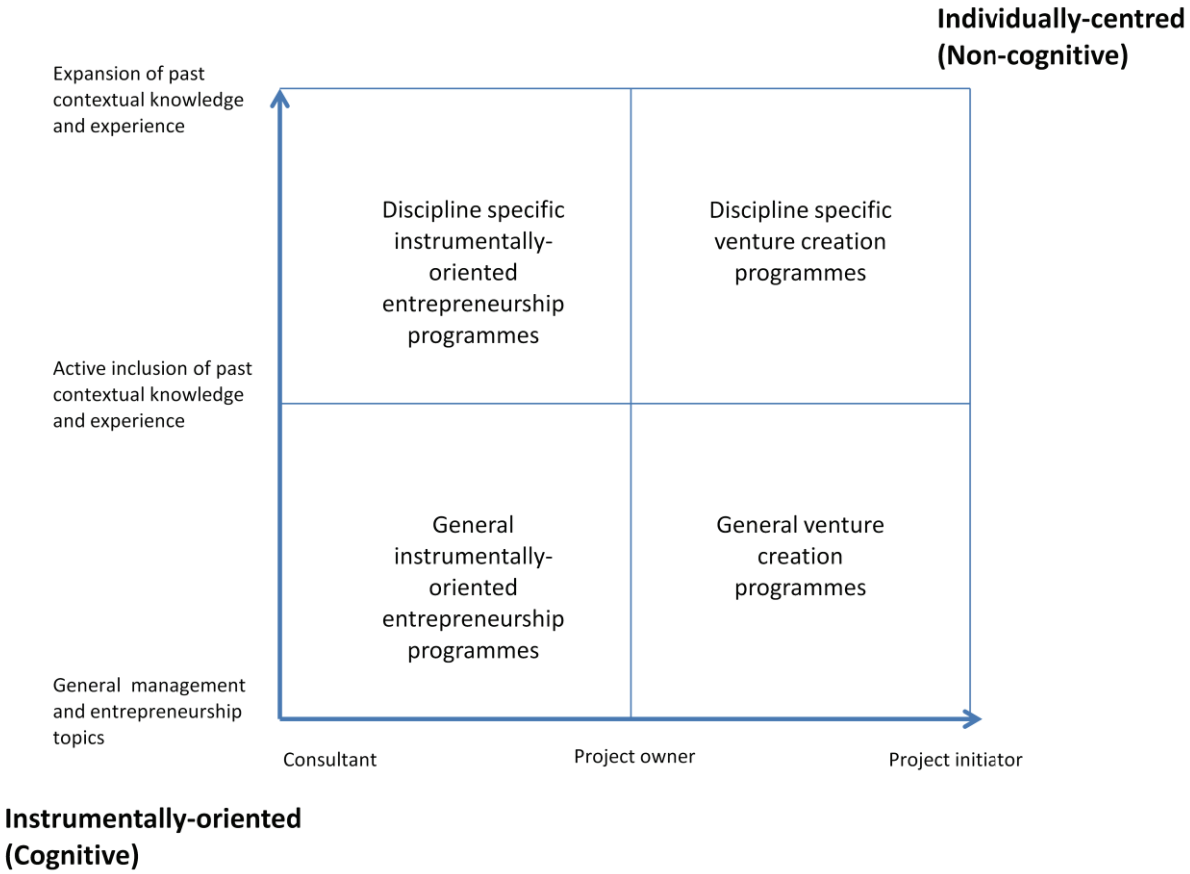


Figure 1: The theoretical model

Figure 1 presents the theoretical model regarding focus on ownership and involvement of prior contextual knowledge as well as how different entrepreneurship programmes are positioned

according to this categorization. As we can see in figure 1, it is possible to derive four different ideal types of entrepreneurship programmes: 1) *General instrumentally-oriented entrepreneurship programmes*; 2) *General venture creation programmes*; 3) *Discipline specific instrumentally-oriented entrepreneurship programmes*; and 4) *Discipline specific venture creation programmes*. This categorization also points out whether the focus of the programmes is predominantly on fostering cognitive or non-cognitive entrepreneurial skills. Naturally, there can be many more ways to structure entrepreneurship programmes than the four categories presented here since entrepreneurship education is a very heterogeneous field (Blenker et al., 2011; Fayolle & Gailly, 2008). The four categories should, however, be viewed as ideal types which incorporate a large variety of different programme designs. Corporate venturing programmes, for example, would typically be placed in the left side categories since the students' level of ownership of the educational projects is typically minimal. This need not be the case, however, as students, also in corporate venture programmes, can have a high level of ownership of the projects they engage in, even if these are located in established organizations.

The use of prior contextual knowledge will, typically, play an important role in these types of corporate venture programmes, as it will influence the possibilities for students to initiate and take ownership of the venture projects. This is also the case for general venture creation programmes, which are in general located at a business school and have a curriculum which is dominated by generic management and entrepreneurship topics. In these types of programmes it is important that the contextual background knowledge that the students possess in fields other than management is included in the venture creation projects, and that the learning process takes its focal point in these projects. In order to move from the instrumentally-oriented approach to a more individually-centred approach the focus should not only be on one of the dimensions, as they are clearly interconnected (Gibb, 2002b; Sarasvathy, 2008). The differences between instrumentally-oriented and individually-

centred entrepreneurship programmes can, thus, be determined by drawing a diagonal line from the upper-left corner down to the lower right.

The effects of instrumentally-oriented and individually-centred entrepreneurship education on ESE

A key aspect of self-efficacy is that it is task-related and can be changed (Hollenbeck & Hall, 2004). In order to increase self-efficacy there are, according to Bandura, four different strategies that can be used: 1) mastery experience, 2) modelling, 3) social/verbal persuasion, and 4) judgement about physiological and affective states (Bandura, 1977a, 1977b, 1982, 1997; Wood & Bandura, 1989). According to Bandura the most important dimension to focus on is mastery experience which is created through repeated performance accomplishment when engaging in challenging tasks (Wood & Bandura, 1989). When it comes to entrepreneurship education it is somewhat problematic to create these master experiences due to the limited amount of time in combination with the structure and requirements which tertiary level education has to live up to (Mauer et al., 2009). It is, however, possible to divide the entrepreneurial process into various milestones and to focus on different types of skill sets that are needed in order to perform entrepreneurial activities (Chen, Greene & Crick, 1998; Hindle, 2007; Honig, 2004).

In process-oriented approaches to entrepreneurship education - such as the instrumentally-oriented approaches - where the focus is on fostering cognitive entrepreneurial skills, this division of entrepreneurial activities is often used as the learning strategy, since it allows for an incremental improvement of the students' confidence in their ability to perform various entrepreneurial skills (Neck & Greene, 2011). When the educational approaches have a more holistic character and the focus is especially on the exploitation phase, the lecturers take a higher risk since it is difficult to predict and monitor the learning process (Gibb, 2002b; Neck & Greene, 2011) which may often be perceived as disruptive to many students (Kyrö, 2005; Lackeus, 2013). Mastery experience requires

a high level of perseverance, which typically spurs from passion and engagement (Brännback,et al., 2006; Cardon et al., 2009; Smilor, 1997). In order to fuel this passion a high level of ownership of the projects is needed (Gibb, 2002a; Pittaway & Cope, 2007) as well as involvement of the students' prior contextual knowledge (Sarasvathy, 2008), but since new venture activities are typically perceived as unfamiliar to most students it can be expected that individually-oriented approaches to entrepreneurship education to a high degree changes the students' perception of their entrepreneurial abilities.

Modelling and vicarious learning as well as social and verbal persuasion are, however, also important elements in the process of building self-efficacy (Bandura, 1982), as it is not only individual efficacy which is important in deciding whether or not a behaviour is preferable. Task-specific self-efficacy, such as ESE, operates in the individual-environment nexus and, depending on the responsiveness of the social system to the activities involved in the task (that is, are they rewarded and appreciated or disregarded or even punished), to a large extent determines the likeliness that individuals successfully engage in such behaviour (Mauer et al., 2009; Pittaway & Pittaway & Cope, 2006). Entrepreneurial activities are typically perceived as risky (Mauer et al., 2009; Sarasvathy, 2008), and in many business schools a corporate career is regarded as more prestigious (Blenker, Dreisler & Kjeldsen, 2006; Gibb, 2002a, 2002b). In order to create an environment that is supportive of entrepreneurship it is important that acceptance of failure is high and that students are met with encouragement rather than with criticism when they iterate their ideas (Neck & Greene, 2001; Pittaway & Cope, 2006; Sarasvathy, 2008).

In instrumentally-oriented approaches the room for failure is limited, as the projects are owned by a third part, and the knowledge which the students are allowed to use is typically restricted to what they are currently being taught in the classroom. The role models in these educational approaches typically come from established organizations or tech transfer offices,

which, in effect, rather foster risk-minimizing corporate businesses or administrative mindsets. Students with a low level of confidence in their exploitation abilities will thus be reluctant to apply their knowledge in creative and risky ways. This risk-adverse behaviour limits the extent to which the educational experience will alter the students' self-efficacy, which can be expected to change only incrementally.

In individually-centred approaches where the focus is on experimentation and execution, and where the students are expected to use and apply their contextual background knowledge, it can be expected that the students will function as role models to one another. Since failure is viewed as a natural part of the entrepreneurial process, which involves constant iterations and trial and error, it is in this approach not only accepted, but also encouraged, that the students take risks and discover creative ways to apply their knowledge (Neck & Greene, 2011). It can therefore be expected that also students with a low level of confidence in their abilities will dare to put them to use, which can thus lead to radical changes in the students' perceptions of their ESE.

This is related to Bandura's (1982) fourth dimension of self-efficacy, which is judgement about physiological and affective states. It is important to know your limits as well as your comfort zone (Mauer et al., 2009). Psychological and physiological signs are interpreted in different ways by different individuals. Failures and setbacks can cause different amounts of stress in two different individuals, and anxiety to perform a specific task can contribute to the likelihood of failure (Gist & Mitchell, 1992). Entrepreneurship is typically related to many challenges, risks and uncertainty, and it is important for the students to learn how they react in the stressful situations which are bound to occur in the process (Shepherd, 2004). When students are the initiators and owners of their own entrepreneurial projects, it becomes possible to mimic the learning that entrepreneurs experience in these processes (Pittaway & Cope, 2006). This process of not only learning how to act entrepreneurially but also understanding how it feels to do it offers an opportunity for students to

understand and cope with their signs of stress and discomfort (Gibb, 2000b; Mauer et al., 2009; Shepherd, 2004).

The instrumentally-oriented and the individually-centred approaches clearly differ in all four dimensions which according to Bandura (1982) are important antecedents to self-efficacy. Whereas the instrumentally-oriented approaches only affect the students' ESE incrementally, the individually-centred approaches can be expected to have a more disruptive affect on the students. The first hypothesis is accordingly:

H1: Individually-centred programmes will to a higher degree change the students' perception of their ESE than instrumentally-oriented programmes.

As demonstrated in figure 1, the two approaches to entrepreneurship education also differ when it comes to which skill sets they focus on. In instrumentally-oriented approaches the focus is predominantly on cognitively-oriented entrepreneurial skills which are dominated by declarative knowledge, that is, knowledge that is easy to codify and convey. These skills are taught to the students through a combination of lectures and practical applications, as the students are expected to apply the knowledge they learn in the classroom in their entrepreneurial projects (Laukkanen, 2000). Since these projects are performed in collaboration with established organizations or tech transfer offices they are typically characterized by corporate values and consequently they are related to predictive management methods (Gibb, 2002b). One would therefore expect students in instrumentally-oriented programmes to predominantly increase their perceived levels of cognitively-oriented evaluation and preparation skills. In individually-centred approaches the focus is not so much on new knowledge but rather on discovering new ways to use and apply prior contextual knowledge in order to create value (Blenker et al., 2011). There is therefore a strong

focus on the exploitation phase and on teaching the students the entrepreneurial method (Neck & Greene, 2011). It can therefore be expected that these students will primarily increase their perceived level of non-cognitive exploitation skills. This leads us to two hypotheses about the effects of the two approaches on different dimensions of ESE:

H2a: Individually-centred programmes will primarily increase the students' level of ESE in non-cognitive exploitation skills.

H2b: Instrumentally-oriented programmes will primarily increase the students' level of ESE in cognitively-oriented evaluation skills.

The effects on new venture creation

Since the entrepreneurial activities take place through industry collaboration in the instrumentally-oriented approaches, it can be expected that the students will adapt to a corporate context and imitate its actors' way of doing things. Work with entrepreneurial innovation projects may constitute a stimulating environment to entrepreneurial students and change their perception regarding a career within established organizations. Furthermore, the amount of effort and time required to perform these projects is also likely to force the students to withdraw from their own entrepreneurial efforts, since not many people have the capacity to focus their energy on multiple innovative projects at the same time (Cardon et al., 2009). One would therefore expect the number of students who engage in individual entrepreneurial activities to decrease.

In entrepreneurship programmes with an individually-centred approach the students are encouraged to combine their individual entrepreneurial projects with the projects they perform during their education, since the use of contextual background knowledge is supported and the

ownership of the projects is given to the students. When the programmes are also designed to expand the *prior* contextual knowledge of the students, the total amount of knowledge which the students can use to pursue entrepreneurial opportunities is likely to increase, both when it comes to identifying entrepreneurial opportunities (Baron, 2006; Shane, 2000, 2003; Shane & Venkataraman, 2000) and creating them (Alvarez & Barney, 2007, 2010; Sarasvathy, 2001, 2008). This leads us to two hypotheses about the effects of instrumentally-oriented and individually-centred programmes in entrepreneurship:

H3a: Individually-centred entrepreneurship programmes will increase the number of students who engage in individual entrepreneurial activities.

H3b: Instrumentally-oriented entrepreneurship programmes will decrease the number of students who engage in individual entrepreneurial activities.

METHOD

Eight master programmes in entrepreneurship and innovation at three universities in Denmark and one university in Sweden were identified as suitable for the study. The programmes were selected on the basis of their curricular design and the disciplinary background of the students. Following the theoretical categorization model presented in figure 1, the author and an expert in entrepreneurship education who works in an organization which develops entrepreneurship education at all levels of the Danish education system, independently assessed the programmes' curricular designs according to their focus on student ownership of the entrepreneurial projects, and the degree to which the students' prior contextual knowledge was involved in the educational process. Both categories were assessed on a five-point scale. Following the benchmark levels suggested by Landis and Koch

(1977) the inter-rater reliability was rated as substantial since the Kappa values for the two categories were .67 and .68.

Four of the programmes had low levels in these two categories and were coded as belonging to the *Instrumentally-oriented* group. Each of these four programmes was matched with a corresponding programme attended by students with a similar disciplinary background but with high levels in both of the categories. These programmes were coded as belonging to the *Individually-centred* group. Table 1 presents the disciplinary background of the students attending the programmes, the location of the programmes, and with which corresponding programme they are matched. Appendix A presents the teaching methods of the programmes and their course content in more detail.

Programme	**Disciplinary-background**	**Location**	**Match**
A1 **MSc Econ**	Business management	Business school	B4
A2 **MSc Eng**	Engineering	Engineering school	B3
A3 **MSSc**	Various	Business school	B1 B2
A4 **MSc Econ.**	Business management	Business school at university	B4
B1 **MSSc**	Various	Business school	A3
B2 **MSc**	Various	University	A3
B3 **MSc Eng.**	Engineering	Engineering school at university	A2
B4 **MSc.**	Various	Business school at university	A1 A4

Table 1: The programmes in the survey

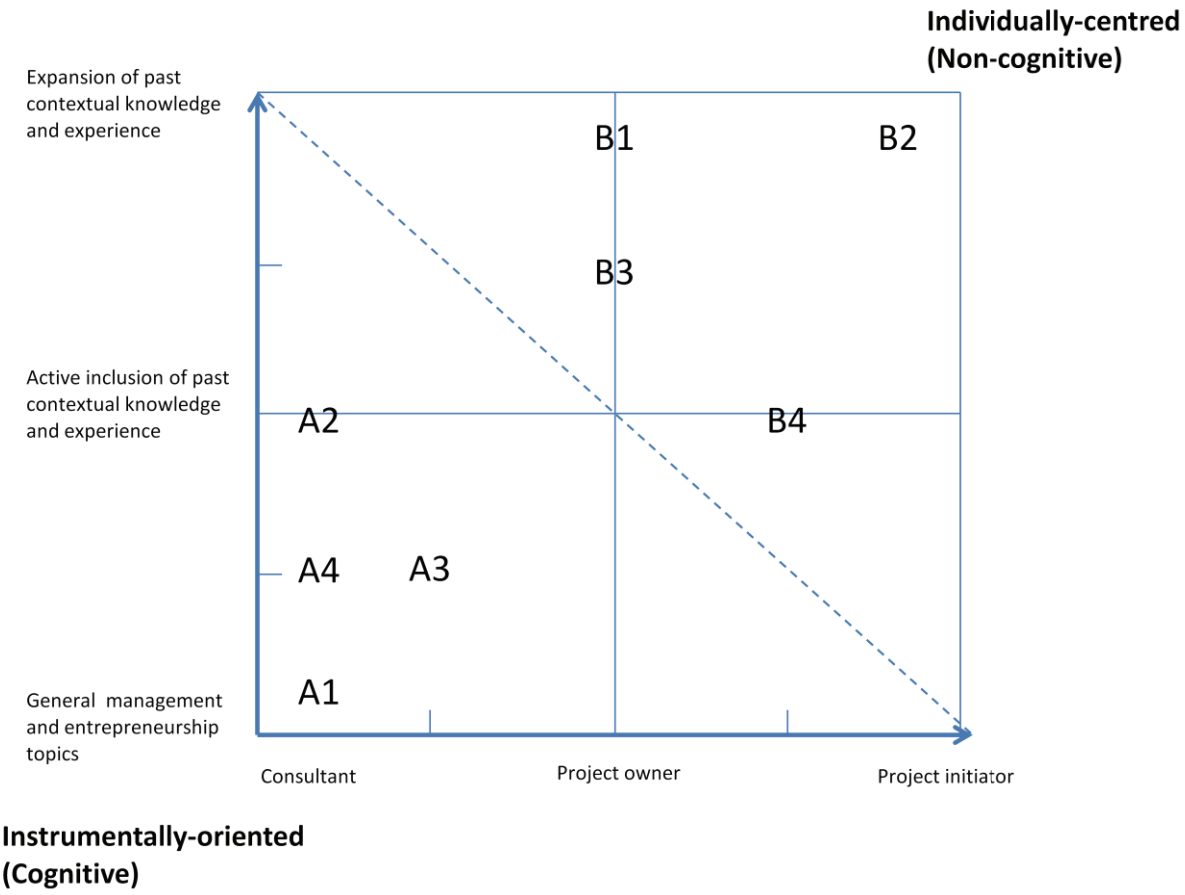


Figure 2: The positioning of the programmes in the theoretical model

Five of the programmes are located at business schools, two at engineering schools, and one of the programmes is located at the humanities department. Even though the target groups of the programmes are very different, the curricular designs and pedagogy used are strikingly similar, except in regard to the extent to which they focus on including and expanding the contextual background knowledge of the students, and the extent to which the students are the initiators and owners of the entrepreneurial projects (see Appendix A). In figure 2 the programmes' positioning in the theoretical model are presented.

ANALYSIS

The analysis plan is divided into three steps. In the first step the properties of the measures that will be used in the analysis are investigated with confirmatory factor analysis on the ex ante responses of the students. This is followed by non-response bias tests. Next, the longitudinal model which includes both ex ante and ex post responses is presented. This will be followed by an analysis of mean differences between groups and times. In the following step the cross-lagged relationships between the ESE variables as well as the time invariant and time variant covariates are investigated. List-wise deletion of missing responses has been used and the recommended levels of model fit proposed by Hu and Bentler (1999) have been followed. Before the results of the analysis are presented, the measures used in the analysis as well as how the data collection has been performed will be described.

Measures

The entrepreneurial self-efficacy scale developed by Moberg (2013), which is specifically designed to be used in programme evaluations of entrepreneurship education, has been used in the data collection. The Moberg (2013) scale is based on the three established ESE scales: Chen et al. (1998); DeNoble, Jung, and Ehrlich (1999); and McGee, Peterson, Mueller, and Sequeira (2009). Compared to these scales the wording used in the Moberg scale is however less jargon biased and, thus, more suitable to students of various disciplinary backgrounds. The five ESE dimensions included in the scale are based on the dimensional overlapping of these three scales, but the dimensions are structured according to their focus on different phases in an entrepreneurial venture (exploration/evaluation/exploitation). All the items included are presented in Appendix B. The five dimensions which the ESE scale focuses on are the following:

1) *Creative ability*: the ability to think in new and imaginative ways. Numerous studies have demonstrated that creative ability is of great importance to entrepreneurs (see for example Baron, 2012; Elsbach, 2003; Lee, Florida & Acs, 2004). This ability is typically used during the exploration phase in order to identify and discover business opportunities (Foss & Klein, 2012; Kirzner, 1997; McGee et al., 2009).
2) *Planning ability*: the ability to plan and structure tasks. The focus on planning ability has a long-standing tradition within entrepreneurship education (Honig, 2004), and there are numerous studies supporting the importance for entrepreneurs of having this ability (see for example Delmar & Shane, 2003, 2006; Matthews & Scott, 1995; McGrath & MacMillan, 2000; Stevenson et al., 1985; Timmons, Muzyka, Stevenson & Bygrave, 1987). It should, however, be noted that the concept of entrepreneurial planning has been heavily criticized during the last decade (see for example Alvarez & Barney, 2007, 2009; Karlsson & Honig, 2009; Sarasvathy, 2001, 2008).
3) *Financial literacy*: the ability to understand financial statements and budgets. This is an important ability in order to successfully engage in entrepreneurial activities. Even though issues such as return on investment, cash flow and liquidity may be delegated to experts, it is important that the entrepreneur has at least a basic financial literacy in order to be trustworthy to external and internal stakeholders (Castrogiovanni, 1996; Delmar & Shane, 2003, 2006; Stevenson et al., 1985). Moberg (2013) categorizes *planning ability* and *financial literacy* as interrelated cognitively-oriented entrepreneurial skills which are most important during the preparation and evaluation phases in an entrepreneurial venture. Since these skills are cognitively oriented, they are easy to codify and teach in an educational setting.

4) *Marshalling of resources*: the ability to assemble and organize resources in order to exploit a business opportunity. This ability is by many researchers seen as the essence of entrepreneurship (see for example Foss & Klein, 2012; Gartner & Carter, 2003; Sarasvathy, 2001, 2008). There is often a strong focus on the role which social capital plays in this process (Davidsson & Honig, 2003; Karlsson & Honig, 2009). This process often takes place in a context characterized by high uncertainty (Foss & Klein, 2012), which leads us to the ESE scale's last dimension.
5) *Managing ambiguity*: The ability to manage and cope with uncertainty and ambiguity in the process of implementing and exploiting a business idea. Entrepreneurship has been more or less synonymous with uncertainty ever since the field's pioneering researchers conceptualized entrepreneurship and the activities of entrepreneurs (see for example Cantillion, 1755; Knight, 1921; Schumpeter, 1911), as entrepreneurial activities always unfold in a context characterized by uncertainty (Foss & Klein, 2012; Sarasvathy, 2001). In order to successfully perform entrepreneurial activities, it is thus important that the individual can manage and cope with uncertainty and ambiguity. Moberg (2013) categorizes *marshalling of resources* and *managing ambiguity* as interrelated non-cognitive entrepreneurial skills which are most important during the execution and exploitation phases in an entrepreneurial venture. Since these skills are of a non-cognitive character, they are difficult to teach in an educational setting because they require practice and hands-on experience to be learnt.

Each item in the ESE scale has been measured on a seven-point Likert scale. The three-construct version, in which financial literacy and planning ability are parcelled into one construct representing cognitively-oriented evaluation skills, and managing ambiguity and marshalling of resources are parcelled into a construct which represents non-cognitive exploitation skills, was used (see Moberg,

2013)[25]. In addition to the ESE dimensions, six covariates were also included in the analysis. These are gender; entrepreneurial role models (close family that has started a company); whether they have any past experience with entrepreneurship education; and whether they have any entrepreneurial experience, that is, whether they have participated in the activity of starting a company in the past; whether they are currently performing activities in order to start a company or are currently operating a business.

Data collection

The data were collected in four rounds. The programme leaders of the eight master programmes were contacted in the early spring of 2011. Individual meetings were set up with all the programme leaders as well as other relevant stakeholders, such as deans and programme administrators. In these meetings the design of the research project was described and the measures included were discussed. In September 2011 the first round of data was collected. The longitudinal character and purpose of the project was presented and the students were informed that the data would be treated with confidentiality and for research purposes only. The questionnaires in this round were only distributed in hard copy format. In May and June 2011 the second round of data was collected. At this time it was not possible to distribute the questionnaire to some students in hard copies, as some programmes did not have any scheduled classes anymore, so the students in these programmes were contacted via email and given the opportunity to fill out the questionnaire in an online format. An effort was, however, made to reach the students in their classes and distribute the questionnaire in hard copy. The students who did not attend these classes, but who had been included in the first round of data collection, were contacted via email. In order to secure a high response rate, all

[25] The parcelling technique recommended by Little, Cunningham, Shahar & Widaman (2002) was used, in which the indicator with the highest loading was parcelled with the indicator with the lowest.

students were rewarded with a cinema ticket if they continued their participation in the survey, regardless of whether they filled out the questionnaire online or in hard copy. The procedure was repeated for the same eight programmes in 2012. In the next section the non-response bias tests performed on the *ex ante* data are presented.

Non-response bias test

The first step in the analysis was to perform non-response bias tests. In order to test for non-response bias, the sample was divided into four groups: the two groups of students included in the analysis who could be matched on their pre-test and post-test and the corresponding students who had dropped out from the survey or could not be matched *ex post*. Chi-square tests were performed for the five covariates included in the analysis (the two variables measuring whether the students were for the moment operating a business or were currently trying to set up their business were merged into one variable named *entrepreneurs*). The results of these tests are presented in table 2. In order to determine whether there were any differences regarding the three dimensions of ESE included in the analysis, mean-difference tests and weak and strong factorial invariance tests were performed. Tests for weak and strong factorial invariance investigate whether the respondents have interpreted the questions in similar ways. When performing tests for weak factorial invariance, the loadings of the indicators are constrained to be equal for the groups, and when performing tests for strong factorial invariance, it is the intercepts of the indicators which are constrained to be equal. In order to establish whether the indicators pass the tests, the CFI should not change more than .01 when the constraints are added (Cheung & Rensvold, 2002). In order to test whether there were any significant mean differences between the respondents and the non-respondents in the two groups, the variables were constrained to be equal, and it was then investigated whether this generated significant chi-square differences. In table 3 below the results of the analyses are presented.

Variable	Instrumental respondents (N=109)	Instrumental non-respondents (N=283)	*p*	Individual respondents (N=111)	Individual non-respondents (N=215)	Chi2/*p*
Females	44(40%)	97(34%)	.26	65(59%)	118(55%)	.53
Entrepreneurs	49(45%)	107(38%)	.20	32(29%)	69(32%)	.55
Prior e'ship education	51(47%)	140(50%)	.63	22(20%)	76(35%)	.00*
Entrepreneurial family[1]	65(60%)	185(65%)	.29	58(52%)	125(58%)	.31
Started bus. in the past	30(28%)	87(31%)	.53	20(18%)	47(22%)	.40

*Indicates a significant level at 5% or less

[1]The high percentage in this variable has to do with the phrasing of the question "*Do you have close family members (parents, siblings, uncles/aunts) who are self-employed?"*

Table 2: Non-response bias tests on the covariates

Model tested	X^2	df	ΔX^2	Δdf	CFI	ΔCFI	Difference?
Configural invariance	229.56	96			.947	---	---
Weak invariance	258.25	114	28.69	18	.943	.004	No
Strong invariance	292.59	132	34.34	18	.937	.006	No
Means constrained							
Instrumental respondents/non-respondents	294.11	135	1.52	3	.937	.000	No
Individual respondents/non-respondents	297.36	135	4.77	3	.936	.001	No

Table 3: Non-response bias tests on the ESE dimensions and tests for weak and strong factorial invariance

As we can see in table 2, there are few differences in the covariates between respondents and non-respondents. In the individually-centred group there are slightly more students in the non-response group who have experienced entrepreneurship education in the past. Table 3 demonstrates that the indicators passed the tests for weak and strong factorial invariance as the CFI only changed marginally (.004 when the loading constraints were added and .006 when the intercept constraints were added). This means that students in the four groups have understood the questions in similar ways. When the mean-levels between the groups were constrained too be equal there was no significant change in chi-square, which indicates that there is no significant difference between respondents and non-respondents regarding the three ESE dimensions.

Table 2 further demonstrates that there is a substantial number of students with entrepreneurial experience in both groups, which is not uncommon for entrepreneurship students.

This type of education, as any type of education, exhibits a high level of self-selection, that is, the students who are already interested in the particular topic are also the ones who choose to study it (Graevenitz et al., 2010). Well designed educational programmes should however be able to turn this into an advantage and give the students exercises that are in accordance with their perceived competence levels (Biggs & Tang, 2007) and challenge them with complicated and demanding tasks (Bandura, 1997). The self-selection does, however, seem to be a bit higher among students in the *instrumentally-oriented group*. But when we have access to longitudinal data, we can control for the effect which the covariates (both time variant and time invariant) have on the outcome variables (Little, 2013; Mohr, 1995).

The influence of the two approaches to entrepreneurship education

A confirmatory factor analysis including both the students' *ex ante* and *ex post* responses was performed on the 220 students who could be matched. The error terms of each corresponding indicator were correlated, as they can be expected to have a common measurement error in both time periods[26]. Weak and strong factorial invariance between the groups had been demonstrated (see table 3), but this also needs to be tested over time, since experience with entrepreneurship education may change the students' understanding of entrepreneurship-oriented questions. Both weak and strong factorial invariance could be demonstrated since the change in CFI was lower than .01. The results of the analysis are presented in table 4.

Model tested	X^2	*df*	*p*	*RMSEA*	*RMSEA 90% CI*	*CFI*	ΔCFI	TLI	ΔTLI	Diff?
Configural invariance	360.28	222	<.001	.075	.061;.089	.933	---	.907	---	---
Weak invariance	388.69	240	<.001	.075	.061;.088	.928	.005	.908	.001	No
Strong invariance	417.49	258	<.001	.075	.062;.088	.923	.005	.908	.000	No

Table 4: Test for weak and strong factorial invariance between groups and over time.

[26] This is standard practice in longitudinal structural equation models (Little, 2013)

Next, it was tested whether there were any significant mean-differences between groups and points in time in the three ESE dimensions. In these tests the change in chi-square was used to decide whether the differences were significant. The base-line in these tests is the model with constraints for weak and strong factorial invariance. The first test performed was the so-called *omnibus test* in which both the mean-differences between groups and across time are constrained to be equal. It makes little sense to investigate any further differences if this test does not indicate differences in either of these dimensions (Little, 2013). As this test clearly indicated that there were differences either between the groups or between points in time ($p=<.001$), tests of differences between the groups, both regarding their *ex ante* and their *ex post* levels in ESE, were performed. The test demonstrated that the students' level of ESE differed at both points in time. The differences in ex ante levels in ESE are somewhat problematic, since it is more difficult to elevate already high levels of ESE, and there is also a natural ceiling effect because the scale, which the measures are assessed by, only ranges up to seven. This is a common problem in many quasi-experimental designs and one that needs to be accounted for in the analysis (Mohr, 1995).

Next, it was tested whether the students in the two groups differed over time. All variables showed a small but significant change in chi-square for students in the instrumentally-oriented group. The largest change for students in this group concerned their perceived evaluation skills. Students in the individually-centred group demonstrated the largest changes in chi-square for the exploration and exploitation skills, but their change in the perceived level of evaluation skills was insignificant. In table 5 the results are presented.

Model tested	X^2	*df*	*Mean difference*	CFI	ΔX^2	Δdf	*p*	ΔCFI	Difference
Baseline	417.49	258		.923					
Instrumental									
Exploration (Creativity)	425.10	259	5.31/5.54 (.23)	.919	7.61	1	.01	.004	Yes
Evaluation (Cognitive)	431.66	259	4.64/4.92 (.28)	.916	14.17	1	.00	.007	Yes
Exploitation (Non-cognitive)	428.92	259	5.01/5.23 (.22)	.917	11.43	1	.00	.006	Yes
Baseline Individual									
Exploration (Creativity)	426.93	259	4.87/5.18 (.31)	.918	9.44	1	.00	.005	Yes
Evaluation (Cognitive)	420.38	259	4.35/4.49 (.14)	.922	2.89	1	.09	.001	No
Exploitation (Non-cognitive)	428.20	259	4.59/4.91 (.32)	.918	10.71	1	.00	.005	Yes

Table 5: Difference in ESE over time for the two groups

As we can see in table 5, the groups differ in the extent to which the students' perceived level of ESE has changed over time. They also differ regarding the five covariates included in the analysis. In order to test whether these differences are significant, chi-square tests were performed for each of the variables. The time-variant covariates were also tested as to whether they were different over time. In table 6 the results of these tests are presented.

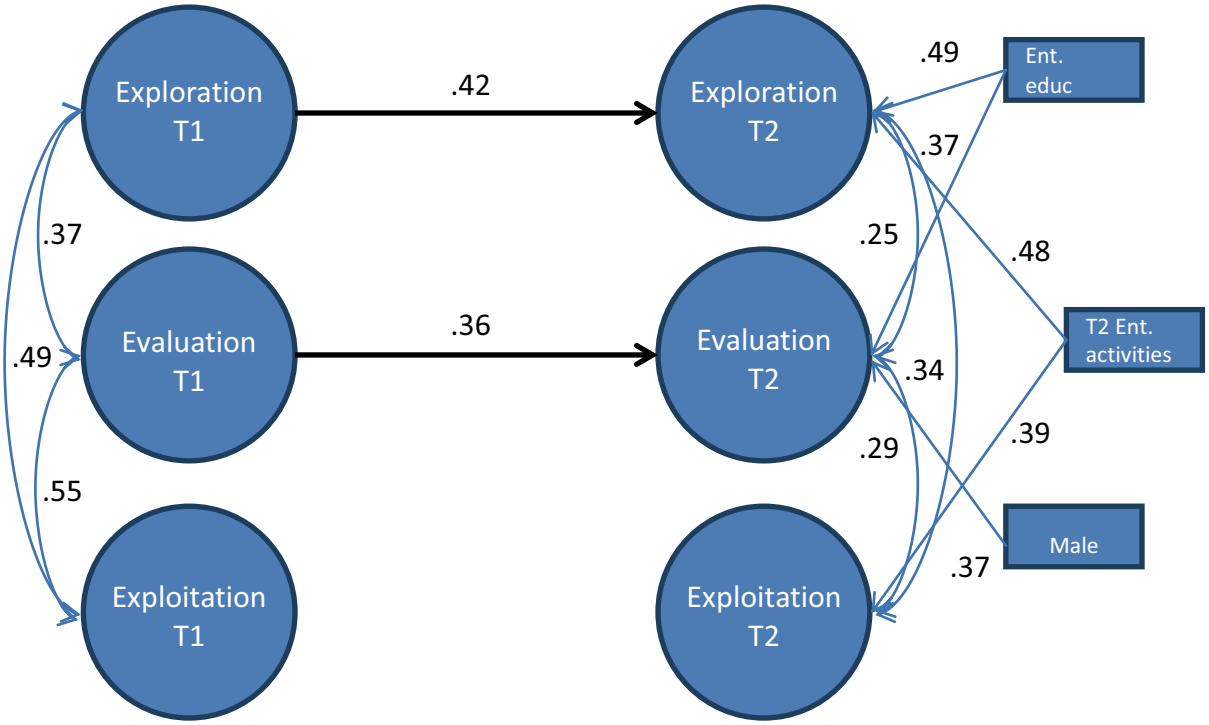
Variable	Instrumental *ex ante*	Learning *ex ante*	*p*	Instrumental *ex post*	*p*	Learning ex post	*p*
Females	44(40%)	65(59%)	<.001*				
Prior e'ship education	51(47%)	22(20%)	<.001*				
Entrepreneurial family	65(60%)	58(52%)	.27				
Started bus. in the past	30(28%)	20(18%)	.09	34(32%)	<.001*	23(21%)	<.001*
Entrepreneurs	49(45%)	32(29%)	<.001*	34(32%)	<.001*	39(35%)	<.001*

Table 6: Difference between groups and over time in time-variant and time-invariant covariates

The results in table 6 demonstrate that there are significant differences between the groups regarding gender, prior education in entrepreneurship, and the number of students who are actively engaged in entrepreneurial activities, that is, either operating a business or actively trying to start one. Especially interesting are the divergent changes in the number of students who are for the moment engaging in entrepreneurial activities. In the individually-centred group there has been a significant increase in the number of students who are currently either operating a business or actively trying to start one, whereas the opposite is true for students belonging to the instrumentally-oriented group, where entrepreneurial activities have significantly decreased. The observed differences in the covariates, both between groups and over time, demonstrate the importance of investigating the effect which these covariates have on the students' change in ESE.

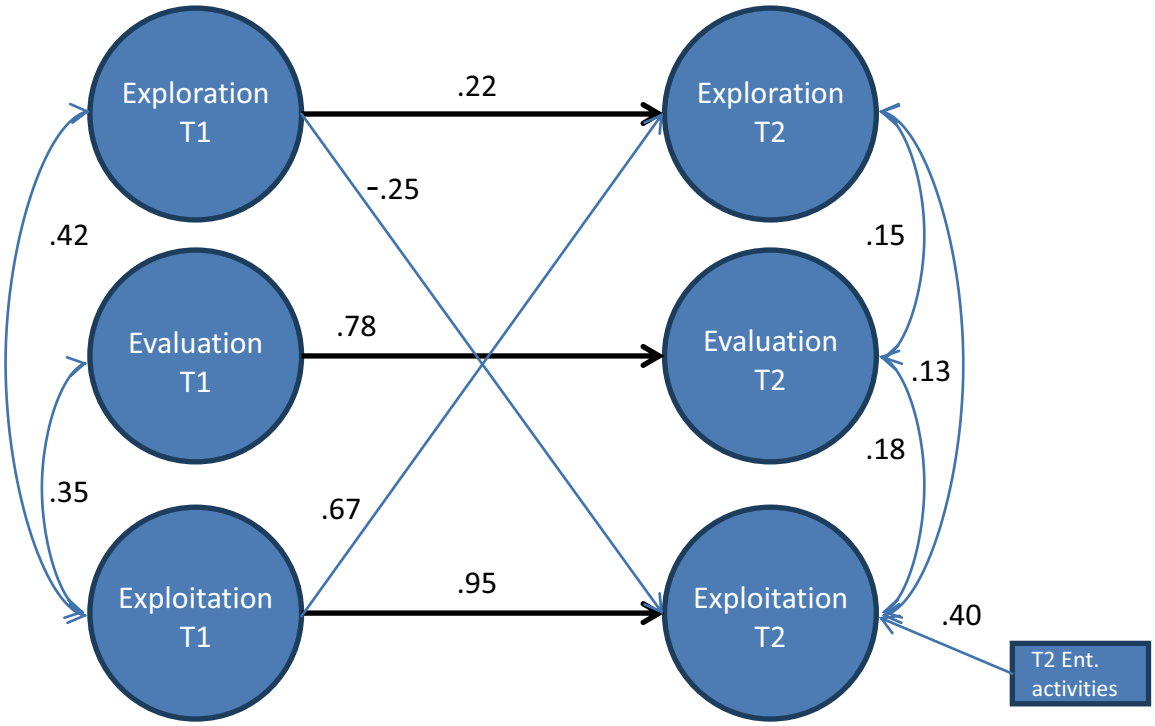
Structured models

A structured model, which includes the covariates gender, previous experience with entrepreneurship education, and entrepreneurial activities (trying to start a business or operating a business in time 1 and time 2), was tested for the two groups. Since all covariates are measured with single items, it is problematic to include them in structured models - especially in models including few constructs, few respondents as well as group analysis - so unfortunately the model fit decreases significantly for this model. Since the model fit is very close to acceptable levels and the CFA of the model without the covariates demonstrated a sufficient fit, the results of the analysis were deemed to be acceptable. In figure 3 and figure 4 the results of this analysis are presented (see Appendix C for a more detailed presentation of the results).



X^2=570.83(df:362) RMSEA=.072(.061;.084) CFI=.903 TLI=.879 SRMR=.094
Only associations significant on a p-value of .05 or lower are presented

Figure 3: The cross-lagged effects of ESE for students in the individual-centred group



X^2=570.83(df:362) RMSEA=.072(.061;.084) CFI=.903 TLI=.879 SRMR=.094
Only associations significant on a p-value of .05 or lower are presented

Figure 4: The cross-lagged effects of ESE for students in the instrumentally-oriented group

As we can see in figure 3 and figure 4, there are differences in the association between the two groups' pre and post levels of ESE. The initial levels of ESE explained to a very small extent the students ex post levels of ESE in the individually-centred group. The association between ex ante levels and ex post levels of both perceived exploration and evaluation skills were below .50, and for perceived exploitation skills there were no significant associations at all. Whether the students in time period two were actively performing entrepreneurial activities did, however, have a significantly positive association with perceived levels in both exploration skills and exploitation skills. Experience with entrepreneurship education before enrolling in the programmes also had a significantly positive influence on the students' perceived levels in exploitation and evaluation skills. Furthermore, only the males in this group perceived ex post that they had high levels of

evaluation skills. These results indicate that this educational approach has been especially beneficial to students who started or were operating companies during their educational process as well as to students who had previous experience with entrepreneurship education. Programmes in this group have also particularly failed to teach female students cognitively-oriented evaluation skills.

In the instrumentally-oriented group the *ex ante* levels of ESE explain a high degree of their *ex post* levels. There is an interesting cross-lagged relationship between the students' perceived levels of exploration and exploitation skills. The students who perceived that they had a high level of creative ability before they started their programmes have lower perceived levels of exploitation skills in time period two. On the other hand, the students who perceived that they had a high level of exploitations skills before they enrolled in the programme have a higher perceived level of creative ability in time period two. This indicates that these programmes have been especially good at channelling the creativity of students with a perceived high level of non-cognitive entrepreneurial skills, whereas they have not been so successful in teaching exploitation skills to students who initially perceived themselves as being highly creative. The only covariate that influences the students' ex post levels of ESE in this group is entrepreneurial activities ex post, which had a significantly positive association with the students' perceived level of exploitation skills.

Discussion and Implications

As we can see, there are significant differences in the effects on students' entrepreneurial self-efficacy depending on the curricular design of the entrepreneurship programmes. The results indicate that the individually-centred programmes have a transformative influence on the students, as their perceived levels of competence in exploration, evaluation and exploitation skills are only to a very limited degree explained by their prior perceptions of competence in these skills. The finding

that students who had started or were currently operating a business alongside their studies increased their perceived level of exploration and exploitation skills the most indicates that these programmes have a strong focus on learning *through* entrepreneurship rather than *for* or *about*. The educational background of the students also had a positive influence on their ex post perceived levels of exploration and evaluation skills. This indicates that students who are used to this type of education also are the ones who gain the most from this educational approach. The finding points to the importance of including entrepreneurship education early on in the education system in order to adapt the students to a different learning approach, one that is intimately connected with ownership, self-directed learning, and an understanding of how to apply knowledge in new ways in order to create value.

Except for *ex post* entrepreneurial activities, it was only the prior levels of ESE that explained the post levels of perceived exploitation skills of students in the instrumentally-oriented group. The students' perceived creative ability, however, differed to some degree compared to the other two skill sets. It was primarily the students' initial levels of perceived exploitation skill that explained their post levels of perceived creative ability, and the students' initial levels of creative ability did in fact also have a negative association with their post levels of perceived exploitation skills. This indicates that students in these programmes needed to have a high level of confidence in their exploitation skills in order to have the courage to use their creativity in their projects, whereas the more creative students did not to the same extent get the chance to practically apply their knowledge. This is most likely a result of the values and procedures which characterize the corporate environment in which the entrepreneurial venture projects were located. Since these types of innovation project are typically resource intensive, risk-minimizing behaviour is commonly practiced and in order to apply creative and innovative methods you need to have a high level of self-efficacy. A high level of non-cognitive entrepreneurial skills thus seems to be a prerequisite to

getting the most out of education which is taught in an instrumentally-oriented manner, whereas creative ability is less useful.

When we compare the associations between pre levels of ESE and post levels of ESE for students in the two groups, it is evident that in the instrumentally-oriented group the students' perceptions of their own competence levels were to a higher degree explained by their initial levels of ESE. This was not so for students in the individually-centred group. The educational experience has thus been perceived as more disruptive for students in the individually-centred group whereas this has only changed incrementally for students in the instrumentally-oriented group. H1 is therefore accepted.

The students in the instrumentally-oriented programmes did, however, increase their level of perceived skill in all three skill sets included in the analysis. Still, these students increased their perceived level of evaluation skills the most, whereas students in the individually-centred programmes did not significantly increase their perceived level of competence in this skill set. The programmes which focused on student ownership and involvement of prior contextual knowledge in the educational process mainly affected the students' perceived levels of non-cognitive entrepreneurial skills, that is, their perceived exploration and exploitation skills. There is thus strong support for H2a but only weak support for H2b, since the increase in perceived cognitively-oriented evaluation skills for students in the instrumentally-oriented group was only marginally higher than the increase in their perceived non-cognitive entrepreneurial skills.

The most evident difference between the two approaches concerns the influence they had on students' entrepreneurial activities. In the individually-centred approach the number of students who were either trying to set up or who were already operating a business increased from 32 to 39, which equals a 22 per cent increase, whereas the corresponding segment in the instrumentally-

oriented group significantly decreased, from 49 to 34 (a 31 per cent decrease). H3a and H3b are thus accepted. In table 7 the results of the hypotheses' testing are presented.

H1	*Individually-centred programmes will to a higher degree change the students' perception of their ESE than instrumentally-oriented programmes.*	Strong Support
H2a	*Individually-centred programmes will primarily increase the students' level of ESE in non-cognitive exploitation skills*	Weak Support
H2b	*Instrumentally-oriented programmes will primarily increase the students' level of ESE in cognitively-oriented evaluation skills.*	Strong Support
H3a	*Individually-centred entrepreneurship programmes will increase the number of students who engage in individual entrepreneurial activities*	Strong Support
H3b	*Instrumentally-oriented entrepreneurship programmes will decrease the number of students who engage in individual entrepreneurial activities*	Strong Support

Table 7: Summary of the hypotheses' testing

These results do not imply that entrepreneurship programmes should avoid involving the students in third party projects. Many of these projects can function very well as important entrepreneurial experiences for students who are unused to working with entrepreneurial ventures. What these results demonstrate is that there are different ways to increase students' ESE and make them more confident in performing entrepreneurial activities. Instrumentally-oriented approaches which focus on industry-collaboration and ongoing entrepreneurial and innovation projects increase the students' ESE incrementally, whereas individually-centred approaches seem to give the students a more disruptive experience which radically changes their perception of their ESE.

The ESE levels increased for both groups but their entrepreneurial activities in the form of self-employment went in opposite directions. What this demonstrates is that the link between ESE and new venture creation through self-employment is not as straightforward as many researchers within the field have described it (see for example Boyd & Vozikis, 1994; Chen et al., 1998; DeNoble et al., 1999; McGee et al., 2009). This is, however, not surprising given the fact that entrepreneurial activities have become increasingly important in established organizations in the

form of strategic entrepreneurship (Foss & Klein, 2012; Foss & Lyngsie, 2012; Hitt & Ireland, 2000; Moberg, 2013).

However, if the goal is to increase the students' empathy of the life world of entrepreneurs, it is important to provide the students with the opportunity to involve and use their prior contextual knowledge in the venture projects and increase the students' perceived sense of ownership of these projects (Gibb, 2002a, 2002b; Pittaway & Cope, 2006). In this way the students will get the opportunity to learn in the same ways as entrepreneurs, which will be a disruptive experience to many of them, but which will also increase the probability that they will pursue a career as self-employed.

Limitations and Suggestions to Future Research

Educational programme evaluations are always complicated to perform since it is hard to isolate the treatment effect that we wish to measure. Many different factors may have influenced the observed results, and these factors are hard to observe, predict, and quantify. During one year a student will experience many things which may influence his or her level of entrepreneurial self-efficacy, and this will possibly contaminate the results (Mohr, 1995). In order to control for potential contamination a significant number of covariates known to have an influence on ESE were included in the analysis, but naturally there is also a risk that some important variables have been omitted.

Another limitation is the lack of a "true" control group, that is, a group that has not experienced any type of entrepreneurship education. In the analysis the effects of two types of approaches to entrepreneurship education were investigated. This limits the critical aspect of the lack of a control group, as the students in the programmes with an instrumentally-oriented design function as a control group as regards H1, H2a, and H2b. When it comes to H3b, which is concerned with the decrease in entrepreneurial activities among students in the instrumentally-

oriented group, a true control group would, however, have been necessary in order to establish whether this is a natural process among university students or something particular to students in entrepreneurship programmes with an instrumentally-oriented curricular design.

It is furthermore complicated to decide the directionality of the students' perceived level of exploitation skills and entrepreneurial behaviour. It would be natural to expect that an increased perceived level in this skill set would lead to an increase in entrepreneurial behaviour, but it could also be the other way around. This makes it problematic to establish the effects of programmes which actively use new venture creation as a teaching method. In order to establish the directionality, data collected in three different points in time would be needed (Little, 2013).

The heterogeneous sample also offers some limitations to the validity of the analysis. The students in the instrumentally-oriented group had, on average, higher initial (starting) values in every dimension, and naturally it is more difficult to increase already high levels of ESE. Future research should seek to match the students not only with regard to their disciplinary background but also with regard to their initial values in ESE. It might also be interesting to target a less heterogeneous sample by focusing on fewer programmes but more students. This is challenging, though, since entrepreneurship programmes typically use teaching methods that require small groups (especially those with an individually-centred approach). However, if such programmes could be identified, the analysis would become more precise and involve fewer threats to validity. In order to control for self-selection, it would be preferable (although not always feasible) if the decision about which students to include in the programmes is randomized.

Furthermore, it could be interesting to include measures of how the educational experience has affected the students emotionally. Many theories about entrepreneurial learning focus on the effectual impact of ownership and how this affects both the intrinsic motivation and the entrepreneurial passion as well as forces the entrepreneurs to reflect on critical incidents, and how

this affects their ventures, themselves and people in their surroundings. A measure of entrepreneurial social capital could also be included in order to capture how the students develop in this area during their educational process.

Concluding Remarks

In this paper, the effects of two approaches to entrepreneurship education have been compared. Instrumentally-oriented approaches, which focus on collaboration with established organizations and tech transfer offices and on the development of cognitively-oriented entrepreneurial skills, had a significantly positive effect on all ESE dimensions. The hands-on experience with entrepreneurial activities provided through industry collaboration, combined with lectures and focus on theoretical knowledge, was demonstrated to be an efficient approach to incrementally increase the students' confidence in their entrepreneurial abilities. These approaches were, however, especially effective for students who already had a high level of confidence in their exploitation-oriented entrepreneurial skills. Individually-centered approaches to entrepreneurship education, which focus on fostering non-cognitive entrepreneurial skills by using the students' personal entrepreneurial activities as the focal point of learning, did, however, only have a significantly positive effect on the non-cognitive ESE dimensions. These approaches were demonstrated to have a more disruptive effect on the students, since the students' perception of their entrepreneurial ability changed to a large degree. In these approaches the involvement of the students' prior contextual knowledge is an important element and the students have a high level of ownership over their entrepreneurial venture projects. It was mainly those students who were running or who were starting up new ventures during their education who were also positively affected by their educational experience. Both instrumentally-oriented and individually-centred approaches thus have a positive influence on

the students' ESE, albeit in different ways. However, in the testing we also saw a difference in the effects which these approaches had on the students' personal entrepreneurial activities.

The link between ESE and entrepreneurial activities in the form of self-employment is thus not as straightforward as prior research has assumed (see for example Boyd & Vozikis, 1994; Chen et al., 1998; DeNoble et al., 1999; McGee et al., 2009), which has to do with the increasing popularity of strategic entrepreneurship within established organizations (Foss & Lyngsie, 2012; Hitt & Ireland, 2000). Entrepreneurial skills are demanded in many contexts today (Foss & Klein, 2012; Gibb, 2011), and various types of education can be used to develop these skills and students' confidence in performing them (Blenker et al., 2011; Hannon, 2005; Neck & Greene, 2011). However, if the goal is to increase the students' entrepreneurial activities in the form of self-employment it is important that the educational approach focuses on including the students' prior contextual knowledge and interests in the educational process, and that the students have a high level of psychological ownership over their entrepreneurial venture projects.

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APPENDIX A

A1 MSc Econ	
A master programme with strong focus on innovation process and product development and commercialization, both within established organizations as well as in the form of new venture creation. A wide spectrum of general business management courses which will equip the students with abilities to assess and evaluate the conditions for new product and process development, supplemented with innovation specific courses which focus on open innovation and user-driven innovation. The first year ends with a business development project in a case company in which the students apply their collated knowledge and work with the innovation challenges of the selected company.	
Categorization	No specific focus on the students' own projects, entrepreneurial background or academic background. The first year ends with a business development project in a case company in which the students apply their collated knowledge and work with the innovation challenges of the selected company.
Teaching methods	Interactive lectures, case-based exercises, student presentations and group-based project work.
Location	Business school
Match	B4

A2 MSc Eng	
An engineering programme at master level in which the students are educated in finding, understanding, evaluating and bringing in to play new technological knowledge and new business opportunities. Half of the classes during the first year are located at the university where the students are taught general knowledge about management of technology, human resources, entrepreneurship, business strategy and innovation. The technology specialization and the innovation projects take place at a partnering company, where the students work with applying the knowledge they have gained in the class room.	
Categorization	Focus on general knowledge about innovation and entrepreneurship, which are practiced in a project located in a partnering company. Some practical specialization regarding the students' academic backgrounds.
Teaching methods	Lectures, student presentations and project work located at the partnering company.
Location	Engineering school
Match	B3

A3 MSSc	
A master programme located at a business school but open to students from a large variety of academic backgrounds. The programme centers on organizational innovation and entrepreneurship with a special focus on clean tech and social entrepreneurship. A special effort is made to make the students understand the particular entrepreneurial challenges and associated managerial tasks for knowledge creation in post industrial entrepreneurial organizations. The courses included cover a wide spectrum of fields, from business management and open innovation to aesthetics and philosophy. The students initiate industry collaboration during their first semester which results in their first year group project assignment.	
Categorization	There is limited focus on the particular academic backgrounds of the students, instead the focus is on a particular phenomenon and challenges that are typical for the post-industrial society. The student projects are located in a partnering company.
Teaching methods	Problem-based and case-based methodology, industry collaboration, interactive lectures.
Location	Business school
Match	B1 B2

A4 MSc Econ.	
This master programme is open to students from different academic backgrounds. The main goal is to teach the students how to manage, renew and develop entrepreneurial activity in newly established and small firms, as well as large organizations, both within the private and the public sector. The programme offers a large variety of general entrepreneurship related courses such as overview courses of the theory related to entrepreneurship and corporate venturing, project management, generation and evaluation of new business ideas, entrepreneurial finance and internationalization and growth. There is no direct connection between the courses and the students own entrepreneurial project or academic backgrounds.	
Categorization	There is no direct connection between the courses and the students own entrepreneurial project or academic backgrounds. The entrepreneurial project is completely lacking in the educational design.
Teaching methods	Interactive lectures, cases and problem-based camp methodology.
Location	Business school at a university
Match	B4

B1 MSSc	
A master programme located at a business school but open to students from a large variety of academic backgrounds. The focus is on educating students in managing the innovation processes set on the borderline between art and commerce, important to firms belonging to the creative industry. By actively utilizing the academic background of the students in mixed teams, the aim is to develop the students' individual profiles and specializations through in-depth business project work. The first semester establishes the foundation with courses in business management and legal risk management with a specific focus on the context of creative industries. The second semester develops the students' specialization and ends with an extensive (15 ECTS) student project which is performed in collaboration with partnering companies within the creative industries.	
Catagorization	Both professional and personal development rather than general knowledge, and focus on the students interest in the entrepreneurial projects
Teaching methods	Case work, interactive lectures, cross-sectional theme work, industry collaboration, project work located in the partnering company.
Location	Business School
Match	A3

B2 MSc	
A master programme in experience economy at the intersection between the humanities and social science with a strong focus on entrepreneurship, innovation and change making. The courses include a wide scope of subjects such as media technology, cultural studies, entrepreneurship and project management. A strong focus on the students' contextual backgrounds in connection with feedback from external stakeholders in the idea generation leading to the entrepreneurial projects which unfolds during the first semester.	
Catagorization	Strong focus on involving and expanding the students contextual background knowledge which are also highly involved in the entrepreneurial projects which are initiated by the students
Teaching methods	Interactive lectures, cross-sectional workshops, industry collaboration, entrepreneurial projects initiated by the students
Location	University
Match	A3

B3 MSc Eng.	
An engineering programme during one semester with a focus on business activities relevant to engineers. Psychological profile tests are used when putting together the student teams that will work on a project assignment related to the competence profiles of the students during the semester. Group coaching and theme days are practiced in these project assignments. The courses that are studied parallel with the project assignments are supply and value chain management, LEAN, sales and marketing, strategy and business management, project management, leadership, communication and organization.	
Catagorization	Strong focus on the contextual background of the students in the project assignments, which are related to the knowledge which they learn in the classroom.
Teaching methods	Interactive lectures, team work, project assignments, group coaching, theme days, industry collaboration
Location	Engineering school located at a university
Match	A2

B4 MSc.	
A master programme specialized in new venture creation which is open to students of different disciplinary backgrounds. The entrepreneurial projects are initiated during the first semester but the focus on the project increases highly during the 2nd semester which leads up to an examination in the form of a theory-related business plan and a reflection essay. The students are taught various entrepreneurship-related topics such as entrepreneurial finance and marketing, managing new venture growth, opportunity recognition and the entrepreneurial process, which the students are expected to apply in their projects	
Catagorization	Strong focus on the contextual background of the students and the entrepreneurial projects which are characterized by a high level of student ownership, even if some of the projects are legally owned by individual researchers.
Teaching methods	Action and reflection, interactive lectures, entrepreneurial projects, industry collaboration
Location	Business school located at a university
Match	A1 A4

APPENDIX B

Search/Creativity
Brainstorm (come up with) new ideas
Think outside the box
Identify opportunities for new ways to conduct activities
Planning/Management
q3. Manage time in projects
q14. Set and achieve project goals
q17. Design an effective project plan to achieve goals
Marshalling
q6. Put together the right group/team in order to solve a specific problem
q8. Form partnerships in order to achieve goals
q10. Network (i.e. make contact with and exchange information with others)
Managing Ambiguity
q4. Tolerate unexpected change
q16. Manage uncertainty in projects and processes
q18. Work productively under continuous stress, pressure and conflict
Financial Knowledge
q7. Read and interpret financial statements
q20. Control costs for projects
Q22. Estimate a budget for a new project

APPENDIX C

Instrumental (N=109) Exploration T2 ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value	Exploitation T2 ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value
Exploration T1	.217	.099	2.194	.028	Exploration T1	-.245	.079	-3.089	.002
Evaluation T1	-.337	.173	-1.946	.052	Evaluation T1	-.186	.147	-1.270	.204
Exploitation T1	.672	.229	2.937	.003	Exploitation T1	.945	.205	4.603	.000
Entrepreneurial activities T1	.015	.145	.103	.918	Entrepreneurial activities T1	-.009	.120	-.075	.940
Entrepreneurial activities T2	.263	.169	1.556	.120	Entrepreneurial activities T2	.398	.142	2.803	.005
Gender (male)	-.145	.144	-1.011	.312	Gender (male)	-.094	.117	-.805	.421
Prior entrepreneurship education	-.014	.135	-.101	.920	Prior entrepreneurship education	-.050	.113	-.439	.661
Evaluation T2 ON					**Exploration T1 with**				
Exploration T1	-.132	.095	-1.380	.168	Evaluation T1	.094	.099	.949	.343
Evaluation T1	.777	.193	4.030	.000	Exploitation T1	.415	.104	3.993	.000
Exploitation T1	-.006	.231	-.028	.978	**Evaluation T1 with**				
Entrepreneurial activities T1	.016	.159	.104	.917	Exploitation T1	.346	.078	4.427	.000
Entrepreneurial activities T2	.231	.185	1.254	.210	**Exploration T2 with**				
Gender (male)	-.011	.161	-.071	.943	Evaluation T2	.152	.053	2.841	.005
Entrepreneurship education	.207	.153	1.353	.176	Exploitation T2	.133	.046	2.894	.004
					Evaluation T2 with				
					Exploitation T2	.184	.047	3.906	.000
x^2=570.83(df:362), RMSEA= .072(.061-.084), CFI=.903, TLI=.879, SRMR=.094									

Individual (N=111) Exploration T2 ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value	Exploitation T2 ON	Estimate	S.E.	Est./S.E.	Two-tailed P-Value
Exploration T1	.418	.098	4.263	.000	Exploration T1	.055	.077	.719	.472
Evaluation T1	-.330	.179	-1.844	.065	Evaluation T1	-.062	.158	-.391	.696
Exploitation T1	.324	.239	1.356	.175	Exploitation T1	.338	.219	1.545	.122
Entrepreneurial activities T1	.117	.241	.483	.629	Entrepreneurial activities T1	.094	.217	.432	.666
Entrepreneurial activities T2	.478	.228	2.100	.036	Entrepreneurial activities T2	.391	.200	1.957	.050
Gender (male)	.320	.172	1.859	.063	Gender (male)	.263	.156	1.688	.091
Prior entrepreneurship education	.488	.198	2.457	.014	Prior entrepreneurship education	.085	.175	.489	.625
Evaluation T2 ON					**Exploration T1 with**				
Exploration T1	-.134	.079	-1.703	.089	Evaluation T1	.365	.137	2.662	.008
Evaluation T1	.357	.162	2.207	.027	Exploitation T1	.489	.128	3.827	.000
Exploitation T1	.306	.218	1.400	.161	**Evaluation T1 with**				
Q700?	.261	.216	1.209	.227	Exploitation T1	.548	.107	5.131	.000
Q701?	.354	.200	1.772	.076	**Exploration T2 with**				
Gender (male)	.350	.155	2.262	.024	Evaluation T2	.253	.066	3.811	.000
Entrepreneurship education	.373	.175	2.130	.033	Exploitation T2	.343	.074	4.638	.000
					Evaluation T2 with				
					Exploitation T2	.291	.064	4.414	.000
x^2=570.83(df:362), RMSEA= .072(.061-.084), CFI=.903, TLI=.879, SRMR=.094									

5. CONCLUSIONS

This thesis has demonstrated that performing educational assessments is a complicated task. The educational context is a complex setting and there are numerous things to account for. Both the personal characteristics of the pupils and students, as well as their interaction with the context, influence the outcomes (Ames, 1992; Finn & Rock, 1997; Maehr, 1984), and it is difficult to isolate the actual effects of the education. Entrepreneurship education is in itself a very heterogeneous field with many different educational approaches and pedagogical perspectives (Hannon, 2005; Neck & Greene, 2011). These approaches have various educational objectives and it is therefore difficult to compare their effects on pupils and students. Even though the objectives of these educational approaches are different, they all stem from the field of entrepreneurship research and their pedagogical approach and teaching methods are inspired by the skills which entrepreneurs use and the ways in which entrepreneurs learn. It is therefore important that evaluators recognize the differences between these approaches but also their similarities. I have throughout this thesis argued that the concept of cognitive and non-cognitive skill development is a useful approach to apply in order to effectively categorize and evaluate educational initiatives within the field.

In chapter 1 I presented a categorization model which classified education *about*, *for* and *through* entrepreneurship[27] according to their focus on 1) skill development (cognitive or non-cognitive entrepreneurial skills), 2) teaching methods (action-based or passive), and 3) outcomes (self-employment or self-directed learners). Education *about* entrepreneurship typically focuses on cognitively-oriented entrepreneurial skills and its objective is to increase the pupils' and students' awareness of entrepreneurship and self-employment as a possible career choice. Education *through*

[27] Education *through* entrepreneurship is here understood as an educational approach which uses teaching methods that are inspired by how entrepreneurs learn and which can be used in order to teach other topics (see Blenker, Korsgaard, Neergaard & Thrane, 2011; Hannon, 2005). This concept is however sometimes understood as action-oriented education for entrepreneurship in which the students initiate their ventures during their education (see for example Johnson, 1988; Lackeaus, 2013; O'Connor, 2013; Pittaway & Edwards, 2012) or as entrepreneurship education which targets practicing small-business owners (Kirby, 2004). In this way, my understanding of education *through* entrepreneurship is similar to what Pittaway and Edwards (2012) categorize as an *embedded* approach to entrepreneurship education.

entrepreneurship, on the other hand, mainly focuses on non-cognitive entrepreneurial skills, and rather than focusing on a specific career path this approach aims to develop self-directed and enterprising individuals who can apply their knowledge in a wide range of contexts and situations. These two approaches thus have few overlaps. When it comes to education *for* entrepreneurship, there are clear overlaps with both education *about* and education *through* entrepreneurship, since this approach most often has self-employment as an outcome goal, but it also focuses on developing non-cognitive skills and, as a consequence, usually relies on action-oriented teaching methods in order to teach these skills.

The Effects of Different Approaches to Entrepreneurship Education

Most research in entrepreneurship education and assessment studies of education in the field have focused on education *for* entrepreneurship. This is natural since it is the most comprehensive approach and it ties together the other two approaches. However, this does not mean that of the three approaches education *for* entrepreneurship is always the most effective one. Depending on the objectives it may be preferable to focus on the other two approaches, since education *about* entrepreneurship can easily be taught to hundreds of pupils and students due to its passive teaching methods, and education *through* entrepreneurship can be implemented across the curriculum. At the lower levels of education, education *through* entrepreneurship is a popular approach (Hannon, 2005), since it focuses more on teaching methods - which is something teachers at this level can influence - rather than on knowledge and learning goals, which are typically decided over the heads of the teachers.

The effects of different educational approaches on students at lower secondary level

In chapter 2 the effects of education *about* and *for* entrepreneurship were compared to the effects of education *through* entrepreneurship on pupils at the lower secondary level of education. In this analysis the focus was on the influence of the educational approaches on the pupils' level of school engagement and perceived teacher support. These variables have been shown to have a positive influence on adolescents' consecutive social, professional, and academic behaviour (Demanet & Van Houtte, 2012; Fredricks, Blumenfeld & Paris, 2004; Libbey, 2004). The analysis did, however, also include a measure of the pupils' entrepreneurial intentions.

Education *through* entrepreneurship, which focuses on the pupils' interests and motivation and on developing non-cognitive entrepreneurial skills, was demonstrated to have a positive association with the pupils' perceived teacher support and level of school engagement but a negative association with their level of entrepreneurial intentions. The opposite was true for education *about* and *for* entrepreneurship both of which had a positive association with the pupils' level of entrepreneurial intentions but a negative association with their level of school engagement. The analysis offers initial support to the perspectives that argue that entrepreneurship education at this level should be embedded across the curriculum rather than taught as a sole standing topic, and that the focus should be on developing non-cognitive entrepreneurial skills rather than cognitively-oriented entrepreneurial skills, since adolescents are far away from the labour market and the interest in self-employment is thus limited (see for example Johannisson, 2010; Jones & Iredale, 2010; Surlemont, 2007).

Furthermore, the analysis demonstrates that it is important to include multiple outcome variables in educational assessment studies in order to capture the effects which different approaches within the field of entrepreneurship education have on the pupils. Evaluation studies of entrepreneurship education usually only focus on variables related to a career as self-employed,

which can be unfortunate since these only capture a fragment of the influence of educational approaches on adolescent pupils. The analysis also pointed out the importance of separately analysing the effects that result from the content taught and the teaching methods applied, as this will give us a better understanding of the mechanisms behind these effects. However, in order to establish the causal relationships between the different educational approaches and the outcome variables it will be necessary to collect longitudinal data and to follow the respondents over many years.

The effects of education for entrepreneurship on students at tertiary level

There are also important differences between different approaches *for* entrepreneurship. Many of the *process-oriented* and business plan-dominated approaches to entrepreneurship education, which have dominated the business schools (Gibb, 2002a, 2002b; Honig, 2004; Neck & Greene, 2011), have a strong focus on teaching cognitively-oriented entrepreneurial skills. This makes good sense since these types of skills are easy to codify and teach in an educational setting. The increasingly popular *method-oriented* approach, however, has a stronger emphasis on non-cognitive skills, which are more challenging for educational institutions both to teach and assess, since these types of skills require practice to be learnt. In my categorization model (presented in chapter 1), these different approaches to education *for* entrepreneurship mainly differ as to the degree to which the focus is on the *evaluation* phase or the *exploitation* phase, and, consequently, whether the main focus is on fostering *cognitive* or *non-cognitive* entrepreneurial skills, and they should therefore be assessed accordingly.

In this thesis I have used Bandura's concept of self-efficacy (Bandura 1977a, 1977b, 1997) to assess the effects of different approaches to entrepreneurship education on students at tertiary level. The multidimensionality of this measure makes it possible to focus on different skill sets important

to entrepreneurs during different phases of entrepreneurial ventures, and since it is a self-reported measure it can be used to assess the students' perceived level of non-cognitive skills, which are typically hard to assess with standard tests and examinations (Heckman, Stixrud & Urzua, 2006). The existing ESE scales do, however, use a jargon-based wording which is hard for students to understand (especially students outside business schools). The dimensionality of these scales is also questionable since few replication studies have been performed and they are commonly treated as one-dimensional measures in assessment studies. It was therefore necessary to develop an ESE scale which was especially designed for educational assessment studies. In chapter 3 this ESE scale was presented.

Based on the three established ESE scales (Chen, Greene & Crick, 1998; DeNoble, Jung, & Ehrlich, 1999; McGee, Peterson, Mueller & Sequeira, 2009) a refined ESE measure with a more jargon-neutral wording was developed. The statistical properties and the predictive validity of the scale were demonstrated, and an alternative way of structuring the indicators and dimensions, which focuses on the three phases in an entrepreneurial venture (exploration/evaluation/exploitation), was presented. This alternative dimensionality is especially suitable for assessment studies since it includes a limited number of indicators and constructs. The importance of treating entrepreneurial self-efficacy (ESE) as a multidimensional measure was demonstrated. Since many assessment studies have shown inconclusive results regarding the association between ESE – or the related concept perceived behaviour control (Ajzen, 2002) – and entrepreneurial intentions, and the effects of entrepreneurial education on these variables (see for example Cox, Mueller & Moss, 2002; Graevenitz, Harhoff & Weber, 2010; Oosterbeek, Praag & Iksselstein, 2009; Soutaris, Zerbinati & Al-Laham, 2007), it was tested in chapter 3 in what ways prior entrepreneurial experience affected the relationship between ESE and entrepreneurial intentions.

The analysis demonstrated that it was mainly the perceived level of non-cognitive exploitation skills - such as how to manage ambiguity and resource marshalling - which explained the entrepreneurial intentions of students with an entrepreneurial background. Their perceived level of cognitively-oriented evaluation and preparation skills, such as planning and financial literacy, were, however, close (p=.052) to having a significantly negative effect on their entrepreneurial intentions. The opposite was true for students who did not have any experience with entrepreneurship. For this group of students it was the perceived level of evaluations skills which had a significantly positive influence on their entrepreneurial intentions, whereas their perceived level of exploitation skills had a negative association with this variable. This finding illustrates the importance of treating ESE as a multidimensional measure, since the diverging influence which entrepreneurial experience has on ESE's association with entrepreneurial intentions would cancel out ESE's influence on entrepreneurial intentions if it were treated as a one-dimensional construct.

The conclusions drawn in this chapter were that individuals' experiences with entrepreneurship have a major influence on which skills they perceive as important in order to perform entrepreneurial activities. Individuals who lack this experience have to rely on other sources than personal experience in order to make such assessment. Since there is a strong focus on the business plan in organizations which support entrepreneurship as well as in many entrepreneurship programmes and in the media (Gibb, 2002a, 2002b; Honig, 2004), it is not surprising that many students believe that it is mainly cognitively-oriented evaluation and preparation skills that are important when embarking on an entrepreneurial venture.

Although it is important to convey which skills are important to active entrepreneurs, we should, nevertheless, be careful not to disregard the above-mentioned skills, which are important during the evaluation and preparation phase in entrepreneurial ventures, since, in fact, many entrepreneurship students are in this very phase. Furthermore, the analysis also demonstrated that

students with entrepreneurial experience had significantly higher perceived levels in this skill set, which indicates that somewhere along the road they have picked up these skills. It can therefore be a good idea to focus, at least partially, on these skills in entrepreneurship programmes, since their cognitive character makes them easy to codify and teach in an educational setting, and since it might just be the lack of a perceived basic level of competence in these skills that hinders many students in even considering a career as self-employed.

The longitudinal effects of entrepreneurship education on students at tertiary level

In chapter 4 the longitudinal effects of two different approaches to education *for* entrepreneurship on students at master level was analysed. Eight master programmes in entrepreneurship, which had been followed for a year, were divided into two groups according to their focus on student ownership of the entrepreneurial venture projects and the extent to which the students' prior contextual knowledge was included in the educational process. The students' initial levels of ESE explained only a very small part of their perceived competence levels after having experienced education where the focus on psychological ownership and involvement of prior contextual knowledge had been strong. These programmes had a significantly positive effect on the students' perceived level of non-cognitive entrepreneurial skills as well as on their personal entrepreneurial venture activities but no significant effect on the students' perceived level of cognitively-oriented entrepreneurial skills. Entrepreneurship programmes which focused more on teaching the students general entrepreneurship and management skills, and where the entrepreneurial venture projects were located in a third-party organization, had a significantly positive effect on both non-cognitive and cognitively-oriented entrepreneurial skills but a negative effect on the students' personal entrepreneurial venture activities. The students' initial levels of ESE did, however, to a large degree explain their post levels of ESE in these programmes.

The analyses presented in chapter 4 indicate that there are many different ways to develop ESE and increase the students' perceived competence in performing different entrepreneurial skills. Education that focuses on involving the students' prior contextual knowledge in the educational process, and where the students have a high level of psychological ownership over their entrepreneurial venture projects, are perceived as disruptive educational experiences which change the students' perception of their entrepreneurial abilities. The strong focus on new venture creation in this approach increases the students' personal entrepreneurial venture activities, but since this educational approach is so closely tied to the venturing process, it is mainly the students who either run or start up a company during their educational process who increase their levels of ESE.

The educational approaches which are more oriented towards strategic entrepreneurship increase the students' confidence in their entrepreneurial skills (both non-cognitive and cognitively-oriented) in a more incremental manner. However, since the entrepreneurial venture projects are placed with a third party in these approaches, it is mainly students who already have a high level of confidence in their practically-oriented skills who dare to apply their knowledge in creative and innovative ways. The strong focus on industry collaboration in these approaches leads to a decrease in the students' personal venture activities, which can be expected as more students will increase their understanding of how to use and apply their entrepreneurial skills and abilities within established organizations or in collaboration with third parties.

The analyses in chapter 4 thus show that the link between ESE and entrepreneurship in the form of self-employment is not as strong as previous researchers have assumed (see for example Boyd & Vozikis, 1994; Chen et al., 1998; DeNoble et al., 1999; McGee et al., 2009). This is a natural development since strategic entrepreneurship within established organizations has become increasingly important (Foss & Lyngsie, 2012; Hitt & Ireland, 2000), and since entrepreneurial

skills and abilities are today demanded in many different contexts (Gibb, 2002a, 2002b; Hannon, 2005; Neck & Greene, 2011; Sarasvathy & Venkataraman, 2011).

Directions for Further Research

This thesis has illustrated that entrepreneurship education is a heterogeneous field which includes many different educational approaches with various objectives and teaching methods. It is therefore problematic to talk about entrepreneurship education and its effects as if it were a clearly defined and codified topic. The effects of the different approaches within the field can vary to a large degree and they can often also have diverging effects. In chapter 2 it was demonstrated that education *through* entrepreneurship and education *about/for* entrepreneurship had the opposite effects of one another when it came to entrepreneurial intentions and school engagement. In chapter 3 it was demonstrated that entrepreneurial experience played an important role in explaining the association between different dimensions in ESE and the students' level of entrepreneurial intentions. In chapter 4 the analysis showed that two different approaches to entrepreneurship had diverging effects on the students' personal venture activities and how they perceived their entrepreneurial self-efficacy.

The influence of different approaches to entrepreneurship education depends to a large degree on which objectives these approaches have, but also the background of the pupils and the students influence the outcomes. We thus have to accept that the world is not black and white, and that it is difficult to get any straightforward answers as to what works, and what does not, within the field of entrepreneurship educations. This does not mean that we should not try. The interest in entrepreneurship and entrepreneurship education has grown enormously during the last decades and is steadily growing (Katz, 2003, 2008). Vast amounts of resources are being invested in initiatives within the field. This makes it increasingly important that we increase our understanding of which

approaches are most effective at different levels of education and, most importantly, that we identify the mechanisms behind these effects.

I have throughout this thesis argued that it is important to recognize the differences between various educational approaches within the field but also their similarities, since they stem from the field of entrepreneurship and entrepreneurial learning. The concept of cognitive and non-cognitive skill development is a useful approach to apply in order to effectively categorize and evaluate educational initiatives within the field, and it is my hope that other researchers are inspired by this approach and will continue to develop and expand its focus. This can be done in numerous ways. Replication studies and analyses which include longitudinal data are needed to verify the findings presented in this thesis, but also qualitative methods are important to focus on in assessment studies, as these could offer valuable insights about the mechanisms that are behind the effects. In addition, methods such as *experience sampling* (Hektner, Schmidt & Csikszentmihalyi, 2007) could be used in order to assess the ongoing effects of different educational approaches. This method, in which the respondents fill out questionnaires multiple times each day, has become increasingly feasible since the introduction of the smartphone and survey apps (see for example Csikszentmihalyi & Larsson, 1984; Csikszentmihalyi & Schneider, 2000; Lackeus, 2013).

There are also numerous variables that would be interesting to include in future assessment studies. The effects which the educational approaches have on the students' emotions could be especially important to focus on (Lackeus, 2013), since there are many pedagogical theories which emphasize the importance of this dimension in learning processes (see for example Illeris, 2009; Kolb, 1984; Mezirow, 1991; Wolf & Kolb, 1984). I touched upon this dimension in chapter 4 where the concept of entrepreneurial passion was discussed (Cardon, Zietsma, Saparito, Matherne & Davis, 2005; Cardon, Wincent, Singh & Drnovsek, 2009). However, I did not include a measure of this in the surveys. It is likely that students who experience their education as disruptive will be

affected more than students who do not emotionally engage in their educational process. This is an interesting field to investigate for future research.

Concluding Remarks

This thesis should be viewed as the first building block in a larger research project which in time will provide us with many insights about how different elements and dimensions in entrepreneurship education influence the students' behaviours. The development of the research projects has been an iterative learning process and naturally there are many more interesting factors and dimensions that could be included in these assessment studies. However, parsimony is important in these types of studies because it makes it possible to collect longitudinal data. This comes with a trade-off, since only a limited number of variables and factors can be studied. However, in my view it is more important to increase our in-depth knowledge about a limited number of dimensions rather than to get shallow knowledge about a wide range of variables. My focus has therefore been to develop adequate measures and survey designs which can be used in longitudinal studies of entrepreneurship education. The ambition is that the research projects which were initiated during my PhD period will continue and that, in time, they will offer us valuable insights about the short term and the long term effects of different approaches to entrepreneurship education.

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