



UiT The Arctic University of Norway

School of Business and Economics

The impact of entrepreneurship education on students' career reflections

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To Ane and Jakob

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Kjersti Kjos Longva

Ålesund, September 2019

ABSTRACT

The thesis aims to explore the impact entrepreneurship education (EE) has on students' career reflections. EE has developed significantly in both scope and importance over recent decades and is now being taught worldwide at all education levels. Major stakeholders, such as educators, education institutions, funders, governments and policymakers, are investing heavily in terms of human and/or financial resources to create, implement and develop EE initiatives. With such exponential development, there is a need for more knowledge on the implications of EE. As a result, EE has emerged as an area of research and EE impact studies have become a sub-field in EE research. However, despite the substantial growth in these impact studies over recent years, the empirical findings remain mixed, conflicting and inconclusive.

Moreover, when career outcomes are addressed in impact studies, the focus is on entrepreneurship as a career, while EE's broader career implications remain unexplored. Accordingly, the point of departure for the thesis is that present understanding of the impact of EE on career outcomes needs to be more comprehensive. There is a need to go beyond the narrow focus of 'producing' entrepreneurs and to take a broader perspective on the implications EE has for students' careers. EE can be a space for career exploration that leads to career reflection, in which students discover more about themselves, about entrepreneurship, and about their career preferences. This is the background for focusing on students' career reflections in the thesis and which led to the following overarching research question: *How does participation in entrepreneurship education impact students' career reflections?* To address this, the thesis draws upon the literature on career development and investigates the potential of EE as a career exploration intervention that triggers students' career reflection. The research question is examined through four sub-research questions, resulting in four papers.

The first paper is a systematic literature review that takes a closer look at quantitative impact studies in EE. These studies have been criticized for having severe methodological deficiencies, so the purpose of the systematic literature review is to examine the extent to which this is the case. Drawing upon seminal work on effect studies in education and social science, the systematic literature review finds that there is a severe lack of strong experimental studies¹ in EE impact studies (i.e. quasi-experimental design and true experimental design) as opposed to weak experimental design (pre-experimental design). This has major implications for the accumulated knowledge of EE impact. A closer examination

¹ The classification of 'strong' and 'weak' experimental design is taken from Johnson & Christensen's (2014) recommendations for researching the impact of educational initiatives. It is accordingly not a classification of strong and weak research design in general, but refers to the extent to which one can make inferences on causality in effect studies on educational initiatives.

of the few studies that do apply a strong experimental design shows that the empirical findings on EE impact remain conflicting and inconclusive. Therefore, the paper highlights the need for more EE quantitative impact studies with a rigorous research design, but also call for exploration of novel impact indicators.

The second paper argues that EE impact research has held a narrow view of career impact. The focus has been on the intention to start businesses, on nascency, and on venture creation. These are important implications of EE, but the point of departure for paper 2 is that the career impact of EE should be viewed more broadly. Hence, the construct of intrapreneurial intentions is introduced. Additionally, the application of conjoint analysis, a novel methodology in EE, enables investigation of unconscious career preferences and is an alternative to measuring career choices through scales or dichotomous measures. However, the findings in terms of EE impact are mixed, which lay the foundation for further exploration in the third paper.

Paper 3 is a follow-up study to paper 2 and examines how participation in a business planning course impacts students' career preferences for entrepreneurship or intrapreneurship. As opposed to paper 2, the study is longitudinal, and can therefore observe the changes in career preferences that takes place during an EE course. The findings indicate a decrease in entrepreneurial intention among EE students compared to the control group, but also show that this is due to a shift in preferences from entrepreneurship to employment (both to intrapreneurship and to employment without intrapreneurship tasks). The proposition of EE as an arena for career reflection is consequently suggested, drawing upon theoretical concepts from career development theory.

Finally, the fourth paper takes an exploratory approach to understanding more about students' reflections during an EE course in design thinking. The exploratory case study finds that the EE course led to the development of both subject-specific knowledge and tangential skills, but more importantly, that the challenge of the course pushed students to their limits and made them engage in deep and transformational learning which had implications for their visions of their future careers.

Overall, the thesis offers new insight into the complexity of EE career impact and the potential of career development theory in EE research. The empirical findings suggest that EE can in fact function as a career exploration intervention that triggers students' career reflection. Furthermore, in line with career development theory, the findings indicate that career exploration and reflection lead to either continued career commitment, or to career reconsideration of entrepreneurship as a career choice. This demonstrates the relevance of the career development literature to EE research and suggests a rewarding direction for further research. Besides theoretical development, the thesis also provides a number of important implications for students, entrepreneurship educators and policymakers.

NORSK SAMANDRAG

Doktoravhandlinga har som formål å utforske effekten som entreprenørskapsutdanning har på studentar sine refleksjonar rundt eiga karriere. Det har dei siste tiåra vore ein sterk vekst i tilbodet av entreprenørskapsutdanning og det vert i dag undervist i entreprenørskap på alle utdanningsnivå og i alle delar av verda. Undervisarar, utdanningsinstitusjonar, sponsorar, regjeringar og politikktutformarar er alle interessentar som investerer både tid og finansielle ressursar i utforming, implementering og utvikling av entreprenørskapsutdanning. Med bakgrunn i denne utviklinga, melder det seg eit behov blant interessentane om å forstå meir om effektane av entreprenørskapsutdanning. Forsking på entreprenørskapsutdanning har difor auka betydeleg dei siste tiåra, men funna frå dei empiriske studiane er førebels blanda, motstridande og uklare.

Vidare fokuserer effektstudiar som ser på karriereimplikasjonar i hovudsak på entreprenørskap som karriereval, mens karriereimplikasjonar utover dette har fått mindre merksemd. Utgangspunktet for doktoravhandlinga er difor at kompleksiteten rundt entreprenørskapsutdanning sin effekt på karriere ikkje er godt nok forstått i dagens forskning. Det er eit behov for å bevege seg frå ei snever oppfatning om at entreprenørskapsutdanning skal «produsere» entreprenørar til eit utvida perspektiv på implikasjonane entreprenørskapsutdanning kan ha for studentar si karriere. Entreprenørskapsutdanning kan vere eit rom for karriereutforsking, der studentar oppdagar meir om seg sjølv, meir om entreprenørskap, og meir om sine eigne karrierepreferansar. Dette er bakgrunnen for å fokusere på studentar sine karriererefleksjonar i avhandlinga og motivasjon for følgjande overbyggjande forskingsspørsmål: *Korleis påverkar deltaking i entreprenørskapsutdanning studentar sine karriererefleksjonar?* For å sjå nærare på dette nyttar avhandlinga seg av litteratur frå karriereutvikling og undersøker potensialet til entreprenørskapsutdanning som ein karriereutforskingssintervensjon som utløyser karriererefleksjon hos studentar. Forskingsspørsmålet vert undersøkt gjennom fire delspørsmål som har resultert i fire ulike artklar.

Den første artikkelen er ein systematisk litteraturstudie som ser nærare på kvantitative effektstudiar på entreprenørskapsutdanning. Effektstudiar i forskingsfeltet har vorte kritisert for å ha betydelege metodologiske svakheiter, og formålet med litteraturstudien er å undersøke kor vidt dette er faktiske utfordringar i forskingsfeltet. Med bakgrunn i litteratur om effektstudiar frå utdanning og samfunnsvitskap, viser litteraturstudien at det er ein framtrudande mangel på empiriske studiar med «sterk»² eksperimentell design (dvs. kvasiekperiment eller randomisert, kontrollert eksperimentell

² Klassifiseringa av «sterk» og «svakare» eksperimentell design er henta frå Johnson & Christensen (2014) i konteksten av forskning på effekten av utdanningstiltak. Det er dermed ikkje ei klassifisering av sterk og svak forskingsdesign på generell basis, men omhandlar «sterke» og «svakare» design med tanke på kor vidt ein kan trekke slutningar om kausalitet i effektstudiar for utdanningstiltak.

design) samanlikna med «svakare» eksperimentell design (pre-eksperimentell design). Dette har alvorlege konsekvensar for den akkumulerte kunnskapen om effekten av entreprenørskapsutdanning. Ei samanlikning av dei få studiane som nyttar «sterk» eksperimentell design, viser at effekten av entreprenørskapsutdanning framleis er motstridane og uklar. Artikkelen trekkjer difor fram behovet for fleire kvantitative effektstudiar med solid forskingsdesign, og etterlyser også utforsking av nye utfallsvariablar.

Den andre artikkelen argumenterer for at effektstudiar i entreprenørskapsutdanning har hatt eit for snevert perspektiv på karriereimplikasjonar. Fokuset har tradisjonelt vore på intensjonen om å starte bedrift, på etablerarforsøk og på faktisk bedriftsetablering. Desse er alle viktige effektar av entreprenørskapsutdanning, men utgangspunktet for artikkelen er at ein også kan undersøke karriereimplikasjonar i eit utvida perspektiv. Begrepet intraprenørskapsintensjon vert difor introdusert i denne artikkelen. I tillegg vert det nytta conjoint-analyse, som ikkje har vorte brukt tidlegare i effektstudiar på entreprenørskapsutdanning. Conjoint-analyse gjer det mogeleg å undersøke ubevisste karrierepreferansar og er dermed eit alternativ til måling av karriereintensjonar gjennom skala eller diktonome variablar. Funna i artikkelen når det gjeld effekten av entreprenørskapsutdanning er derimot blanda og legg grunnlaget for vidare utforsking av dette i den tredje artikkelen.

Den tredje artikkelen er ein oppfølgingsstudie av artikkel 2 og undersøker korleis deltaking i eit kurs i forretningsplanlegging påverkar studentar sine karrierepreferansar for entreprenørskap og intraprenørskap. I motsetning til artikkel 2, har studien ein tidsseriedesign som mogleggjer undersøking av korleis karrierepreferansar endrar seg i løpet av kurset. Funna i artikkelen indikerer at entreprenørskapsintensjonen blant studentane i kurset går ned samanlikna med ei kontrollgruppe. Funna syner òg at det er ei forskyving i studentane sine preferansar frå entreprenørskap til tilsetjing (både til intraprenørskap og til tilsetjing utan arbeidsoppgåver som omhandlar intraprenørskap). Påstanden om entreprenørskapsutdanning som ein arena for karriererefleksjon vert difor lagt fram, basert på teoretiske begrep frå karriereutviklingsteori.

Den fjerde artikkelen har ei utforskande tilnærming for å forstå meir om studentar sine refleksjonar i eit entreprenørskapsutdanningskurs innan designtenkning³. Den utforskande case-studien viser at kurset bidrog til utvikling av både fagspesifikk og generell kompetanse, men også at utfordringa som kurset utgjorde, utfordra studentane til ytterkanten av sine grenser og gjorde at dei engasjerte seg i djup og transformerande læring som hadde implikasjonar for refleksjonane deira rundt framtidig karriere.

³ På engelsk: design thinking. Eit samlebegrep for ein metodikk for utviklingsprosessar, som er inspirert av designdisiplinar.

Doktoravhandlinga som heilheit bidreg dermed til å utvikle ny innsikt når det gjeld påverkinga som entreprenørskapsutdanning har på studentar si karriere. I tillegg viser dei empiriske studiane at litteratur innan karriereutvikling kan vere eit viktig teoretisk bakteppe for forskning på entreprenørskapsutdanning. Funna i avhandlinga syner at entreprenørskapsutdanning kan ha ein funksjon som karriereutforskingsintervensjon, og at dette utløyer karriererefleksjon hos studentane rundt kven dei er og deira framtidige karriere. I tråd med karriereutviklingsteori, viser funna at karriereutforskinga og karriererefleksjon kan føre til både vidare forplikting til karrierevalet ein har tatt, men også til fornya vurdering av karriereval. Dette viser at det er relevant å forstå entreprenørskapsutdanning i eit karriereutviklingsperspektiv og at dette er eit viktig område for vidare forskning. I tillegg til å ha implikasjonar for teoriutvikling, bidreg doktoravhandlinga også med fleire viktige implikasjonar for studentar, for undervisarar innan entreprenørskapsutdanning og for politikktutformarar.

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The future is not a result of choice among alternative paths offered by the present, but a place that is created – created first in the mind and will, created next in activity. The future is not some place we are going to, but one we are creating. The paths are not to be found, but made, and the activity of making them changes both the maker and the destination.

John Homer Schaar

LIST OF PUBLICATIONS AND AUTHOR'S CONTRIBUTION

Publications

The following papers are included in the PhD thesis:

- I:** Title: Measuring impact through experimental design in entrepreneurship education: A literature review and research agenda.
Authors: Kjersti Kjos Longva & Lene Foss
Status: Published in *Industry & Higher Education*, 32(6): 358-374.
<https://doi.org/10.1177/0950422218804912>
- II:** Title: Hope for the future? Students' attitudes towards entrepreneurship, innovation, and international mobility.
Authors: Kjersti Kjos Longva
Status: Published in *Det regionale i det internasjonale – Fjordantologien 2018*.
<https://doi.org/10.18261/9788215031224-2018-14>
- III:** Title: Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course.
Authors: Kjersti Kjos Longva, Øivind Strand & Mark Pasquine.
Status: Draft. Submitted to *Education + Training*.
- IV:** Title: Combining technology and entrepreneurial education through design thinking: students' reflections on the learning process.
Authors: Matthew Lynch, Uladzimir Kamovich, Kjersti Kjos Longva & Martin Steinert
Status: Forthcoming in *Technological Forecasting & Social Change*.
<https://doi.org/10.1016/j.techfore.2019.06.015>

Contributions

Table 1 below provides an overview of the contributions of co-authors and supervisors to the different papers. Signed co-author statements with more detailed information about their contributions to the different papers can be found in Appendix 1.

Table 1: Contributions from co-authors and supervisors

Developmental phase	Paper I	Paper II	Paper III	Paper IV
Concept and idea	KKL	KKL	KKL, ØS	KKL, ML, UK
Study design and methods	KKL	KKL	KKL, MP	KKL, ML, UK
Data collection	KKL	KKL	KKL	KKL, ML, UK
Analysis and interpretation	KKL	KKL	KKL, ØS, MP	KKL, ML, UK
Manuscript preparation	KKL	KKL	KKL	KKL, ML, UK, MS
Critical revision of the intellectual content	KKL, LF, ØS, ÅLD	KKL, ØS, LF	KKL, ØS, MP, LF, ÅLD	KKL, ML, UK, ØS, LF

KKL: Kjersti Kjos Longva

LF: Lene Foss

MP: Mark Pasquine

MS: Martin Steinert

ML: Matthew Lynch

ØS: Øivind Strand

UK: Uladzimir Kamovich

ÅLD: Åsa Lindholm Dahlstrand

PART 1
OVERVIEW OF THE THESIS

1. INTRODUCTION

This thesis focuses on entrepreneurship education (EE) and the impact it has on students' career reflections. With a rapidly increasing number of entrepreneurship courses and programs across the world and at all education levels, it is becoming ever more important to understand the effects of EE as a pedagogical initiative. The purpose of the thesis is therefore to contribute to knowledge development on the career impact of EE, and more specifically the impact it has on how students reflect upon their future careers. The following section introduces the background of the study and its objective in the form of a main research question. Further, the theoretical positioning is presented, as well as the overall structure of the thesis.

1.1 Background of the study and practical relevance

Deciding in which direction their career should go is a major developmental task for adolescents and young adults (Erikson, 1980; Super, 1957). Finding and pursuing a chosen career can be an overwhelming decision to make, but it is also a very important one. Work represents a central aspect of life across societies and cultures, as it provides a means of survival and an arena for cultivating social relationships, a sense of identity and meaning (Blustein, 2013). Career development and the emergence of vocational identity have consequently been established at the core of contemporary career theory (Brown & Lent, 2013; Porfeli et al., 2011; Porfeli et al., 2013). According to Porfeli & Lee (2012), the process of career development and vocational identity formation begins in childhood through learning about the world of work, establishing a basic sense of self, and projecting this into the world of work through one's future work self. As children become adults, a *"vocational identity becomes shaped by an emerging awareness of personal talents, values and interests and bounded by perceived opportunities and constraints"* (Porfeli et al., 2013, p. 135). Progress towards career development and a vocational identity is of great importance in a person's life and a lack of progress can have severe consequences. Research shows that struggling with one's own career identity, being unemployed, and having an unfulfilling career have very negative effects on an individual's well-being (Lent & Brown, 2008; Paul & Moser, 2009).

The time as a student in higher education should accordingly be one of self-exploration, change and growth in terms of both personal and career development. It is a time when it is important to engage in exploration of different career trajectories and to reflect upon one's future career opportunities. The importance of career exploration and reflection implies that higher education needs to arrange activities that promote this among students; i.e., career interventions that trigger career development

through exploration and reflection. In the literature, career exploration is defined as a process of exploration that is both internal (understanding more about oneself) and external (understanding more about the world of work) (Porfeli et al., 2011). Career exploration can trigger and develop career reflection, which refers to the ability to reflect on personal capacities and motivations in one's own career (Akkermans et al., 2012; Kuijpers et al., 2006). Career counseling during tertiary education has been suggested as one means of career exploration that stimulates career development (Kuijpers & Meijers, 2012), and so includes internships as integrated parts of higher education degrees (Silva et al., 2016). This thesis sets out to investigate the potential of EE as a career exploration intervention and as an arena for career reflection. According to Kuijpers and Meijers (2012), a learning environment that supports career development is characterized by a practice-based and inquiry-based curriculum and provides opportunities to engage in career dialogue. The point of departure for the thesis is that EE in its most active forms meets these characteristics and thereby could function as a career exploration intervention that enhances career development through career reflection.

EE has many variations and differs in terms of objectives, target group, content, pedagogies and assessments (Fayolle & Gailly, 2008). However, a common denominator is its purpose to introduce entrepreneurship into an educational setting. In the thesis, entrepreneurship is defined as the discovery, evaluation and exploitation of opportunities for new combinations in the context of new venture creation. The definition is based on seminal work by Schumpeter (1934), Gartner (1988) and Shane and Venkataraman (2000) and will be elaborated in Chapter 2. Therefore, it should initially suffice to highlight that the definition emphasizes entrepreneurship as something that takes place in the context of the creation of new organizations. Accordingly, EE is about developing the mindset, skill set and practice necessary for entrepreneurship (Neck & Corbett, 2018). While EE takes place at all education levels, from primary school to PhD, the focus in this thesis is EE in higher education. After first being introduced into higher education at the Harvard Business School in 1947, EE has grown exponentially and spread to all corners of the world (Katz, 1992; Kuratko, 2005). The number of EE courses in the US exceeds 5000 (Kauffman, 2008) and EE continues to expand worldwide as a result of governments' and policymakers' interest in the role entrepreneurship plays as a catalyst for both economic and social development (Valerio et al., 2014).

EE encompasses many different pedagogics, from learning about entrepreneurship in a theoretical manner, to experiential learning through engaging in entrepreneurship practice (Neck & Greene, 2011). In its more active forms, EE is situated at the intersection of theoretical and practical learning. From a career development perspective, EE has potential as a career exploration intervention, since it encourages students to make use of other skills than those normally used in an education setting. EE thereby serves as a space for career reflection, where students learn more about themselves, about

entrepreneurship, about the workplace, and about their opportunities in future careers. For adolescents and young adults today, there is myriad of career alternatives available; a few generations ago, the concept of career choice was unknown for most people. Occupations were inherited from the preceding generation and, with a few exceptions, lasted for the rest of one's life. Today, at least in the Western world, the alternatives are numerous and careers are described as discontinuous and boundaryless (Arthur & Rousseau, 1996). However, children and young adults spend far more time in school and have less opportunity to acquire practical work experience in everyday life. EE as a career exploration intervention provides an opportunity to overcome this challenge.

1.1.1 The importance of career development in higher education

As discussed above, progress towards career development and a vocational identity has substantial implications for an individual's well-being later in life. However, in an educational context, it also has more immediate implications in terms of retaining the motivation to graduate from higher education, as well as for the important school-to-work transition. Statistics suggest that student drop-out and school-to-work transition are major challenges, both in the Norwegian and European contexts. In Norway, half of students do not complete their degree in the nominal study length (Statistics Norway, 2017) and an EC report indicates that completion rates in Norwegian higher education dropped from 65% in 2005 to 59% in 2011 (Vossensteyn et al., 2015). This is a trend seen in several European countries; the same report shows that in Sweden completion rates dropped from 69% in 2005 to 53% in 2011, while they dropped from 85% in 2005 to 81% in 2011 in Denmark. The UK is facing the same challenge and 20,295 UK students who began studying for their first degree in 2016 did not make it beyond their first year (HESA, 2018). Career indecision and subsequent drop out from higher education have major consequences for both the individual and society. Immense investments are being made into higher education today and increasing the number of individuals holding tertiary education qualifications is at the top of policy agendas⁴ (EC, 2006; KD, 2017; OECD, 2018). The increasing student dropout rates are working against this goal and are also a major cost burden⁵. It has long been acknowledged that goals and commitment towards a career are important for students' decisions on whether to persist with, or drop out from, their educational process (Tinto, 1975; Wang & Degol, 2014).

⁴ Following the «Europe 2020» strategy, the European target for higher education is that at least 40% of 30-34 year-olds in the EU should have completed tertiary education by 2020 (EC, 2019).

⁵ According to the OECD (2018), OECD countries on average spent USD 15,700 annually per full-time student in tertiary education; in Norway this figure was USD 20,973.

Thus, through a better understanding of the relevance of education to their future careers, students might become more dedicated to their studies and thereby avoid dropping out.

Similarly, providing arenas for career reflection will assist students when transitioning from student life to work life. Career development during higher education is crucial for the important school-to-work transition. This is one of the most critical steps in graduates' careers, as it is a precursor for successful career development (Ryan, 2001). However, the transition is also a challenging one, as it can be difficult to enter the labor market with little prior work experience. Hence, graduates face the risk of unemployment and underemployment, with the negative consequences these have for career prospects and well-being (McKee-Ryan & Harvey, 2011; Paul & Moser, 2009). Career preparation and development while studying have been identified as important factors for succeeding in the transition from school to work (Hirschi et al., 2011; Koen et al., 2012). Therefore, the career development perspective is an important aspect of higher education, since progress in such development and vocational identity formation lay an important foundation for graduating, successfully transitioning from school to work, and for an individual's well-being later in life.

1.1.2 The emergence of entrepreneurship education in higher education

Despite the importance of career development in higher education, it has received little attention in the EE literature. In fact, EE has remained somewhat separate from the body of career development literature. In terms of a career perspective in EE, the predominant focus has been on the career choice to become an entrepreneur (e.g. Fayolle & Gailly, 2015; Souitaris et al., 2007; Westhead & Solesvik, 2016). While this is an important part of the objective of EE, at the same time it is also a rather narrow one. EE is not only about 'producing' entrepreneurs, but is equally about preparing students for the 21st century workplace. In fact, EE is widely promoted by the European Union and is considered one of eight key competences for lifelong learning (EC, 2006). It is defined as a competence that European citizens need for "*personal fulfilment, active citizenship, social cohesion and employability in a knowledge society*" (EC, 2007, p. 5). Similarly, the entrepreneurial competencies identified in the EntreComp framework⁶ (Bacigalupo et al., 2016) can be applied beyond the start-up context in other aspects of work and personal life. Thus, from an EU perspective, EE should be both about increasing entrepreneurship through the creation of new ventures, as well as about educating change agents who

⁶ The EntreComp framework (Bacigalupo et al., 2016) is an EU initiative to develop a common conceptual framework that defines entrepreneurship competence. It consists of 15 entrepreneurial competencies grouped into three competence areas: Ideas and Opportunities (e.g. creativity), Resources (e.g. financial and economic literacy) and Into action (e.g. taking the initiative).

will create value in society in settings beyond entrepreneurship, through the application of entrepreneurial competencies.

The strong belief in the importance of EE has made it a priority among universities worldwide and has attracted the attention of policymakers. The EU recommends that EE is provided at all levels of the education system (EC, 2006, 2012) and a policy analysis indicates that European countries are following the recommendation (Eurydice, 2016). There are few cross-country comparisons of the dispersion of EE, although a few national mappings do exist. In the UK, Rae et al. (2012) found that 77% of higher education institutions offered EE and that 16% of all students took part in these initiatives. In Sweden, the number of students taking university level EE increased from 13,744 to 22,419 from 2004 to 2008, accounting for a growth from 3.5 % to 5.9 % of the total student population (HSV, 2009). Further, a Danish study shows that 9.7 % of university students received EE during the school year 2016/2017 (FFE-YE, 2018).

In Norway, there has also been a substantial increase in EE in higher education. From 2010 to 2013, the number of EE courses of 10 ECTS⁷ or more increased from 135 to 193 (Scordato & Støren, 2014). EE is an area of priority in Norwegian higher education (Spilling et al., 2015). Norway was among the first countries to have a dedicated EE policy with the 2004 strategy plan for EE (KRD, 2004). This was followed by an action plan for EE in 2009 (KRD, 2009). The EE initiatives have led to extensive use of EE at all education levels, which is reflected in a study by Støren (2012), which shows that half of business and engineering students have had EE during their bachelor's degree.

EE has grown both in importance and scope over the recent decades, and so has its own community of interest (Henry, 2013). Its stakeholders comprise students, educators, education institutions, funders, governments, policymakers and future employers. Several of these stakeholders are investing heavily in terms of human and/or financial resources to create, implement and develop EE (Henry, 2013; Hoppe, 2016; O'Connor, 2013). While there are few overviews on the level of resources spent on EE globally, an example from Norway is Ungt Entreprenørskap⁸. In Norway, a comparatively small country in the global context, with only 5 million inhabitants, Ungt Entreprenørskap receives almost 15 million euros annually to provide EE within the Norwegian education system (UE, 2019). 70% of the funding was public spending, which makes it particularly important that the money is well spent.

With this backdrop, there is a need among stakeholders to understand the implications of their efforts towards EE. As a result, EE as an area of research has emerged and developed during recent decades.

⁷ European Credit Transfer and Accumulation System

⁸ Ungt Entreprenørskap is part of JA (Junior Achiever) Worldwide, a global non-profit youth organization. The European branch, JA Europe, is Europe's largest provider education programs for entrepreneurship, work readiness and financial literacy, with more than 4 million young people in 2017/2018 (JA Europe, 2019).

According to recent reviews, there has been an exponential growth in research on EE in terms of conceptual and empirical contributions (Blenker et al., 2014; Gabrielsson et al., 2018; Nabi et al., 2017). This has formed a research community within EE, with recognized international conferences such as *ECSB 3E*⁹ and *USASBE*¹⁰, as well as important research outlets through, for example, the newly established Sage journal *Entrepreneurship Education & Pedagogy*. Despite the growth in EE research and the development of a research community, critical voices have raised concerns regarding the direction and quality of the research that is being conducted. Some argue that we have a situation where the implementation of EE has occurred so rapidly that the practice has raced far ahead of the theory, pedagogy and research needed to explain and legitimize it (Fayolle et al., 2016; Morris & Liguori, 2016; Rideout & Gray, 2013). Therefore, there is still no agreement in the EE literature on what to teach, how to teach it and what outcomes to expect from EE courses and programs.

1.1.3 Entrepreneurship education as an arena for career reflection

The focus of this thesis is on the outcomes of EE. Research on this area has developed into a sub-field of EE research and is referred to as EE impact research (Fellnhofer, 2019; Loi et al., 2016); that is, research on the effect EE has on various outcome measures. Outcomes such as knowledge and skills, attitudes to entrepreneurship, entrepreneurial self-efficacy, entrepreneurial intention, nascency and venture creation have been addressed in quantitative EE impact studies, yet the research has been criticized for delivering mixed, conflicting and inconclusive findings, as well as applying methodologically deficient research designs (Bae et al., 2014; Fayolle et al., 2016; Lorz et al., 2013; Martin et al., 2013). Consequently, there is a need for more robustly founded empirical knowledge about the impact of EE in order to support policymakers, higher education institutions and other stakeholders engaged in the development and implementation of EE in higher education (Fayolle, 2013; Nabi et al., 2017).

As described above, career development in higher education is critical for study completion rates, the school-work transition, as well as general well-being later in life. This is, however, an underdeveloped area in EE impact research. In terms of career development, emphasis has typically been on career decisions on whether to become either an entrepreneur or a paid employee (Katz, 1992), with entrepreneurial intention as the prevailing outcome measure (Nabi et al., 2017). EE impact on careers

⁹ Annual EE conference arranged by the European Council for Small Business and Entrepreneurship (ECSB)

¹⁰ Annual EE conference arranged by the United States Association for Small Business and Entrepreneurship (USASBE)

beyond the career choice of entrepreneurship remains a gap that has received little attention (Hytti & Heinonen, 2013). This thesis addresses this gap by taking a career development perspective. It focuses on the construct of career reflection; i.e., the competency to reflect on personal capacities and motivations in one's own career (Akkermans et al., 2012; Kuijpers et al., 2006).

The point of departure for the thesis is that present understanding of the impact of EE on career outcomes needs to be more comprehensive. There is a need to move beyond the narrow focus of 'producing' entrepreneurs and to take a broader perspective on the implications of EE for students' careers. EE is not just about motivating students to become entrepreneurs, but can serve as a space for career reflection in which students discover more about themselves, about entrepreneurship, and about their career preferences. By combining the career development perspective with the established literature on entrepreneurship as a career choice, the empirical studies in the thesis set out to investigate the impact EE has on how students reflect upon their future careers. This is a novel approach to EE impact that has only partly been addressed previously; for example, through studies on entrepreneurial identity work in EE (e.g. Blenker et al., 2011; Donnellon et al., 2014; Hytti & Heinonen, 2013) and the sorting/alignment effects on entrepreneurial intention (e.g. Fayolle et al., 2006; Fretschner & Lampe, 2018; Von Graevenitz et al., 2010). It is, however, a critical topic for EE stakeholders to know more about. Educators need knowledge of EE career impact in their development of EE courses and programs. Higher education institutions, governments and policymakers also need such knowledge in order to make informed decisions on the implementation of EE. Moreover, EE is competing for attention and resources with other subjects and activities in higher education. If EE stakeholders are to continue to spend time and money to develop entrepreneurial study programs and courses, there is need to know more about the impact of EE. Essentially, the introduction of a career development perspective to EE contributes both to disentangling the previous inconclusive findings in EE impact research, as well as to presenting a novel motive for the continued focus on EE in higher education.

1.2 The overarching research question and its sub-research questions

EE is believed to have an impact on many different outcome constructs. Among those studied in quantitative impact studies are entrepreneurial knowledge and skills (e.g. Nabi et al., 2018; Volery et al., 2013); affect and entrepreneurial passion (e.g. Gielnik et al., 2017; Zampetakis et al., 2015); entrepreneurial self-efficacy (e.g. Huber et al., 2014; Karlsson & Moberg, 2013); entrepreneurial intention (e.g. Sánchez, 2011, 2013; Souitaris et al., 2007); early phase entrepreneurship (e.g. Gielnik

et al., 2015; Rauch & Hulsink, 2015); and venture creation (e.g. Gielnik et al., 2015; Gielnik et al., 2017). The career aspect is consequently central to the exploration of outcome constructs in EE impact research, as these all relate to either acquiring skills and knowledge for future careers, developing attitudes and intentions towards entrepreneurship, or engaging in nascency and venture creation. This is in line with policies on EE, which state the objective of economic and societal development through increased entrepreneurship (EC, 2006; Valerio et al., 2014). There is an inherent assumption that EE students, to a larger extent than those who are not exposed to EE, pursue careers within entrepreneurship. Despite this objective and the resources activated to achieve it, there is limited knowledge on the effect of these efforts. Several EE impact studies have examined the issue, but the results remain mixed, inconclusive and many of the studies suffer from severe methodological deficiencies (Bae et al., 2014; Fayolle et al., 2016; Lorz et al., 2013; Martin et al., 2013). Moreover, the focus is concentrated on entrepreneurship as a career, while EE's broader career impact remains mostly unexplored.

As a result, the purpose of this thesis is to expand the knowledge about EE career impact. A career development perspective is taken, which has a specific focus on the impact EE has on students' career reflections on their personal capacities and motivations. Career exploration interventions can trigger and support career reflection, and the thesis seeks to investigate the potential of EE as such an intervention and as a catalyst for career reflection. Therefore, the main research question (RQ) of the thesis is:

RQ: How does participation in entrepreneurship education impact students' career reflections?

1.2.1 Sub-research questions and their relation to the overall research question

In order to answer the main RQ, sub-research questions (SRQ) have been developed. These focus on particular aspects of the main RQ, and thereby contribute to form a more holistic understanding of it. The SRQs have all been chosen because they shed light on particular aspects of EE career impact that are not sufficiently understood in current EE research. First, as previously discussed, the EE literature suggests that EE impact studies have not been applying rigorous methodologies. Thus, there is a need to examine whether this is the case and to establish how educational impact should be studied quantitatively. This leads to the development of SRQ1: *What are the findings on*

entrepreneurial outcome measures in impact studies with a strong experimental research design? The purpose of the SRQ is both to establish what best practice is in quantitative EE impact research, as well as to summarize the findings from best practice impact studies. Second, as mentioned, EE research has taken a rather narrow view of career impact. The focus has been on entrepreneurial intention and entrepreneurship as a career choice, while the broader career implications of EE have received less attention. For instance, EE's impact on intrapreneurship and EE as a trigger for reflection on career alternatives remains unaddressed in quantitative impact studies. This was the rationale for introducing intrapreneurship and career preferences to quantitative impact studies and for formulating SRQ2: *What are students' attitudes towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives* and SRQ3: *How does participation in a business planning course impact students' career preferences for entrepreneurship and intrapreneurship?* Third, in addition to the need to broaden the perspective on EE career impact, there is also a need to understand *how* such impact occurs through EE and to understand more about how students reflect upon their learning processes. This spurred the development of SRQ4: *How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?* Together, the four SRQs contribute to advancing knowledge on aspects of EE career impact that are poorly understood today. An overview of the relation between the SRQs, their contribution towards addressing the main RQ, and related empirical studies and papers is presented in Table 2. The theoretical framework that lays the foundation for the RQ is presented in detail in the following chapter and concludes with a further explanation of the rationale for developing the SRQs.

Table 2: Overview of the SRQs and their relation to the RQ, papers and empirical studies

Sub-research question	Contribution towards answering the main research question	Paper	Empirical study
<p><i>SRQ1:</i> What are the findings on entrepreneurial outcome measures in impact studies with a strong experimental research design?</p>	Examines how educational impact should be studied quantitatively and summarizes the findings of EE impact studies that meet these criteria.	1	Systematic literature review
<p><i>SQ2:</i> What are students' attitudes towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives?</p>	Investigates the relationship between EE and students' intentions towards entrepreneurship and intrapreneurship.	2	Cross-sectional impact study
<p><i>SQ3:</i> How does participation in a business planning course impact students' career preferences for entrepreneurship and intrapreneurship?</p>	Investigates the impact of EE on students' intentions towards entrepreneurship and intrapreneurship, as well as changes in preferences towards different career alternatives.	3	Longitudinal impact study
<p><i>SRQ4:</i> How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?</p>	Explores students' reflections on their future career and the application of their new insights during and after an EE course.	4	Explorative case study

1.2.2 Status of the papers

The empirical studies of the thesis have resulted in four publications, which are included in Part II. The publications have all been presented at conferences and have either been published, accepted or are currently in a review process. Table 3 outlines the dissemination of the research at national and international conferences, as well as the publication status of each paper included in the thesis.

Table 3: Research dissemination

No.	Article	Conference presentation	Publication outlet
1	Measuring impact through experimental design in entrepreneurship education: a literature review and future research opportunities Kjersti Kjos Longva & Lene Foss	ISBE 2017, Belfast.	Published in: <i>Industry and Higher Education</i>
2	Hope for the future? Students' career preferences for entrepreneurship, intrapreneurship and international mobility Kjersti Kjos Longva	Fjordkonferansen 2017, Loen.	Published in: <i>Fjordantologien 2018</i>
3	Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course Kjersti Kjos Longva, Øivind Strand & Mark Pasquine	RENT 2017, Lund. NORSI 2018, Oslo.	In review in: <i>Education + Training</i>
4	Combining technology and entrepreneurial education through design thinking: students' reflections on the learning process Matthew Lynch, Uladzimir Kamovich, Kjersti Kjos Longva & Martin Steinert	ISBE 2016, Paris. Science and Technology EE, Toulouse	Accepted for publication in: <i>Technological Forecasting & Social Change</i>

At the time of writing, paper 1 has been published in *Industry & Higher Education*, while paper 2 has been published as an anthology chapter in *Fjordantologien 2018*. Paper 4 has been accepted for publication in *Technological Forecasting & Social Change* and is available as an article in press on the journal website. Paper 3 is in review in *Education + Training*. While the research conducted is described in greater detail in the full-length versions of the publications, the following chapters present the common theoretical, methodological and empirical foundations for the publications, with emphasis on the coherence between the publications.

1.3 Positioning of the thesis

By focusing on the impact of EE on career reflection, the thesis draws upon theories within three different fields of literature, namely entrepreneurship, education and career development. This is illustrated in the Venn diagram in Figure 1.

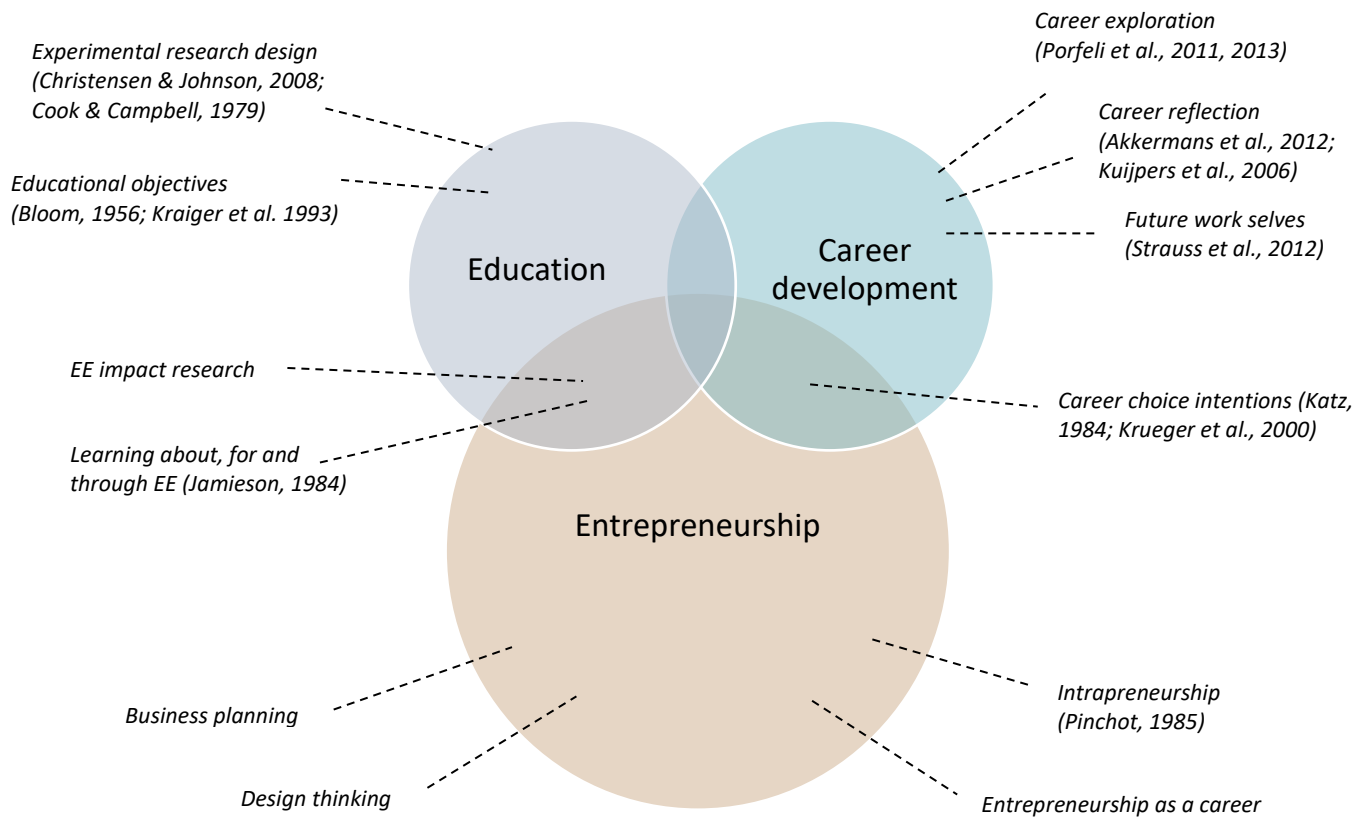


Figure 1: Theoretical positioning of the thesis

As the figure illustrates, the thesis is positioned within the entrepreneurship research field. Entrepreneurship represents the largest circle in the figure and is placed at the bottom as it lays the foundation of the theoretical framework. However, the thesis also draws upon selected theoretical contributions from the research fields of education and career development theory, as well as topics at the intersections between entrepreneurship and education, and entrepreneurship and career development, respectively. Therefore, it is the intercept of the three strands of literature that provides the theoretical foundation for the thesis and the empirical studies, while the contribution that is made concerns mainly the entrepreneurship literature and the sub-research stream of EE. While aspects of EE career impact have been addressed previously in the literature, this thesis develops new perspectives by expanding the existing theoretical framework of EE. Prior research has predominantly been on the career choice between self-employment and paid work, with entrepreneurial intention as

the focal point of such studies. The thesis builds upon, but also criticizes, this stream of research. While encouraging future venture creation among EE students is undoubtedly an important task, to only focus on 'producing' entrepreneurs through EE appears rather simplified. EE also needs to be about encouraging entrepreneurial behavior both in new and existing organizations; i.e., through entrepreneurship *and* intrapreneurship. Moreover, EE is an opportunity for career reflection, during which students do not necessarily strengthen their intentions, but gain insight that helps them make more informed decisions regarding their careers. This perspective has not been sufficiently taken into consideration in prior EE impact research.

1.4 Structure of the thesis

The thesis consists of two parts. Part I is the introductory chapter, which provides an overview of the work, while Part II includes the four individual publications. Part I begins with the introduction chapter, which presents the overall view of the thesis and outlines the background, motivation, research objective and research questions. In the following chapter, the theoretical aspects within entrepreneurship, EE and their potential as a space for students' career reflections will be discussed, before the methodological approach and empirical data collection are explained in chapter 3. Chapter 4 gives summaries of the individual publications, as well as a synthesis of the main findings. The results are then discussed together with previous research to address the theoretical contributions, as well as implications for practice, and suggestions for further research. Finally, Part II contains full-length versions of the four publications included.

2. THEORETICAL FRAMEWORK

This chapter presents the theoretical framework of the thesis. This draws upon theoretical models and constructs mainly from the field of entrepreneurship, but is supported by literature from educational research and career development theory. The three fields of literature provide an eclectic framework and a novel lens through which to view EE career impact. The chapter first presents a review of entrepreneurship as a career choice, before reviewing the emergence and development of EE in higher education, with a particular focus on EE impact research. The chapter concludes by presenting a conceptual model composed of EE, career reflection, career choice intention and future work selves, along with reasoning on how EE serves as a career exploration intervention that influences these constructs.

2.1 Entrepreneurship as a career choice

The emergence and growth of entrepreneurship as both a research field and policy area is based on the understanding of entrepreneurship as an important factor in economic growth and prosperity (Audretsch et al., 2006; Baumol & Strom, 2007). Governments and policymakers are eager to encourage and stimulate entrepreneurial activities, and an important motive for this is the wish to understand why some individuals choose to pursue entrepreneurial behavior in their careers. The following section delves deeper into existing knowledge on the matter, but begins by describing entrepreneurship as a research field and by defining entrepreneurship as it is understood throughout the thesis.

2.1.1 Definition of entrepreneurship

In the thesis, entrepreneurship is defined as the discovery, evaluation and exploitation of opportunities for new combinations in the context of new venture creation. The definition is based on work by Schumpeter (1934), Gartner (1988) and Shane and Venkataraman (2000), who have all been pivotal in the development of entrepreneurship as a research field.

An important starting point for the current understanding of entrepreneurship and its development as a research field is the work of Joseph Schumpeter (1883-1950) and his seminal book 'The theory of economic development' (Schumpeter, 1934). In his book, Schumpeter sheds light on an

underdeveloped area of economic theory, namely the entrepreneur as an agent of change and entrepreneurship as a key mechanism for economic development (Fagerberg, 2004; Schumpeter, 1934). Although the word 'entrepreneur' has been in use for centuries, Schumpeter's emphasis on the entrepreneur as an agent for change who disrupts existing systems through the introduction of new combinations¹¹, laid the foundation for the development of entrepreneurship as a research field (Landström & Benner, 2010). Since Schumpeter's introduction of entrepreneurship into economic and management literature, and particularly since the 1980s, the entrepreneurship research field has seen significant growth (Landström et al., 2012), which has gone through several phases. It started by focusing on entrepreneurship as an economic function and on the entrepreneur as an individual with particular characteristics and personality traits. It was assumed that entrepreneurs were to a large extent born and that they had particular personal qualities that separated them from others (McClelland, 1987). This was an influential research stream in the first decades of entrepreneurship research, but was essentially proclaimed to be a 'dead end' by Gartner (1988) in his seminal paper, which posited in the title that *"who is an entrepreneur is the wrong question"*. He argued that it was the activities undertaken to create new organizations that should be the focal unit of analysis. Gartner's contribution can be seen as the starting point for a shift from mainly focusing on the entrepreneur as a unique and special person, to increased attention to entrepreneurship as a process.

As a relatively new and rapidly growing research field, entrepreneurship has faced the challenge of fragmented, vague and conflicting definitions. In fact, Shane and Venkataraman (2000) describe entrepreneurship as a *"label under which a 'hodgepodge' of research is housed"* (p. 217), while Low (2001) describes the research field as a 'potpourri'. While there is still no agreement upon a common definition, a widely accepted one is that of Venkataraman (1997) and Shane and Venkataraman (2000), who state that entrepreneurship is *"an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organizing, markets, processes and raw materials through organizing efforts that previously had not existed"* (Shane & Venkataraman, 2000, p. 4). The definition introduced the individual-opportunity nexus in the entrepreneurial process, and laid the foundation for novel perspectives in entrepreneurship research, such as the discussion on whether opportunities are discovered or created (Alvarez & Barney, 2007), the theory of effectuation (Sarasvathy, 2001) and bricolage (Baker & Nelson, 2005).

¹¹ Schumpeter emphasized the importance of new combinations and labelled this combinatory activity 'the entrepreneurial function'. This was a role to be fulfilled by the entrepreneur. Schumpeter's five examples of new combinations were new products, new methods of production, new sources of supply, new markets, and new ways to organize a business (Fagerberg, 2004).

This thesis adopts the definition by Shane and Venkataraman (2000), although it applies Schumpeter's (1934) new combinations notion instead of the extended description in Shane and Venkataraman's (2000) definition. However, a challenge to the definition by Shane and Venkataraman (2000) is that it does not limit entrepreneurship to a specific context. In this thesis, the difference between entrepreneurship and intrapreneurship is a central aspect; Gartner's (1985) view on entrepreneurship as the creation of new organizations is consequently integrated; and entrepreneurship is therefore defined as something that takes place within the context of new venture creation.

The development within the field of entrepreneurship has had important implications for the development of EE. Shifting the focus from the individual entrepreneur with special traits to an understanding of entrepreneurship as a process entails an assumption of entrepreneurship as something that can be learned. From an EE perspective this is essential, since the view of entrepreneurship as something that is learnable calls for the prioritization of EE within the education system.

2.1.2 Becoming an entrepreneur

The increasing recognition of the importance of entrepreneurship for development and economic growth has created interest among policymakers and scholars to understand the decision to become an entrepreneur (Valerio et al., 2014). By better understanding the antecedents of such a decision, the rationale is that resources can be dedicated to influencing relevant antecedents and thereby increasing entrepreneurship. This has been an ongoing discussion in Norway, since reports from GEM Global Entrepreneurship Monitor (Alsos et al., 2015) indicate that entrepreneurial activity has been declining in Norway over the last decade and that Norway is ranked 21st out of the 29 countries classified as innovation-driven economies.

Initially, in line with the general development of entrepreneurship research described above, the focus in research on becoming an entrepreneur was on personality traits and their predictive capacity. While this stream of research has been declared a dead-end by many (e.g. Aldrich, 1999; Gartner, 1988), there is also empirical evidence of significant differences in personality traits when comparing entrepreneurs and non-entrepreneurs. For instance, in a meta-analysis of 104 articles, Rauch and Frese (2007) established a significant relationship between entrepreneurial behavior and the personality traits of innovativeness, need for achievement, generalized self-efficacy, stress tolerance, need for autonomy, and proactive personality. However, an issue in terms of personality traits as predictors of

entrepreneurship is that they are assumed to be relatively stable throughout one's life and therefore difficult to influence through policy efforts.

The literature has consequently also explored career motivations for pursuing entrepreneurship (e.g. Carter et al., 2003; Kolvereid, 1996; Schjoedt & Shaver, 2007); demographic factors such as gender and having self-employed parents (e.g. Hoffmann et al., 2015; Verheul et al., 2012); and the importance of previous entrepreneurial experience (e.g. Ucbasaran et al., 2010; Zapkau et al., 2017). The research stream on entrepreneurial intention has been important for understanding the decision to become an entrepreneur. Based on recognized frameworks from social psychology, such as the theory of reasoned action (Fishbein & Ajzen, 1975) and its successor the theory of planned behavior (Ajzen, 1991), entrepreneurial intentions were introduced into the field and suggest that the intention to become an entrepreneur could partly be explained by three associated antecedents: the subjective norm to entrepreneurship by significant others; attitude to entrepreneurship; and the perceived behavioral control (Bird, 1988; Krueger et al., 2000). A recent study by Kautonen et al. (2015) supports the explanatory power of the model and finds that entrepreneurial intention and perceived control over behavior explain 31% of the variance in subsequent entrepreneurial behavior.

During the last decade, the importance of entrepreneurial learning has received increasing attention with regards to understanding the decision to become an entrepreneur (Wang & Chugh, 2014). Such learning has been the focus of studies on the importance of learning from entrepreneurial failure (Cope, 2011), but the role of EE as an entrepreneurial learning experience has also emerged as a research topic (Pittaway & Cope, 2007b).

In short, although there is agreement about the importance of stimulating entrepreneurship in order to increase the number of people who pursue it as a career, there is less agreement on how to do so. Predicative personality traits and demographic factors have been identified, and the importance of attitudes, intentions and previous learning experiences have been highlighted. However, there is still a need for a better understanding of entrepreneurship as a career choice and, subsequently, how this can be influenced through policy measures.

2.1.3 Entrepreneurial behavior through intrapreneurship

According to the above definition of entrepreneurship, it takes place in the context of creating new organizations. However, the behavior and processes that resemble entrepreneurship can be present within existing organizations and contribute to increasing the competitiveness of companies (Lumpkin

& Dess, 1996; Miller, 1983). Corporate entrepreneurship and intrapreneurship have accordingly attracted attention from scholars in recent decades (Antoncic & Hisrich, 2003; Blanka, 2018; Corbett et al., 2013; Dess et al., 2003). Corporate entrepreneurship is, in its broadest definition, behavior that resembles entrepreneurship in an existing organization. This can take the place in the form of *strategic renewal*, whereby entrepreneurial efforts result in changes in the organization's strategy or structure; *innovation*, through which the organization creates and introduces new products and processes; and *corporate venturing*, in which entrepreneurial efforts lead to the creation of a new organization either internally through new organizational entities within existing an organization, or externally through new organizations that reside outside the existing organization (Guth & Ginsberg, 1990; Sharma & Chrisman, 1999; Zahra, 1996). The importance of corporate entrepreneurship to an organization's competitiveness has been highlighted by several studies (Ireland et al., 2009; Morris et al., 2011), while a recent meta-analysis by Bierwerth et al. (2015) shows that corporate entrepreneurship has significant performance implications. According to Bierwerth et al. (2015), corporate entrepreneurship has a significant and positive effect on overall performance in terms of financial performance and growth measures, as well as on subjective performance, such as perceived performance compared to competitors.

While corporate entrepreneurship takes place at the organization level, intrapreneurship helps understand entrepreneurial behavior at the individual level through the employee perspective (Åmo & Kolvereid, 2005). Pinchot III (1985) coined the term intrapreneur, and empirical evidence suggests that intrapreneurs have a mindset and skill set that resemble those of start-up entrepreneurs. The literature indicates that particular individual characteristics tend to influence the process of intrapreneurship, such as risk-taking propensity, personal initiative, innovativeness, desire for autonomy, need for achievement, goal orientation and internal locus of control (Gawke et al., 2019; Rigtering & Weitzel, 2013).

The definition of entrepreneurship based on the individual-opportunity nexus (Venkatamaran, 1997; Shane & Venkatamaran, 2000) is also accepted in the intrapreneurship literature (Kuratko et al., 2015). Hence, since entrepreneurship and intrapreneurship are viewed as similar but separate behaviors in this thesis, there is a need for two separate definitions. Drawing upon the previous definition of entrepreneurship, intrapreneurship is accordingly defined as the discovery, evaluation and exploitation of opportunities for new combinations in the context of an existing organization.

With this backdrop, a career characterized by entrepreneurial behavior can take place both through the emergence of new organizations, as well as through intrapreneurship within the organization in which someone is employed. As intentional behaviors, entrepreneurship and intrapreneurship can be

encouraged and cultivated. Section 2.3.3 will consider more closely how EE can contribute to this through stimulating career reflections. First, the following section will review the development of EE as a research field and define how it is viewed within the context of the thesis.

2.2 The emergence and evolution of entrepreneurship education as a research field

There has been an exponential growth in EE over the past decades. Since the first occurrence of entrepreneurship courses in the US in the middle of the twentieth century (Katz, 2003; Kuratko, 2005), EE is now a frequent feature worldwide and at all education levels. With the rise of entrepreneurship as a research field, research on EE has emerged as a sub-field of entrepreneurship that aims to describe and understand the development that is taking place.

As a sub-field of entrepreneurship, EE research has developed in parallel and has been influenced by the debates taking place within entrepreneurship research. Discussions about whether entrepreneurs are born or made have had implications for debates within EE research on whether entrepreneurship can actually be taught (Fiet, 2001). Logically, if entrepreneurs are principally born and are a result of inherited personality traits and characteristics, the objective of EE would mainly be to supply the business-specific knowledge necessary for starting a venture. However, as entrepreneurship research has increasingly realized that entrepreneurs are also a product of the context they live in and their learning experiences, new avenues have opened up for EE (Henry et al., 2005a, 2005b). Recognizing that entrepreneurship can be taught has enabled a focus on new elements in EE pedagogics, such as teaching mindsets or letting students experience entrepreneurship through practice.

Both the scope and the content of EE have seen extensive development in recent decades. In fact, scholars are now airing concerns that the pace of EE development means that practice is racing ahead of our understanding of what to teach, how to teach it, and what outcomes to expect (Fayolle, 2013; Morris & Liguori, 2016; Rideout & Gray, 2013). According to Neck and Corbett (2018), EE now appears to be at a tipping point, where it is essential to build a knowledge base on teaching and learning entrepreneurship that can aid educators in their teaching development. Similar concerns have been raised by Fayolle (2013, 2018), who argues that it is time to stand back and critically reflect upon practices and the assumptions of EE that are taken for granted. Research in EE is a young field that is still in need of legitimation in terms of theoretical, conceptual and methodological foundations (Fayolle et al., 2016; Nabi et al., 2017).

Following the call for explicit definitions of EE (Fayolle, 2018), this thesis builds upon the definition by Neck and Corbett (2018) developed through their Delphi analysis of 17 expert entrepreneurship educators. They describe EE in terms of *“developing the mindset, skill set, and practice necessary for starting new ventures”* (p. 10). Others have defined EE more broadly. Entrepreneurial competence has been defined as a key competence for lifelong learning (EC, 2006) and there are inclusive definitions focusing on EE as value creation (Blenker et al., 2011; Lackéus, 2016; Vestergaard et al., 2012). For example, Lackéus et al. (2016) define value creation-based entrepreneurship education as learning in which students apply *“their existing and future competencies to create something preferably novel of value to at least one external stakeholder outside their group, class or school”* (p. 790). While it is difficult to disagree with these perspectives on EE, the wide definitions also make it challenging to define the limits of EE. The perspective of the thesis accordingly adheres to the view of Neck and Corbett (2018), that EE must be contextualized, and that the context of EE is start-ups and organizations. Even though the learning acquired through EE can be utilized in many contexts, placing organizations at the centre, either through the creation of new ones or the attempts to do this, enables EE to be differentiated from other forms of progressive education which encourage the same type of mindset and skills.

2.2.1 What do we teach and how do we teach it?

With the rapidly expanding number of EE courses and programs, a myriad of EE pedagogics has developed. While the numerous EE approaches bring about challenges for researchers trying to keep pace with the development, these are a natural consequence of the variety of EE objectives, the different student groups who take part in it, the teachers, the education institutions and the location (Neck & Corbett, 2018). There is no one best way to teach EE, nor should there be. As suggested by Fayolle and Gailly (2008) in their EE teaching model, the way we teach EE should be an alignment between five interrelated factors: the objectives, the students, the assessment, the content and the pedagogies. Hence, the methods and pedagogies of an EE course are the final aspects to decide upon, after all the other four factors have been clarified. Ultimately, a compulsory EE course for 200 secondary students with the aim of raising awareness needs to be taught differently to an EE course for a small group of graduate students who have self-selected into EE and might already be engaged in nascent entrepreneurship.

EE cannot be a ‘one size fits all’ process, but should be tailored to the context in which it is. This complicates the overview of different EE approaches. The predominant categorization of pedagogics

is the three-category framework of learning *about*, *for* and *through* entrepreneurship (Hannon, 2005; Jamieson, 1984; Scott et al., 1998). While learning *about* entrepreneurship deals with awareness creation from a theoretical perspective, education *for* entrepreneurship is focused on the preparation of aspiring entrepreneurs and small business owners. Learning *through* entrepreneurship takes a more active approach, from which students learn through actually 'doing' entrepreneurship.

In practice, the three categories of EE will not be clearly separated within a course or even within the same lecture session (Blenker et al., 2011). When teaching EE, there can be elements of learning about, for and through present at the same time. For example, when teaching about prototyping, there will necessarily be theoretical input *about* different perspectives on this, while at the same time learning *for* entrepreneurship will involve students reflecting upon the use, strengths and weaknesses of different approaches to prototyping. At the same time, students might also be engaged in actual prototyping in the same session and thereby be learning *through* entrepreneurship. This is in line with the processual approach suggested by Blenker et al. (2011), in which different pedagogies complement each other.

Learning about entrepreneurship

Learning *about* entrepreneurship is often referred to as awareness education, through which entrepreneurship is explored as a societal phenomenon (Henry et al., 2005a). The approach is theoretical in its form and explores the '*whats*' and '*whys*' of what entrepreneurs do and the implications of entrepreneurship for the economy and society (Johansen & Schanke, 2013; Lackeus, 2015). Learning about myths, team roles and theoretical perspectives such as the individual-opportunity nexus (Shane & Venkataraman, 2000), effectuation (Sarasvathy, 2001) or bricolage (Baker & Nelson, 2005) are examples of possible content in the *about* approach (Thrane et al., 2016). The emphasis is on a general understanding of the phenomenon and its implications, and on knowledge rather than skills and experience. In a review of 117 course outlines and syllabi in the US and UK, Pittaway and Edwards (2012) found that learning about entrepreneurship was the primary form of approach in 59% of the courses examined.

Learning for entrepreneurship

Learning *for* entrepreneurship is concerned with preparing aspiring entrepreneurs for a career in self-employment. According to Henry et al. (2005a), the objective of EE for entrepreneurship is to teach participants the practical skills required for starting up a business. In a study by Pittaway and Edwards (2012), 27.4% of the courses analyzed had the *for* as its primary form of pedagogics. Business planning is an example of this way of teaching entrepreneurship and is one of the most frequently employed pedagogical approaches in EE. Business planning is also the teaching method of the EE course that provides the context for paper 3 in the thesis. A study by Honig (2004) showed that 78 out of the top 100 US universities offered courses in business planning in the area of entrepreneurship or small business management. In a business planning course, students typically develop a written document that outline a new product, service, concept or organization. This document summarizes strategies on marketing, production, operations, financing and the organization, and is often pitched in class or to external judges in business plan competitions. The business plan has its place in what Neck and Greene (2011) refer to as the process world of planning and prediction. In this view, entrepreneurship is taught in a linear fashion, whereby students identify and evaluate opportunities, develop concepts, and make forecasts. The business plan approach has accordingly been criticized for creating a gap between what is taught in entrepreneurship courses and what entrepreneurs actually do in practice (Edelman et al., 2008; Fayolle, 2013; Neck & Greene, 2011). Theories of effectuation (Sarasvathy, 2001) and bricolage (Baker & Nelson, 2005) in entrepreneurship research have shown that there are different views on how entrepreneurs think and behave. Business planning courses with a process world view focus on ideas and see entrepreneurship as a linear process. Therefore, Neck and Greene (2011) claim that students consequently learn less about actual practice and the complex, chaotic and non-linear aspects of entrepreneurship. They argue that students spend a disproportionate amount of time honing secondary research skills rather than taking smart action in the real world.

Learning through entrepreneurship

Learning *through* entrepreneurship has received increasing attention in recent decades. Several EE scholars have argued that learning *through* entrepreneurship should be the preferred method of teaching entrepreneurship and the best way to prepare students for entrepreneurship in the real world (Gibb, 1996; Heinonen & Poikkijoki, 2006; Neck et al., 2014). In their influential paper, Neck and Greene (2011) argue that EE should involve a portfolio of practices by which entrepreneurship is taught as a method that lets students develop a bias for action and explore authentic entrepreneurial processes

in an experiential and iterative manner. Hence, learning *through* entrepreneurship entails learning through doing entrepreneurship in practice. Students thereby acquire entrepreneurial competencies and skills that are applicable beyond the entrepreneurial context, as described in, for example, the EntreComp framework by Bacigalupo et al. (2016), or in the value creation perspective of Lackéus (2015). Learning through entrepreneurship can take place through student start-up companies, interdisciplinary practical projects, or collaboration projects with local businesses to solve real-life problems (Johansen & Schanke, 2013).

However, the strong emphasis on actionable, experiential and practice-based pedagogies has also raised concerns among EE scholars. Although there is general agreement on the value of including such elements in EE (Hägg, 2017; Neck & Greene, 2011; Rasmussen & Sørheim, 2006), there is also a risk of cognitive overload, as suggested by Hägg (2017). He states that the action orientation therefore needs to be counterbalanced by reflective thinking in order to avoid action that overwhelms novice learners and creates panic rather than learning.

Paper 4 in the thesis takes a closer look at the learning process of design thinking, a teaching approach that is increasingly applied in EE. This is a course in which students learn *through* entrepreneurship. The basic argument for applying design thinking in EE is that the way designers think and act resembles the way an entrepreneur needs to think and act in order to identify and follow up on entrepreneurial opportunities (Neck & Green, 2011). Design thinking has therefore been proposed as a way of teaching entrepreneurship (Daniel, 2016; Neck & Greene, 2011; Nielsen & Stovang, 2015). Multiple models of design thinking have emerged during the two last decades (Dorst, 2011). One that has become well-established is the Stanford d.School version based on Brown (2008), which consists of five steps: empathize, define, ideate, prototype and test. In an EE course applying design thinking, students will need to empathize with users or customers to identify and define entrepreneurial opportunities, and thereafter ideate, prototype and test solutions to exploit the opportunities, while receiving frequent feedback from users/customers. Design thinking in EE is accordingly an experiential, practice-based and action-oriented approach through which students learn by experiencing real-life customer contact and developing simple, but real, prototypes. Through taking action and thereafter receiving feedback from users, customers and the faculty, students are able to engage in active experimentation, reflect upon their actions, and thereby transform the experience from an authentic entrepreneurial process into knowledge both about themselves and entrepreneurship.

Entrepreneurship education and educational objectives

The taxonomy of learning *about*, *for* and *through* entrepreneurship enables a hierarchical cumulative visualization, as illustrated in Figure 2. The figure shows that while learning *about* entrepreneurship can take place without necessarily learning *for* and *through* entrepreneurship, learning *about* entrepreneurship is an inherent part of learning *for* and *through* entrepreneurship. For instance, in the example of EE business planning above, which is a learning *for* approach, conducting market research and outlining a new concept will necessarily entail the knowledge *about* entrepreneurship acquired as an inherent part of the experience.



Figure 2: Hierarchical cumulative model of EE categories

The figure, as the case for all models, is a simplification of reality and does not allow for nuances that might exist between the different interpretations of the EE categories. At the same time, it illustrates the main differences in the categorization and perhaps gives an explanation of why the learning *through* approach has increasingly gained ground in EE teaching and research. The figure can also be understood in light of established literature in the education field. In Bloom's (1956) taxonomy of educational learning objectives, the cognitive domain comprises six levels of objectives¹²: remembering (recalling relevant knowledge); understanding (making sense of ideas and concepts learnt); applying (using the knowledge in new situations); analyzing (analyzing elements, relationships and organizations); evaluating (making judgements based on a set of guidelines); and creating (putting information together in a new way). While learning *about* entrepreneurship will most likely

¹² From the revised version of the taxonomy by Krathwohl et al. (2002).

concentrate on remembering and understanding, learning *through* entrepreneurship is more likely to engage all cognitive domains, and even the creation of something new and original, which is at the highest level of Bloom's taxonomy.

To sum up, there are many ways to teach EE, both in terms of content and the pedagogical methods applied. As there is no 'one size fits all' EE that is applicable to all contexts, it needs to be adapted to the overall objectives of the course and the student group taking part in it (Fayolle & Gailly, 2008; Hytti & O'Gorman, 2004). Furthermore, as emphasized by Blenker et al. (2011), learning *about*, *for* and *through* entrepreneurship are not mutually exclusive approaches, but should rather be complementary pedagogies that can be present in the same course. Accordingly, it is not a matter of choosing one or another, but to develop a course where the pedagogies fit the context they are being taught in. In view of that, it is important to understand the different approaches to teaching EE, as they are likely to lead to quite different outcomes. The issue of understanding these different outcomes is the topic of the two subsequent sub-chapters.

2.2.2 What results do we expect?

EE has gained ground at all education levels due to the implicit premise that it has an impact on the individual student, on economic activity, and/or on society as a whole. The importance of evaluating the outcomes of EE has accordingly become acknowledged (Duval-Couetil, 2013; Mets et al., 2017), as has the recognition that the outcome measured needs to be closely aligned with the intended learning outcomes of EE courses (Kamovich & Foss, 2017). However, there are few frameworks that provide an overview of impact measures that could be EE outcomes. Table 4 gives an overview of outcome measures and builds upon the work of Fisher et al. (2008), Kyrö (2008), Kozlinska (2016) and Mets et al. (2017).

Table 4: Categories of outcome measures in EE impact studies

Outcome measure	Example of constituents
Cognitive	Knowledge: comprehension about entrepreneurship; business basics
	Traits: need for achievement; proactiveness; self-esteem; risk propensity
Skill-based	Business modeling; opportunity recognition; creative thinking; teamwork
Affective	Passion/inspiration; attitude to entrepreneurship; subjective norm
Conative	Entrepreneurial intention; entrepreneurial self-efficacy ; possible selves
Behavioral	Nascency; venture creation; intrapreneurship; social entrepreneurship; employability

While competence frameworks have long been a frequent feature of education research and policy, it was Fisher et al. (2008) who introduced the competence framework into EE. They developed a tripartite framework based on seminal works in education literature by Bloom (1956) and Kraiger et al. (1993) and suggested three categories for learning outcomes: 1) cognitive skills, which refer to knowledge, comprehension and critical thinking about entrepreneurship; 2) skill-based outcomes, describing the skills necessary to start a business; and 3) affective outcomes, which comprise entrepreneurial attitudes, volition, and behavioral preferences.

Kyrö (2008) suggests an alternative framework for learning outcomes consisting of three constructs: cognition, affection and conation. Compared with the framework of Fisher et al. (2008), skill-based learning outcomes are included in the cognitive learning outcomes. Moreover, affective learning outcomes are divided into two constructs, affection and conation. Affection refers to emotions and perceptions, while conation describes how one acts on one's thoughts and feelings via impulse or directed effort (Ajzen, 1989).

Hence, the four first outcome measures in Table 4 are drawn from these frameworks. Cognitive measures comprise both concrete factual knowledge about entrepreneurship, while trait outcomes refer to personality traits or characteristics. Skill-based outcomes are skills that are important for doing entrepreneurship. In line with Kyrö (2008), Table 4 separates affective and conative outcomes. The table also adds a fifth outcome measure, namely behavioral outcomes, as the cognitive, skill-based, affective and conative outcomes developed through EE should ultimately lead to action in the form of entrepreneurial behavior. This can take form through, for example, venture creation, intrapreneurship,

social entrepreneurship or employability (Koszlinska, 2016; Mets et al., 2017). It is thus vital to understand the influence that EE can have on all five outcome categories in EE impact research.

2.2.3 Measuring the impact of entrepreneurship education

There have been many contributions to summarizing the empirical findings of EE impact studies through both systematic literature reviews (SLR) and meta-analyses. An influential early contribution was an SLR by Pittaway and Cope (2007a), who reviewed 184 papers on EE published between 1970 and 2004. They concluded that EE seemed to have an impact on student propensity and intentionality towards entrepreneurship. They did, however, also highlight the lack of research on the implications for real-life entrepreneurial behavior after EE and called for more research on the link between EE pedagogy and EE outcomes. Three years later, Mwasalwiba (2010) reached the same conclusion in his review of 108 articles, and emphasized that there appeared to be a substantial focus on attitudes and intentions, but a failure to link these to actions. He also called for broader outcome definitions in EE impact research.

Between 2013 and 2014, critical voices started raising concerns about methodological weaknesses and deficiencies in the body of quantitative impact studies. In their SLRs, Rideout & Gray (2013) and Lorz et al. (2013) all criticized research design in EE impact studies, and problematized the lack of longitudinal design and control groups. The tendency was confirmed in two meta-analyses on EE by Martin et al. (2013) and Bae et al. (2014). Martin et al. (2013) conducted a meta-analysis of 42 studies applying human capital theory and found a significant positive association between both EE/training and entrepreneurial human capital, and between EE/training and entrepreneurship outcomes. However, the positive relationships were overestimated in EE impact studies with weak experimental designs, and when disregarding these, the effect size was substantially reduced. This is in line with Bae et al.'s (2014) study on the relationship between EE and entrepreneurial intention. In a meta-analysis of 73 studies, they found a small significant correlation. However, the association was no longer significant after controlling for the intentions students had prior to EE and thereby addressing the self-selection bias that is present in EE.

Nabi et al. (2017) conducted an SLR of 159 impact studies of EE in higher education. They voice criticism in terms of the focus on short-term subjective outcome measures and emphasize the need for impact studies on long-term behavioral measures. Like the earlier SLRs and meta-analyses, they also recognize the substantial methodological weaknesses in many EE impact studies and call for more research to explain their contradictory findings; for instance, by including person-, context- and model-specific

moderators.

In conclusion, the above reviews point towards three main issues in terms of impact research on EE. First, there are considerable methodological weaknesses, as the majority of impact studies are cross-sectional. The lack of experimental design with control groups and pre- and post-measurement has severe consequences for the methodological rigor and the opportunity to draw conclusions about causal inference. The reason for using control groups and longitudinal design is to control for confounding variables that threaten internal validity. For instance, according to Johnson and Christensen (2014), and drawing upon the seminal work of Cook & Campbell (1979), true experimental design (randomized control trials) or quasi-experimental design should be the preferred choice when investigating educational effect quantitatively. These are defined as strong experimental designs, while studies that lack longitudinal design and/or control groups can be characterized as weak experimental designs (Johnson & Christensen, 2014) Second, impact studies tend to under-describe the pedagogies being tested. There is a great level of variation in EE in terms of objectives, contents and teaching strategies. Hence, one should be cautious about treating all EE interventions as one. Finally, the focus on short-term and subjective outcomes is a challenge. Therefore, outcomes such as the intention-behavior link, venture creation and performance could provide fruitful avenues for future research, as would novel impact indicators.

To sum up, it appears that despite an increasing body of EE impact research, there is still limited knowledge on the subject of EE impact. While existing empirical studies have provided valuable insight, there is a need to be more ambitious about the outcome measures studied and the methodology applied. This is essential in order to provide EE stakeholders with the knowledge they need to continue developing, implementing and investing in EE.

2.3 The impact of entrepreneurship education on career reflections

As described in the literature review, there are many different outcome measures that are relevant when researching EE impact. A common denominator of the outcome measure categories that are identified in Table 4 is that they are all related to the careers of EE students. If knowledge, traits, skills, affective measures, conative measures and behavior can be impacted through participation in EE, this impact will have implications for students' future careers. Consequently, EE has the potential to impact how students behave in their future careers and how they reflect upon these. This reflection is the topic of this sub-chapter, which takes a closer look at two career-related outcome measures in EE, namely career choice intentions and career reflections.

2.3.1 Career choice intentions

Katz (1992) defines career choice related to entrepreneurship as *“the vocational decision process in terms of the individual’s decision to enter an occupation as a wage-or-salaried individual or as a self-employed one”* (p. 30). Given the importance of new venture creation for economic growth and development, both the entrepreneurship research community and policymakers have been eager to understand this particular career choice in order to encourage entrepreneurship. As the general understanding of entrepreneurship has moved away from believing that entrepreneurs are born with specific personality traits and characteristics (Gartner, 1988), the prevailing understanding of an entrepreneurial career choice is that it is something that can be influenced. The literature suggests that this career choice, among other factors, is influenced by exposure to and prior experience of entrepreneurship (Burton et al., 2016; Unger et al., 2011; Zapkau et al., 2017). This thesis examines how EE can provide such exposure to entrepreneurship and thereby make students reflect upon their careers.

In terms of predicting the career choice to become an entrepreneur, entrepreneurial intention is an important construct. The construct was introduced to the field of entrepreneurship through contributions from, among others, Shapero and Sokol (1982), Bird (1988), Krueger (1993) and Krueger et al. (2000). The construct and theoretical frameworks of the entrepreneurial event (Shapero & Sokol, 1982) and the theory of planned behavior (Ajzen, 1991) were subsequently adopted in studies by, for example, Kolvereid (1996) and Kolvereid and Moen (1997), which proved their value in empirical settings. Entrepreneurial intention can be defined *“the cognitive state temporally and causally prior to the decision to start a business”* (Krueger, 2017, p. 13). This presupposes that entrepreneurial behavior is intentional and therefore can be predicted by intentions towards the behavior (Krueger et al., 2000). Both the field of entrepreneurship and the sub-field of EE have consequently been engaged in understanding this construct, both in terms of the antecedents for entrepreneurship intention, but also how intentions can be influenced and encouraged (Liñán & Fayolle, 2015).

According to the theory of planned behavior, intentions are determined by three antecedents, i.e. attitude towards the behavior, subjective norm, and perceived behavior control (Ajzen, 1991). In an entrepreneurial context, attitude towards the behavior refers to the degree to which an individual has a positive or negative view of entrepreneurship. Subjective norm concerns whether someone perceives social pressure in favor or disfavor of entrepreneurship. The third antecedent is perceived behavioral control, which in the entrepreneurial context concerns a person’s perception of whether they have the ability to be an entrepreneur or not. Perceived behavioral control is viewed conceptually as somewhat similar to Bandura’s (1977) self-efficacy construct, as both refer to a person’s belief that they have the ability to perform a particular behavior. However, operationally, the two constructs are

often different, as perceived behavioral control has to do with how difficult one considers something, while self-efficacy is operationalized as an individual's confidence to carry out the behavior (DeGeorge & Fayolle, 2008). In addition to the three antecedents, there are several empirical contributions that have shed light on the influence on both personal-level and context variables (Liñán & Fayolle, 2015). For example, there has been evidence of differences between countries (Kristiansen & Indarti, 2004), between genders (Wilson et al., 2007), and findings suggesting that prior family exposure (Carr & Sequeira, 2007) and risk propensity (Zhao et al., 2005) are positively related to entrepreneurial intentions.

The construct of entrepreneurial intentions has also been influential in EE. Due to the assumption that previous exposure to entrepreneurship can impact entrepreneurial intention (Zapkau et al., 2015), EE can be seen as an opportunity for exposure that subsequently has impact on entrepreneurial intentions. Intentions are a particularly valuable construct for EE, since actual future entrepreneurial behavior is often years ahead at the time students take part in EE (Fayolle et al., 2006). Hence, it becomes difficult to measure the effect of EE courses on behavior without conducting longitudinal follow-up studies over several years. The intention construct makes it possible to measure the immediate effect of EE courses on possible future behavior and is therefore a frequently used outcome measure in EE impact studies. The empirical evidence is, however, equivocal and inconclusive. Out of 10 EE impact studies between 2007-2015 with a strong experimental research design (i.e. quasi-experimental design or true experimental design), five report a positive impact (Gielnik et al., 2015; Rauch & Hulsink, 2015; Sánchez, 2011; 2013; Souitaris et al., 2007), two found no significant difference (Nabi, et al., 2018; Volery et al., 2013), one found both non-significant and negative impacts depending on the pedagogics (Varamäki et al., 2015) and two even found a negative impact (Huber et al., 2014; Oosterbeek et al., 2010). Accordingly, although entrepreneurial intention is the most frequently applied outcome measure in EE impact studies, empirical evidence remains highly inconclusive and the cause of the equivocal findings is poorly understood.

EE is not just about "producing" entrepreneurs and creating more start-ups. Obviously, this is part of the objective, but as one of eight key competences for lifelong learning (EC, 2006) entrepreneurship is essential for everyone, whether one plans to start a new company or to engage oneself in developing social enterprises or non-profit organizations. However, this career aspect does deserve more attention in EE impact research. The same applies to the impact EE has on intrapreneurship, which has only been addressed in a few empirical studies (Heinonen, 2007; Hytti & Heinonen, 2013). Entrepreneurship researchers are, however, studying intrapreneurial intentions (Douglas & Fitzsimmons, 2013) and claim that the notion of intention can be extended to intrapreneurship, thereby assuming that intrapreneurial behavior is also intentional. Intrapreneurial intention is

accordingly a potential measure for whether an employee or a student has ambitions to be an intrapreneur in a current or future job. Douglas and Fitzsimmon (2013) further found that intrapreneurial intention in fact is a separate construct from entrepreneurial intention, and that although there is a common antecedent in self-efficacy, there are also distinct career preferences in terms of income, ownership, autonomy and risk. As a result, it is important to not simply address entrepreneurial intentions when considering EE's impact on career choices. Intrapreneurship is a career choice in which employees can be involved in entrepreneurial behavior and should accordingly also be addressed in the EE impact literature.

2.3.2 Career reflections and future work selves

Students in higher education are in a phase of their life when career development is central (Erikson, 1980; Super, 1957). They are acquiring knowledge and skills that are essential for their future careers, but are at the same time expected to mature in terms of career development through a process of career exploration, career commitment, and career reconsideration (Porfeli et al., 2011). Building upon identity theory, Porfeli et al. (2013) suggest that exploration, commitment and reconsideration are interwoven processes on the pathway of establishing vocational identity. Career exploration is a process that has an internal component (understanding more about oneself), and an external one (understanding more about the world of work and the opportunities that exist) (Jiang et al., 2019; Porfeli & Lee, 2012). Career exploration is positively associated with career commitment (Portfeli et al., 2011), which refers both to making a choice as well as identifying with it. The third process, reconsideration, refers to the opposite, namely reexamining current commitments. Reconsideration is viewed as a critical process in identity development, and can have both positive and negative aspects (Porfeli & Lee, 2012). On the positive side, career reconsideraton can lead to career flexibility, with openness to alternative careers that lead to more suitable commitments in the long term perspective. On the negative side, career reconsideration can lead to self-doubt and career indecisiveness if someone is not able to advance from reconsideration, to exploration, and to new commitment to other career opportunities. Thus, the processes of career exploration, commitment and reconsideration, and the reflection that takes place within these, are vital for career development.

In a labor market that is increasingly boundaryless and characterized by uncertainty and frequent career transitions (Arthur & Rousseau, 1996), it is critical to be proactive in career development. Such proactivity has been linked to higher job satisfaction, higher salaries and faster career progression (Seibert et al., 2001), and it is consequently important that students are given opportunities for career

exploration during higher education to promote their career development. Career exploration lays the foundation for two main constructs in the thesis, namely career reflection and future work selves. Career reflection is, as the term suggests, reflection upon one's own career opportunities. It is defined as a core career competency and refers to the competency to be able to reflect on personal capacities and motivations in one's own career (Akkermans et al., 2012; Kuijpers et al., 2006). The career reflection that takes place during career exploration activities or interventions has implications for the two other processes of career commitment and reconsideration in Porfeli et al.'s (2013) model of career development. By engaging in career reflection, it is possible to develop future work selves, a notion coined by Strauss et al. (2012) that refers to "*representations of the self in the future that encapsulate individually significant hopes and aspirations in relation to work*" (p. 2). The notion of the future work selves draws on research in the psychology field on the concept of hoped possible selves (Markus & Nurius, 1986). According to Markus & Nurius, this is a cognitive representation of who individuals hope to become in the future, which influences motivation and behavior. By introducing the possible selves concept into the career context, Strauss et al. (2012) show how salient future work selves can motivate future-orientated career behavior. Recent empirical studies have found that career exploration predicts the salience of students' future work selves (Cai et al., 2015) and that students' clarity of the future work selves predicts proactive career behavior (Taber & Blankemeyer, 2015).

Career exploration is essential for students' career development and should be encouraged in higher education. Both career counselling (Kuijpers et al., 2011) and internships (Silva et al., 2016) have consequently been suggested as potential career exploration interventions in higher education. According to Porfeli et al. (2013), it is important that the curriculum helps students make connections between school subjects, different types of occupations and the labor market in the surrounding environment. Further, Kuijpers & Meijers (2012) emphasize the importance of a practice-based and inquiry-based curriculum, in which students have the opportunity to engage in career dialogue. Reflection is accordingly key in the career development process of exploration, commitment and reconsideration. EE has several of the characteristics that are required for career development. In its more active forms of learning *through* entrepreneurship, it is practice-based and inquiry-based, and opens up the possibility of internal exploration of students' capabilities, motives and ambitions, as well as external exploration of opportunities in the labor market. EE can accordingly be a career exploration intervention that enables career reflection on career choice and future work selves. When students take part in EE, it can potentially be a process of transformational learning (Mezirow, 1991), when they change how they view themselves (psychological transformation) or how they see the world (convictional transformation). Thus, the future work selves might need to be altered or tuned in

response to the new perspectives acquired through EE. Through the change in how students view themselves, they might discover new opportunities for their future careers, but might also realize that something does not suit them and subsequently reconsider, as described by Porfeli et al. (2013). In the same way, convictional transformation could provide career openings that students were not aware of before the EE experience, but at the same time be a reality check when students realize that their current future work selves are not realistic or feasible.

2.3.3 Entrepreneurship education as a career exploration intervention

EE is said to have the ambition to change the hearts and minds of students (Souitaris et al., 2007). From a career perspective, EE can therefore be seen as an opportunity for career exploration, with students taking part in both self-exploration and environmental exploration. Essentially, EE should provide a space in which students can reflect upon themselves through identity work, while also learning more about opportunities in the external environment outside the classroom (Blenker et al., 2011; Donnellon et al., 2014; Hytti & Heinonen, 2013). Career exploration may in turn help individuals in their career development and to form a vocational identity (Porfeli et al., 2013; Porfeli et al., 2011; Savickas, 2005; Savickas et al., 2009) through their reflections on new experience and insights. Therefore, the thesis sets out to examine the potential of EE as an arena for career reflection; i.e., a career exploration intervention that provides students with an opportunity to reflect upon careers. Career reflection can concern several different issues, but in this thesis the focus is on career choice intentions, career preferences and students' future work selves. The theoretical framework presented in this chapter draws upon theories and constructs from entrepreneurship literature, education literature and career development literature, and forms the basis for the conceptual model presented in Figure 3, which shows the main constructs, main RQ and the SRQs.

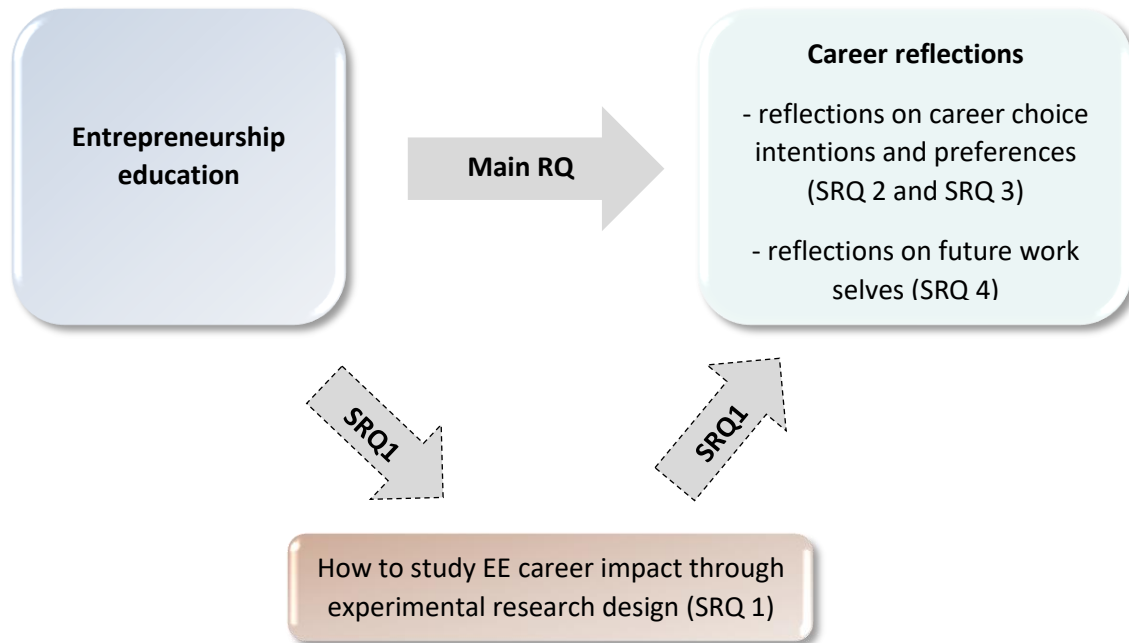


Figure 3: Conceptual model for the thesis

The main RQ of the thesis asks: *How does participation in entrepreneurship education impact students' career reflections?* The conceptual model shows that the purpose of the thesis is to examine how *entrepreneurship education* as a pedagogical and career exploration intervention provides students with an opportunity for *career reflection*. While there are several aspects of career reflection that could be addressed, the thesis concentrates on *career choice intentions*, *career choice preferences* and *future work selves*. In addition, the methodological challenge of how to study EE career impact is addressed by focusing on *experimental research design*. Therefore, three main research gaps are identified in the literature review in this chapter, which are addressed in the empirical studies of the thesis.

First, the review shows that there are severe methodological deficiencies in quantitative EE impact studies. The main criticism of these studies is the lack of a longitudinal design with pre-tests and post-tests, along with a lack of control groups. Consequently, seminal work on effect studies in education and social science by Campbell and Stanley (1963) and Cook and Campbell (1979), and recommendations from educational research (Johnson & Christensen, 2008), lay the foundation for a classification of weak experimental studies (i.e. pre-experimental design) and strong experimental studies (i.e. quasi-experimental design and true experimental design). The classification is applied to analyze the accumulated knowledge of EE impact in studies with a rigorous research design in paper

1, which aims to answer SRQ1: *What are the findings on entrepreneurial outcome measures in impact studies with a strong experimental research design?* The paper has a two-fold research objective. The first focuses on establishing the current status of experimental studies in EE impact studies. The second RQ of the paper focuses on impact studies that have a strong experimental design and their findings, and is therefore the RQ that is relevant for the thesis. Paper 1 thereby lays the foundation for the subsequent papers of the thesis, by establishing appropriate methodologies for studying EE impact quantitatively, by summing up EE impact on outcome measures in general, and subsequently, and more specifically, identifying research gaps and avenues for further research on career impact.

Second, quantitative EE impact research has had a narrow view of career impact. The focus has been on the intention to start businesses, on behavioral measures of nascency, or on venture creation. While these are all important implications of EE, the point of departure for paper 2 is that the career impact of EE can be viewed more broadly. Hence, the construct of intrapreneurial intentions is introduced, as is conjoint analysis as a novel methodology in EE in order to capture unconscious career preferences as opposed to only measuring career choices through scales or dichotomous measures. Accordingly, paper 2 aims to answer SRQ2: *What are students' attitude towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives?* Paper 2 has regional implications through its insights into students' career preferences in a region characterized by a brain drain, and also establishes the basis for a follow-up study of parts of the sample in paper 3. The review highlights both the lack of rigorous EE impact studies and the challenge of a narrow view of career impact. Hence, the quasi-experimental study of EE students taking a business planning course in paper 3 is led by SRQ3: *How does participation in a business planning course impact students' career preferences for entrepreneurship and intrapreneurship?*

Third, the review reveals the relevance of career development theories to the EE impact literature, but also the lack of integration of the two. Hence, the thesis takes an initial step towards integration of these two literature streams. Paper 4 is an exploratory case study of a design thinking course directed by the following SRQ4: *How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?* The study takes an exploratory approach and the phrasing of the SRQ is therefore broad in order to capture several aspects of the learning process. However, career implications are a central part of the learning process and the findings have spurred the development of the conceptual model presented in this chapter, which integrates EE impact and career development literature.

A summary of the empirical findings of the papers follows in chapter 4, but first the research design and methodological considerations are described in the following chapter.

3. RESEARCH DESIGN

Starting out as a new PhD student with the ambition to study the impact of EE, the initial proposals and ideas mainly adhered to the post-positivistic paradigm described by Guba and Lincoln (1994). Early proposals assumed an objective ideal and hypothetic-deductive methodology leading to causal explanations through quantitative measurement. As the PhD project progressed, the realization of the complexity of EE and the limitations of only applying quantitative deductive approaches led to the adaptation of a pragmatic approach. The reasoning for this philosophical stance will be discussed below, followed by an outline of the research process and methods applied in the articles, as well as reflections on the methodological considerations made.

3.1 Research philosophy

Pragmatism emerged in the United States in the last decades of the 19th century, with the work of Charles Sanders Peirce (1839-1914) and William James (1842-1910), and advances by John Dewey (1859-1952) and George Herbert Mead (1863-1931) being central contributions (Russill, 2016). Pragmatism was a reaction to the prevailing positivist paradigm that assumed the existence of a single reality and an objective truth (Morgan, 2007). The foundation of pragmatism is Peirce's pragmatic maxim, which states that pragmatism is a logical method of inquiry that aims to arrive at an understanding of an idea by considering its practical outcomes or effects. Experience and practice are accordingly at the core of pragmatism and lay the basis for the scientific ideas developed. Hence, we will never know the absolute truths of the universe, but we can try to understand things the best we can and accept a changing, dynamic reality. When new insights arise, inconsistency with the prevailing understanding of scientific ideas forms the basis for future scientific inquiry. Furthermore, instead of focusing on specific methods, it is the problem being studied and the questions being asked about this problem that should guide the methodological decisions (Creswell and Poth, 2017).

An important point of departure for my pragmatic approach to the PhD project was the prevailing assumption and instrumental view of policymakers and educational institutions that EE would automatically lead to more start-ups. In the early phases of the PhD and in the preliminary data collection my preconception was that I was going to provide evidence for whether this was true or not. My initial hypothesis was that EE would have a positive association with students' entrepreneurial intentions, and I expected that my contribution would add empirical evidence to the scarce body of literature. My initial ideas and preconception were soon put to the test. When examining the EE literature, conflicting and inconclusive findings emerged (Bae et al., 2014; Fayolle et al., 2016; Lorz et

al., 2013; Martin et al., 2013). Conversations with present and previous EE students soon initiated the idea of EE as a test arena, where in some cases students actually became quite sure that they never wanted to pursue entrepreneurship. Others had a strong commitment to it, but preferred to channel their commitment to other contexts than start-ups¹³. In line with the pragmatic approach to research, I found myself in a situation of doubt; practice and experience did not match my preconceptions. My initial understanding of the world was challenged and I let the doubt guide my subsequent PhD inquiry. Several important realizations arose from this. First, the realization about the need to go beyond entrepreneurial intention and the theory of planned behavior to investigate EE impact. This laid the foundation for exploring intrapreneurship, as my understanding of EE impact was no longer that its objective should be to create more start-ups, but to encourage more individuals to *behave* entrepreneurially in their careers, independent of whether this was in a start-up or existing organization. Further, it also spurred initial ideas around whether EE could have wider effects on students' careers than merely helping them in the entrepreneur vs. non-entrepreneur career choice. An emerging realization that the experience of EE participation could have an impact on students' reflections on their own careers led to the exploration of the career development literature and new insights for the theoretical framework of the thesis. Finally, the pragmatic approach also had methodological implications for how the PhD process progressed. From starting out with an intention to hypothetico-deductively test the hypothesis quantitatively, doubts and new insights triggered the inclusion of explorative quantitative methods such as conjoint analysis, as well as qualitative studies. In my opinion, keeping an open mind when approaching a phenomenon such as EE has been important for the final thesis. While I still very strongly believe that rigorous quantitative studies are essential for moving the research field forward and having impact on policy, I equally strongly believe that EE is a phenomenon that is too complex to be understood solely through quantitative inquiry.

¹³ During the PhD project, dialogue beyond the research context with current and previous EE students and EE teachers has been important. I observed how some EE students who wanted to be entrepreneurs at the outset of the course would be even more sure after its completion, while others reconsidered and decided not to pursue entrepreneurship. Similarly, EE students who did not want to become entrepreneurs at the beginning of their EE journey in some cases started successful companies one month after graduation, while others remained sceptic. There were also several examples of students who were very engaged in entrepreneurship, but pursued it in other settings than the start-up scene, for example as innovation managers in existing businesses, as promoters of entrepreneurship and innovation in the public support system or as scholars in entrepreneurship and innovation.

3.2 Research approach

With the pragmatist view leading the progress of the thesis, a mixed method approach was adopted in the exploration of EE as a phenomenon in the PhD project. Mixed method research may be defined as a combination of both qualitative and quantitative design, either concurrently or sequentially, in which the collected data are integrated at one or more stages in the research process to answer the research question (Creswell, 2014; Creswell et al., 2003). Qualitative and quantitative methods each have their particular strengths and weaknesses. By combining the two approaches, the weaknesses of each approach alone can be compensated for and the rich data obtained provide a more complete and holistic understanding of the phenomena researched than could be obtained by using either approach alone. Even though the individual papers in the thesis are either qualitative or quantitative, the thesis as a whole adopts a mixed method approach. For example, Longva and Strand (2018), whose paper is not included in the thesis, conducted exploratory focus group interviews to understand and develop the construct that papers 2 and 3 build upon. In the same way, paper 4 is an exploration of the insights developed through the work on the quantitative papers in this thesis, as well as findings from interviews by Kamovich and Longva (2016). The thesis as a whole can thereby be said to have elements of a sequential exploratory mixed methods design, in which insight from qualitative data collection is tested through quantitative methods, but also elements from a sequential explanatory design, in which findings from quantitative data collection are further investigated through qualitative methods (Creswell, 2014). However, since the independent papers can be categorized as either qualitative or quantitative, they will be presented with the particular research methodologies applied in the continued presentation of the research process.

The PhD project consists of three independent studies, resulting in four different papers that each contribute to addressing different aspects of the main RQ. While several different viewpoints could be relevant to address the main RQ, the four papers all aim to make novel contributions that shed light on aspects of EE career impact that have previously not been well understood. The methodological choices made for the different studies will be elaborated below, with the main elements of the research design presented in Table 5.

Table 5: Overview of the research design of the papers

Paper 1	Longva, K. K. & Foss, L.. (2018). Measuring impact through experimental design in entrepreneurship education: a literature review and research agenda. <i>Industry & Higher Education</i>, 32(6): 358-374.	
	Research objective	Examine the extent and application of experimental design in EE impact studies and summarize the findings from identified studies with a strong experimental design.
	Research question	What are the findings on entrepreneurial outcome measures in impact studies with a strong experimental research design?
	Research design	Systematic literature review.
	Data source	145 quantitative EE impact studies from ABS-listed journals.
	Data analysis	Reviewing and coding according to a predefined thematic reading guide.
Paper 2	Longva, K. K. (2018). Hope for the future? Students' career preferences for entrepreneurship, intrapreneurship, and international mobility. In Hogset, H., Berge, D. M. & Dale, K. Y. (Eds.). <i>Det regionale i det internasjonale – Fjordantologien 2018</i>. Universitetsforlaget.	
	Research objective	Explore how students perceive entrepreneurship, intrapreneurship and international mobility when considering different career choices.
	Research question	What are students' attitude towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives?
	Research design	Cross-sectional survey design with conjoint analysis.
	Data source	210 survey responses from bachelor's degree students.
	Data analysis	Factor analysis and regression analysis in SPSS.
Paper 3	Longva, K. K., Strand, Ø. & Pasquine, M. Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course. Draft.	
	Research objective	Research the impact of an EE course on students' career preferences, and entrepreneurial and intrapreneurial intentions.
	Research question	How does participation in a business planning course impact students' career preferences for entrepreneurship and intrapreneurship?
	Research design	Longitudinal survey design with conjoint analysis.
	Data source	99 matched surveys responses from EE students and a control group.
	Data analysis	ANOVA analysis and Wilcoxon signed rank test in SPSS. Conjoint analysis with Sawtooth Software.
Paper 4	Lynch, M., Kamovich, U., Longva, K. K. & Steinert, M. Combining technology and entrepreneurial education through design thinking: students' reflections on the learning process. Forthcoming in <i>Technological Forecasting & Social Change</i>.	
	Research objective	Examine students' reflections on the learning process in a corporate entrepreneurship course taught with design thinking pedagogics.
	Research question	How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?
	Research design	Exploratory case study.
	Data source	308 pages of students' reflection essays and learning diaries, class observation, course materials, course description and interview with the teacher.
	Data analysis	Thematic analysis through first and second cycle coding in NVivo.

3.2.1 Systematic literature review (SLR)

The starting point for the SLR was the call for more experimental design in entrepreneurship research and more evidence-based entrepreneurship (Frese et al., 2012; Frese et al., 2014; Hsu et al., 2017; Kraus et al., 2016). According to Frese et al. (2012, p. 1), evidence-based entrepreneurship can be defined as a *“summary of knowledge based on several sources of information which clearly goes beyond individual experience and a few isolated studies”*. To achieve this, they suggest accumulating knowledge through systematic reviews and meta-analyses. As opposed to narrative reviews, which run the risk of summarizing literature in a subjective and biased manner, SLRs aim to ensure a systematic, transparent and replicable selection of literature (Tranfield et al., 2003). There have accordingly been several important SLRs and meta-analyses within entrepreneurship, which have helped move the research field forwards (e.g. Liñán & Fayolle, 2015; Unger et al., 2011; Wang & Chugh, 2014). SLRs are especially valuable when attempting to sum up evidence over long periods and has, according to Nabi et al. (2017) and Pittaway and Cope (2007a), become a well-established methodological approach within EE.

Conducting an SLR was valuable in the early phases of the PhD in order to obtain an overview of EE research in general and of EE impact studies in particular. Although there were many statements about the methodological deficiencies in EE impact research and the severe implications that this had for the field, there was a lack of statistics to support the claims. Additionally, there was little distinction between rigorous and non-rigorous impact studies in the narrative reviews of the literature. Hence, an SLR could be an important contribution to the EE literature. In my opinion, the application of methodologically deficient experimental design is a matter that has been frequently discussed, but poorly understood. Moreover, it was a personal learning process that informed and laid the foundation for the rest of the thesis. The SLR enabled a renewed understanding of the outcome measures that were being used, which was important for further development in upcoming papers in the thesis, as well as for the appropriate methodologies to apply.

The SLR paper employs a journal-led search of peer-reviewed journals within the ABS Academic Journal Quality Guide 2015. When choosing to search within selected journals, there are limitations in terms of the risk of potentially excluding relevant articles. Nevertheless, restrictions on included journals were seen as an important means to ensure the feasibility of the SLR in order to generate hundreds rather than thousands of search hits. Further, it was a decision made in order to target high quality and impactful EE research in line with previous SLRs on EE and entrepreneurship (Blenker et al., 2014; Wang & Chugh, 2014). The journal-led search was conducted within all journals in the ABS subject areas of ‘entrepreneurship’ and ‘management education’, as EE is a research field at the interface of these. A Boolean search term in the databases of Science Direct, Elsevier Scopus, ABI

Inform and Business Source Complete was used to search the majority of the journals, while a few that were not accessible on the databases were searched manually. The initial search, after the removal of duplicates, resulted in 613 articles, which were reduced to a final sample of 145 that met the inclusion criteria for the quantitative impact studies. These 145 articles were coded according to a thematic reading guide in order to: 1) classify the experimental research design applied to understand the application and extent of strong experimental research design in EE impact studies; and 2) to summarize the findings of the EE impact studies with a strong experimental design to address SRQ1.

Status of the paper

The paper was developed between 2016 and 2018. I am the first author of the paper, while Professor Lene Foss co-authored it by contributing critical revisions of the content of several paper drafts. The first draft of the paper was presented at the ISBE conference in Belfast, Northern Ireland in November 2017. We received valuable feedback at the conference for the continuation of the work and the paper was submitted to the *Industry and Higher Education* journal in February 2018. The paper was revised following feedback from three reviewers and was resubmitted in May 2018. The paper was published in the November 2018 issue.

3.2.2 Quantitative studies

There are two quantitative studies in the thesis, which both apply experimental research design with conjoint analysis. However, the motivation and experimental design of the studies are different. Experimental research design and conjoint analysis as a research method will therefore first be introduced below, before its application in the two different papers is explained.

Experimental design in impact studies

The key objective of a quantitative impact study in an educational setting is to find evidence of a causal link between the education intervention that takes place and the observed outcomes (Johnson & Christensen, 2014). Causality can, however, be a tricky matter in social science research. In a laboratory setting, an experiment can be conducted in a controlled environment, where the researcher precisely

manipulates one or more variables and meticulously controls for all confounding extraneous variables. In a field study in the real world it is more challenging to control for confounding variables that might threaten the internal validity. The presence of confounding variables provides alternative explanations and rival hypotheses to the observed effects and accordingly makes it challenging to claim causality. However, if the confounding variables are controlled for, as they are to varying degrees in different experimental designs, it can be claimed that the observed effect is most likely due to the treatment. Returning to the influential work in experimental design of Campbell & Stanley (1963) and Cook & Campbell (1979), experiments can be categorized into three types depending on how well confounding variables are controlled for: 1) *True experimental design*; 2) *Quasi-experimental design*; and 3) *Pre-experimental design*. Such design differs with respect to three characteristics: 1) whether it makes use of control groups; 2) whether respondents are randomized into treatment and control groups; and 3) whether the research is longitudinal as opposed to cross-sectional.

In a *true experimental design*, randomization is applied; Figure 4 illustrates how this experiment appears in practice. Participants are randomly assigned to either a control group C or a treatment group T. Thereafter, they are given a pretest O_{T1} (for the treatment group) or O_{C1} (for the control group) in order to ensure that the groups do not differ from the outset. Subsequently, treatment group T undergoes treatment X, in this context in the form of an EE course, while control group C does not take part in the course. Subsequently, a posttest O_{T2} and O_{C2} is completed, and any difference between treatment group T and control group C is assumed to be due to treatment X. With this design, differences attributed to history, maturity and testing should be equally manifested between the two groups, while random assignment protects against statistical regression, mortality and selection (Cook et al., 2002).

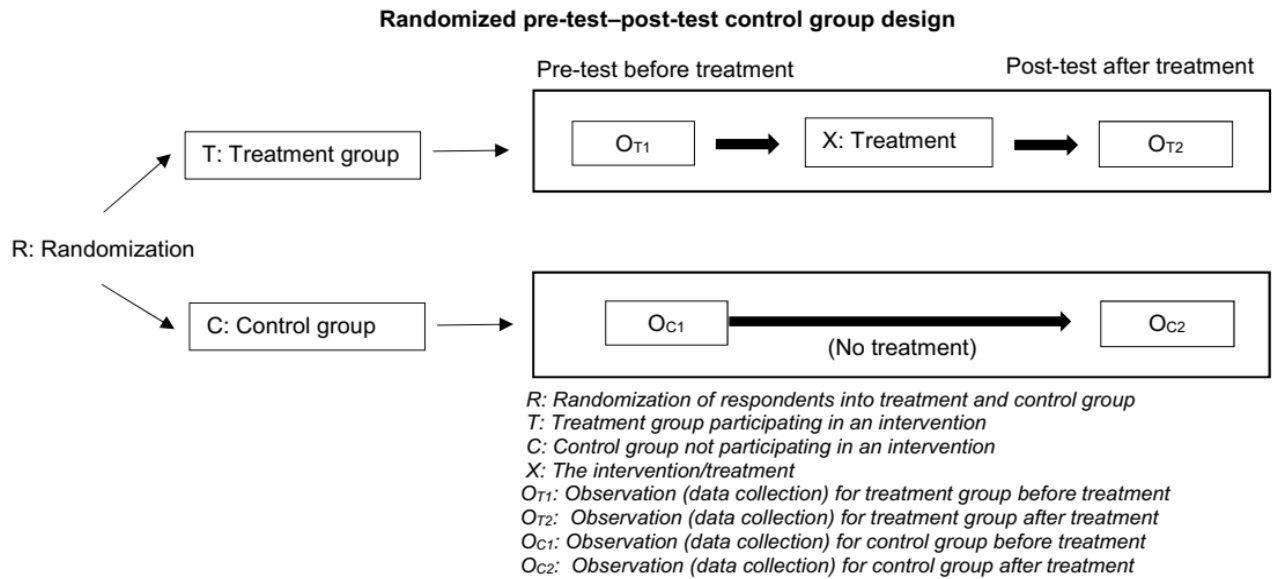


Figure 4: Types of experimental research design

In many educational real-life settings, random assignment is not a realistic scenario. Thus, a *quasi-experimental design* could be an appropriate technique. The term quasi-experiment was coined by Cook and Campbell (1979) to describe an experimental design without random assignment, which they recommend when randomization is not available. In an EE setting, the treatment group would comprise students taking an EE course. The control group would be a student group as similar to the student treatment group as possible, but which does not take part in the EE course. Without randomization, the internal validity of the design faces challenges in terms of selection, maturation, history and statistical regression (Cook & Campbell, 1979). Nonetheless, with the presence of both control groups and a longitudinal design, it can still be considered to be a rigorous experimental design.

Pre-experimental designs are considered to be weak because they do not control for many potentially confounding variables. The weakest pre-experimental design is the *one-group post-test-only design*, in which EE students would take a post-test after finishing a course. With no possibilities for comparisons with others or over time, its value is questionable. In fact, Campbell & Stanley (1963, p. 5) state that it has ‘...such a total absence of control as to be of almost no scientific value’.

The *static group comparison* is a pre-experimental design with control groups for comparison, but without pretesting before the treatment. At first glance, the design appears more adequate than the

one-shot case study, since it introduces a comparison group, although the design still has basic problems when aiming to address causality. The main issue is that the status of the two groups prior to an EE course is not known. Accordingly, it becomes impossible to claim that any difference between the student groups in the post-test is due to the EE course, as there might very well have been an initial difference between the student groups prior to the course; for example, because of self-selection onto EE courses.

The *one-group pre-test – post-test design* has the advantage of capturing change in a student group due to the measurement both before and after an EE intervention, but it also has substantial deficiencies in terms of internal validity. The apparent weakness is that changes in outcome variables cannot automatically be taken as evidence of the effect of the EE course, since there are several confounding extraneous variables that could have an influence. There could, for example, have been events (e.g. media impressions of entrepreneurship, a change in the economic climate, an extra-curricular entrepreneurship event at campus) that resulted in a change among all the students, not just the EE ones.

Hence, relying on pre-experimental design when attempting to address the impact of EE courses on the participating students can be problematic. If the objective is to establish causality between EE pedagogical interventions and various entrepreneurial outcomes, true experimental design or quasi-experimental design should be the preferred research design.

Conjoint analysis

Traditional survey scales are valuable instruments in quantitative research, but also have their limitations. One drawback is that they do not capture trade-off effects. For example, when someone is introduced to intention scales on both entrepreneurship and intrapreneurship in the same survey, it is possible to rate both intentions at the higher end of the scale. The trade-off that underlies real-life choices is thereby missed. After all, it is usually not possible to be both an entrepreneur and an intrapreneur at the same time. Conjoint analysis, a market research analysis method, provides an opportunity to overcome these challenges and has been suggested as a valuable methodology for studying decision-making in entrepreneurship (Lohrke et al., 2010; Shepherd, 2011). The method attempts to understand how people make complex choices and is a statistical technique used to determine how respondents value different attributes in a decision-making process by decomposing the underlying structure of the decision policies (Hair et al., 2014; Orme, 2010). Hence, in a study of career choice intentions, conjoint analysis enables the use of career choice scenarios and captures the

relative preference towards these, instead of only relying on traditional survey scale measures. By constructing career choice scenarios in which respondents have to choose between either entrepreneurship or intrapreneurship in a scenario consisting of several career attributes, respondents are forced to make a trade-off, which consequently reveals the relative attributed value of the different career choices.

Paper 2: Cross-sectional survey with conjoint analysis

The point of departure for the paper was to explore how students perceive entrepreneurship, intrapreneurship and international mobility when considering different career choices. Further, it was an ambition to investigate the antecedents of these constructs, as well as the career preferences of students. Acknowledging the limitations of traditional questionnaire scales, the survey made use of adaptive conjoint analysis, by which students evaluated the perceived attractiveness of seven job opportunity scenarios composed of different job attributes developed through prior focus interviews in Longva & Strand (2018). The job attributes and attribute levels are shown in Table 6. The former were job description, income, work hours, location, job security, work environment, and possibilities for personal career development. Each attribute consisted of three or four levels. The conjoint analysis presented students with different career scenarios consisting of two to five attributes, which the students rated and compared. A printed version of the online survey and examples of the different career scenarios can be found in Appendix II. The conjoint analysis resulted in values indicating the relative importance of each attribute and in part-worth utilities for the individual attribute levels.

Table 6: Attributes and attribute levels in the conjoint survey

ATTRIBUTE	ATTRIBUTE LEVEL
SALARY	1. NOK 300,000 a year
	2. NOK 450,000 a year
	3. NOK 600,000 a year
WORK EFFORT	1. 38 hours a week
	2. 44 hours a week
	3. 50 hours a week
JOB SECURITY	1. 100% certain that you will have work in 1 year
	2. 50% certain that you will have work in 1 year
	3. 10% certain that you will have work in 1 year
WORK ENVIRONMENT	1. Very good – very good relationship with colleagues and management
	2. Satisfactory – no problems with either colleagues or management
	3. Poor – poor relationship with colleagues and management
CAREER OPPORTUNITIES	1. Very good career opportunities – for professional development and promotion
	2. Some career opportunities – for professional development and promotion
	3. No career opportunities – for professional development and promotion
LOCATION	1. In your home county
	2. Oslo
	3. Abroad
JOB DESCRIPTION	1. Entrepreneur – start a company alone
	2. Entrepreneur – start a company with 2-5 others
	3. Intrapreneur – employee with intrapreneurial tasks in an existing company
	4. Employee – employee without intrapreneurial task in an existing company

The second part of the survey consisted of a traditional questionnaire that captured demographics, previous experience, and intentions for entrepreneurship, intrapreneurship and international mobility. Entrepreneurial and intrapreneurial intentions were based on validated scales by Thompson (2009) and Moberg et al. (2014) respectively, while the international mobility scale was constructed for the purposes of the study. The sample for the study was 210 undergraduate second year students at a Norwegian University. The survey was distributed to all study programs within four departments, resulting in a response rate of 50.2%.

The objective of the paper was to examine whether previous participation in EE had had an impact on the three different intention constructs. The study accordingly employed a static group comparison design. Students who had participated in EE ($n=88$) and those who had not ($n=122$) were compared, but there were no data on students' intentions prior to EE. The only data available to address EE impact were post-test data, which have limitations. Accordingly, although the statistical analysis showed a significant association between EE and career intentions, the cross-sectional design made it difficult to move from correlation to causation. This was an essential insight for the development of the PhD project, as it highlighted the challenge of founding EE impact research on pre-experimental design and spurred the development of paper 3 as a follow-up study.

Paper 3: Quasi-experimental survey with conjoint analysis

With the valuable lessons from paper 2 in mind, paper 3 was a follow-up study partly based on the same sample. A group of respondents from the survey in paper 2 were participating in an EE course, which made this an interesting case for longitudinal study. The same course was also taking place at a different campus, which enabled expansion of the sample. Accordingly, the study applied a quasi-experimental design in order to overcome some of the limitations from the previous study. The survey from paper 2 was used as pre-test at T1, while a post-test (T2) was distributed to EE students after the course, as well as to a control group. The pre-test survey resulted in 65 survey responses from the treatment group and 74 from the control group, while the post-test survey produced 52 responses from the treatment group and 73 from the control group. The survey respondents from the pre-test and post-test surveys were matched according to an anonymous survey code, resulting in 99 matched respondents; i.e., $n=44$ for the treatment group and $n=55$ for the control group.

The EE course in question was a business planning course that lasted for one semester. During the course, students received theoretical input on how to develop ideas and start a company, but also worked in groups to develop a business plan based on their own ideas. They were also given the opportunity to participate in a business plan competition in which they pitched their ideas in a public event for an investor panel.

The data were analysed through conjoint analysis and analysis of variance (ANOVA) and Wilcoxon signed rank tests, which compared the treatment and control groups before and after the EE course. Quasi-experimental design is a rigorous research design that enables statements on causality, in this case about EE and the measured outcome constructs. At the same time, it is important to acknowledge

that there are challenges in terms of response rates and small samples in the study, as well as a context-specific EE course that is not necessarily valid in other circumstances.

Status of the papers

Paper 2 was developed in 2016-2018. The first draft was presented at the Fjordkonferansen conference in Loen, Norway. It was submitted as a book chapter to *Fjordantologien 2018* in August 2017 and I was the sole author of the paper. Following two rounds of reviews in autumn 2017, the chapter was published in June 2018.

Paper 3 was co-authored with Professor Øivind Strand and Associate Professor Mark Pasquine. I was the first author, while Øivind Strand contributed with advice during the concept development, interpretation of statistical analysis, and advice on revisions of the drafts. Mark Pasquine contributed with advice on the study design, interpretation of statistical analysis, and advice on revision of the final draft. A first version of the paper was first presented at the RENT conference in Lund, Sweden in November 2017 and thereafter at the NORSI conference in Oslo, Norway in January 2018. The paper was since revised and is now in review in the *Education + Training* journal.

3.2.3 Qualitative study

After working on two quantitative papers, a need to study the phenomenon from a different perspective emerged. The focus group interviews prior to papers 2 and 3 had given valuable insight into how students reflected upon career choices and their future careers. Although there remained much to be explored on EE impact, Paper 4 provided an opportunity for this through an exploratory case study of students' reflections on a corporate entrepreneurship course applying design thinking. The data collection took place both during and after the course and was based on the principle of triangulation, applying multiple sources of evidence to search for converging findings and thereby strengthening validity (Yin, 2009). The data material consisted of reflection essays from 27 of the 28 participating students, six weekly learning diaries from six of the students, as well as access to course materials, course descriptions, observations of teaching and group work, and an interview with the lecturer.

The data were analyzed by conducting first and second cycle coding, as recommended by Saldaña (2012). In the first cycle coding, the objective was to develop individual descriptive coding in the qualitative analysis program NVivo (version 11). The authors attempted to keep an open mind in the first cycle coding and summarized passages of written student reflections by using single words and short phrases. After coding five common essays, the coding in three of them was compared, revealing a high similarity in the use of codes. This resulted in an initial set of codes, which were used for the remainder of the essays and diaries. The cross-check of the initial essays allowed us to give sharper definitions, discuss equivocal cases and led to a common understanding around each code and its fit to the blocks of data (Miles et al., 2014). The coding list was dynamic throughout the process and new codes were discussed and added to the list as they emerged. When advancing to second cycle coding, the initial codes from the first cycle were kept in mind when applying focused coding (Saldaña, 2012) to re-code the material. The purpose was to look for recurring patterns and conceptual similarities among the codes. The process resulted in 12 revised categories and the structuring of these into four broader themes.

While the research focus of the paper was the broader learning process, it also provided important insight into students' reflections on their visions of their future careers and thereby contributing to address the main research question. The in-depth insights gained from students' written reflections were valuable for a broader understanding of the impact EE can have on students' career reflections, and opened up several ideas for future research on the topic. One of the limitations of the exploratory approach in this paper is that it cannot be generalized and that an exploratory study will produce a rather broad overview of the phenomenon investigated. Hence, following up with quantitative studies and more focused qualitative studies could lead to enhanced understanding of this particular EE impact.

Status of the paper

The paper was co-authored with PhD candidates Matthew Lynch and Uladzimir Kamovich, and Professor Martin Steinert. Matthew Lynch, Uladzimir Kamovich and I shared first authorship¹⁴. The

¹⁴ We all contributed equally to the paper, but at different stages. All three first authors took part in the development of the concept, study design and data collection. In terms of data analysis and interpretation, the two other first authors performed the first-cycle coding of the reflection essays, while I was responsible for the first-cycle coding of the reflection diaries. The second-cycle coding of all the material was done by me. The first draft was prepared for a conference mainly by the two other first authors. I gave advice on the first draft, but had the main responsibility for a major revision of the paper in the first revise and resubmit process to

paper was presented at the ISBE conference in Paris, France in November 2016 and at the International Research Conference on Science and Technology Entrepreneurship Education conference in Toulouse, France in April 2017. It was thereafter submitted to the *Technological Forecasting & Social Change* journal in January 2018. It was revised and resubmitted in November 2018, March 2019 and June 2019, before it was accepted for publication in June 2019. The article is currently available online as an article in press and will be published in an upcoming issue of the journal.

3.2.4 Other studies emerging from the research process

The PhD project has also resulted in three additional papers that have been important for my understanding of the phenomenon of EE and in its extension entrepreneurial learning. The papers presented or published are:

- Book chapter: Kamovich, U., & Longva, K. K. (2016). When theory is invisible and hidden in practice: a qualitative study of one entrepreneurship course. In J. Amdam, R. Bergem, & F. O. Båtevik (Eds.), *Offentleg sektor i endring* (pp. 157-173). Oslo: Universitetsforlaget.
- Book chapter: Longva, K. K., & Strand, Ø. (2018). Comparing career preferences of regionally oriented and internationally oriented students. In Hogset, H., Berge, D. M. & Dale, K. Y. (Eds). *Det regionale i det internasjonale – Fjordantologien 2018*, pp. 267-294.
- Conference presentation: Holm, M. L., Longva, K. K. & Strand, Ø. *Exploring entrepreneurial learning in a multilevel perspective through boundary crossing theory – a case of Norwegian nascent entrepreneurs*. In conference proceedings for RENT 2018, ISSN 2219-5572. Toledo in Spain 14th – 15th of November 2018. Also presented at NORSI Research School Conference 2019. Oslo 17th – 18th of January 2019.

Technological Forecasting & Social Change. The responsibility in the subsequent minor revisions of the paper was shared among the first authors.

3.3 Methodological considerations

In the thesis three empirical studies have been conducted to address the impact that EE has on students' career reflections. All three empirical studies employ different methods; i.e., an SLR, two quantitative studies with cross-sectional and quasi-experimental design, and a qualitative exploratory case study. Each of these has its strengths and limitations. The SLR in paper 1 was conducted due to the fragmented and rapidly developing nature of EE impact research. Conducting an SLR could thereby contribute with an understanding of the current situation of the field and guide future research. Additionally, an SLR minimizes subjective bias in the selection of literature and establishes a replication logic through its systematic and transparent nature that thoroughly describes the selection of literature (Tranfield et al., 2003). In terms of validity, the inclusion of studies of only quasi-experimental or true experimental design contributed to limiting internal validity threats in the studies. With regards to the SLR's internal validity as an empirical study, the selection of journals and search terms is always a source of error. Restraints on journals and search terms included will necessarily lead to the exclusion of others. Therefore, it is important to acknowledge that the results could have been different with other search criteria. However, at the same time the SLR criteria were chosen with a purpose and were guided by the research objective. External validity is always a challenge in EE impact studies. Due to the diverse nature of EE in terms of students, teachers, pedagogy, teaching materials, geography etc., there is always a question of whether the findings of one impact study are generalizable outside its specific context. Consequently, it is important to acknowledge the risk of treating EE as a black box. The findings need to be interpreted in the context of the study and replication is necessary to examine if they are valid beyond this.

As previously discussed, the first quantitative study had several limitations. While the reliability criteria were met in the Cronbach α tests, there were challenges in terms of internal validity. The research design was pre-experimental through static group comparison and causality must accordingly be claimed with caution (Cook et al., 2002). Self-selection bias is especially problematic in EE, since students interested in entrepreneurship enroll on EE courses in larger numbers than those who are less interested (Liñán et al., 2018). When there is no knowledge about the pre-level of outcome measures, it becomes problematic to address inferences beyond correlation. The quasi-experimental study therefore applies a more rigorous experimental design, thereby overcoming several shortcomings in terms of internal validity. There is still no randomization, hence internal validity is still threatened to some extent. Nonetheless, quasi-experimental design is often the only feasible design in a real-life setting (Cook & Campbell, 1979). The lack of randomization is an issue for external validity, along with the challenge of small samples. While small samples are not uncommon, either in quasi-experiments or

EE impact studies, it is nevertheless important to keep in mind that generalization of the findings must be made with caution.

The exploratory case study provided valuable insights into the learning process and students' reflections. Following Yin (2009), multiple sources of data material were used based on the principle of triangulation. According to Creswell and Miller (2000), triangulation can be defined as a validity procedure in the search for convergence among multiple and different sources of information. Further measures taken included systematic first- and second-cycle analysis following Saldaña (2012), and independent coding by the three researchers to arrive at common themes and categories through discussion. While generalizability is a goal in quantitative research, qualitative research seeks transferability; i.e., whether the results can be transferred to other contexts or settings (Lincoln & Guba, 1985). This cannot be established within our single case study. Therefore, thick descriptions of the EE context, data collection and analysis were provided in order to allow readers to judge the fit of the findings in contexts beyond the study. A future methodological step towards transferability could be to extend the single-case study to multiple-case studies.

In terms of ethical considerations, this was an important aspect of the empirical studies, since the data collection involved interviews, written reflections and surveys among the students. As a first step towards ethically sound research, quantitative surveys were reported to and authorized by the Norwegian Center for Research Data (NSD). Students received the survey by e-mail, along with an information letter about the research purpose, the researchers involved and data management. Students had to actively accept to participate by starting the survey. They had the opportunity to stop the survey at any time. In order to match the pre-test and post-test responses, it was necessary to have an identification code. This was done through a three-letter code consisting of the first letter of the mother's first name, the first letter in the father's first name and the number corresponding to the month of birth. This enabled matching without sacrificing students' anonymity. For the qualitative study in paper 4, information letters were sent out before the course started. It was voluntary to participate in the writing of reflection diaries and students chose whether they wanted to grant us access to the reflection essays they had written. One student did not grant access and students had the opportunity to withdraw the access at any time.

Another important ethical aspect is that I was not involved in the teaching of any of the courses. While I teach other EE courses, I felt that it was important to do research on ones I was not a part of. One reason for this is my ambition for confirmability and objectivity in research. Another was that I did not want students to feel that they were obliged to participate or that they had to answer in a way that I would prefer.

It is important to acknowledge that the studies have their particular strengths and weaknesses and that there are other research designs that could have been applied. However, the studies have developed along with my understanding of the research field and my development as a junior researcher. When I started my PhD, there was a substantial focus on the impact EE could have on entrepreneurial intentions and knowledge. The field has since developed to take a broader view of EE impact. Through engagement with the EE literature, participation in PhD courses and research conferences, my PhD project has developed in parallel. Starting out with a predominantly quantitative perspective, I soon realized that one single approach would only shed light on parts of the main research question. Moreover, a Norwegian PhD is defined as researcher education to prepare for a diverse set of research tasks in the future. It was therefore important for me to develop a research tool box with more than one methodological approach. Hence, the methodological part of the PhD expanded to include alternative quantitative methods such as conjoint analysis, but also allowed use of interviews, focus groups and qualitative analysis of written reflections.

In conclusion, I am still an advocate of the application of rigorous methodology when conducting quantitative EE impact studies in order to have an influence on practice and policy that will help move the field forward. At the same time, EE is a complex phenomenon that also needs to be explored in-depth through qualitative methods to really understand the 'whys' and 'hows' of students' experiences and development.

4. SUMMARY OF THE APPENDED PUBLICATIONS

4.1 Paper 1: A systematic literature review of EE impact studies

Longva, K. K. & Foss, L. (2018). Measuring impact through experimental design in entrepreneurship education: a literature review and research agenda. *Industry & Higher Education*, 32(6): 358-374.

4.1.1 Background of the study

True experimental design and quasi-experimental design are considered to be strong experimental research designs appropriate for assessing the impact of pedagogical interventions (Johnson & Christensen, 2014). Strong experimental designs include control groups, which enable comparison of those taking part in an intervention and those who are not. Moreover, strong experimental design implies a longitudinal approach, with measurement both before and after the intervention. This enables inferences about whether one can attribute differences between treatment and control groups to an intervention, or if differences already existed prior to it. When studying EE as a pedagogical intervention with the purpose of better understanding its impact, it is accordingly important to apply rigorous experimental research designs in quantitative studies. EE impact literature has been criticized for not doing this (Bae et al., 2014; Fayolle et al., 2016; Lorz et al., 2013; Martin et al., 2013). Narrative reviews have paid little attention to research design in summaries of previous findings, so it has been a challenge to understand whether the established knowledge of EE impact is based on rigorous methodology or not. With this backdrop, the SLR paper sets out to examine the extent and application of experimental research design in EE impact studies, as well as to summarize the findings of studies that could be considered methodologically robust. The paper therefore poses two research questions, of which RQ1b is relevant for answering the main research question of the thesis:

RQ 1a How is experimental design applied in EE impact studies and to what extent do impact studies have a strong experimental research design?

RQ 1b What are the findings on entrepreneurial outcomes measures in impact studies with a strong experimental research design?

4.1.2 Main findings

A systematic search in ABS-listed journals resulted in 145 quantitative impact studies. Further analysis revealed that only 17 of these could be characterized as impact studies with a strong experimental research design, i.e. true experimental design or quasi-experimental design. The remaining studies had a pre-experimental design, demonstrating a substantial lack of methodologically rigorous approaches to EE impact. This has severe implications for the accumulated knowledge of such impact. In fact, it appears that we still know little about the effects of EE. The article therefore continues by summarizing the findings from the body of experimental impact studies that do apply a strong research design. Although there are indications of a positive impact on outcome measures in the 17 studies with such a design, there are also studies which show non-significant and even negative impacts. Hence, the overall impact remains conflicting and equivocal. The paper therefore highlights the need for more EE quantitative impact studies with rigorous research designs, as well as an exploration of novel impact indicators. This could contribute to the development of more finely-grained understanding of EE and the contextual factors surrounding it, and thereby a better understanding of the complex phenomenon that EE is. In terms of the main RQ of the thesis, the SLR reveals that EE career impact has been defined rather narrowly, predominantly focusing on entrepreneurial intention, nascency and venture creation.

4.2 Paper 2: Students' career preferences for entrepreneurship & intrapreneurship

Longva, K. K. (2018). Hope for the future? Students' career preferences for entrepreneurship, intrapreneurship, and international mobility. In Hogset, H., Berge, D. M. & Dale, K. Y. (Eds.) *Det regionale i det internasjonale – Fjordantologien 2018*. Universitetsforlaget.

4.2.1 Background of the study

This paper focuses on the career preferences of the future workforce of the Møre and Romsdal region in Norway. The region is historically innovative and internationally-oriented, and is dependent on a workforce that can act entrepreneurially, be innovative within existing companies and cultivate connections with international markets. The study explores whether regional students are up to the task. It does so by applying intention constructs of entrepreneurship, intrapreneurship and international mobility. Within the EE literature, the entrepreneurial intention construct is well established, while the intrapreneurial one is less so. The objective was therefore to develop a better

understanding of the antecedents of these constructs, their inter-relationship, as well as the potential impact that EE could have on them. Hence, the research question that guided the quantitative study was:

RQ 2 What are students' attitude towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives?

4.2.2 Main findings

The findings were promising for the region and indicated that students had quite positive attitudes towards both entrepreneurship and intrapreneurship, as well as towards international mobility. Entrepreneurship was perceived as a relevant career choice by many, but was at the same time was seen to be far more attractive as a team rather than as a sole entrepreneur. The students were also quite positive to international mobility, but studying or working temporarily abroad was considered more advantageous than moving abroad permanently. There was also a positive relationship between intentions to go abroad, entrepreneurial intentions and intrapreneurial intentions, indicating that there are common underlying variables to be explored in future research. However, with regards to the main RQ in the thesis, the findings on EE impact were conflicting. While EE in higher education had a positive impact on entrepreneurial intention, it in fact had a negative relationship in secondary schools. Hence, further research employing a longitudinal design is necessary to advance our understanding of what actually takes place during and after an EE pedagogical intervention.

4.3 Paper 3: The impact of EE on students' career preferences

Longva, K. K., Strand, Ø. & Pasquine, M. Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course. In review in *Education + Training*, submitted August 2019.

4.3.1 Background of the study

Both the SLR in paper 1 and the limitations of the cross-sectional study in paper 2 point towards the importance of longitudinal and rigorous experimental design when studying the impact of EE. Paper 3 is a result of the reflections made during the work with the two first papers, and an effort to contribute to the limited body of literature that applies strong experimental design in EE impact studies. The paper seeks to achieve a deeper understanding of how EE in the form of a business planning course can affect students' career choice intentions. The target of the course was bachelor students and it lasted for one semester. During the course, students received theoretical input on how to develop ideas and start a company, but also worked in groups to develop a business plan for their ideas. The topics covered were evaluation of business ideas, business plan development, market prospects, competitor and sector analysis, business model development, intellectual property rights and basic financial analysis. The teaching methods included lectures, guest lectures, group exercises, workshops and case discussions. Students could also participate in a business plan competition in which they pitched their ideas to an external jury.

While extensive research applies survey scales to measure entrepreneurial intentions, this study takes a novel approach that allows us to capture students' immediate decision-making processes when presented with different career opportunity scenarios in a conjoint analysis. Career choice intentions measured on a scale indicate something about the preference towards one particular career alternative. Career choices measured through conjoint analysis are able to address the relative preference for a career choice compared to other choices. The study examines the impact a business planning course has on the preferences for entrepreneurship and intrapreneurship. The following research question was formulated for the study:

RQ 3 How does participation in a business planning course impact students' career preferences for entrepreneurship and intrapreneurship?

4.3.2 Main findings

The findings suggest that for the sample of EE students participation in a business planning course actually reduced their entrepreneurial intentions. We found no support for impact on students' intrapreneurial intentions. The results from the conjoint analysis showed a significant change in three out of four career preferences for EE students. There was a significant decrease in the ranking of

starting a company alone, while there was a significant increase in the ranking of intrapreneurship, and being employed without intrapreneurship tasks. There were no significant changes in any rankings among the control group. The paper thereby introduces the proposition that EE is an arena for career reflection, which facilitates students' career development process through career exploration, leading to career commitment or career reconsideration. The paper contributes to the limited empirical literature on the impact of business planning courses and shows that this particular form of learning *for* entrepreneurship reduces students' entrepreneurial intentions and also causes a displacement of their career preferences. Furthermore, we problematize the widespread use of entrepreneurial intention as an impact measure of the effectiveness of EE.

4.4 Paper 4: Students' reflections on the learning process in EE

Lynch, M., Kamovich, U., Longva, K. K & Steinert, M. (2018). Combining technology and entrepreneurial education through design thinking: students' reflections on the learning process. Accepted for publication and available online in *Technological Forecasting & Social Change*.

4.4.1 Background of the study

There has been a growing call to educate students within all study programs in entrepreneurship. However, current EE has been developed predominantly within business schools and is accordingly often suited to the needs of business students. However, entrepreneurship should be relevant to all careers in the 21st century, and should therefore also be an element in faculties beyond business schools. Practitioners and scholars are increasingly intrigued as to how to teach EE to non-business students, with design thinking suggested as a pedagogy that could be particularly suitable to do this. However, the empirical evidence supporting this claim is scarce. This study therefore sets out to advance knowledge on the appropriateness of design thinking as an EE teaching pedagogy by exploring students' reflections upon the learning process. The setting is an interdisciplinary master's course that uses design thinking to teach entrepreneurship through a technologically challenging case. 28 students participated in the 4-week course, which had an intensive format. They were expected to spend the same amount of time on the course as they would on a course running for a whole semester. The students were divided into groups and received a real-life problem description from a technology company. They were expected to gather information from experts, collaborators and potential

customers, and create a novel product/concept which they presented to the technology company at the end of the course. The exploratory case study was led by the following research question:

RQ 4 How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?

4.4.2 Main findings

The paper makes use of students' written reflections through reflection essays and learning diaries, but also draws upon observations, course materials and interviews with the teacher. A qualitative analysis applying first and second cycle coding led to four main findings. First, students report that the development of knowledge and skills has been important to them, both in terms of design thinking and commercialization of technology. Second, learning has gone beyond subject-specific knowledge and has led to the development of tangential skills of a more generic kind. Third, students' reflections indicate that the course constituted a major challenge for them, but also an opportunity for personal development. In fact, they found that the challenging aspect of the course was of value in itself, as it forced them to move beyond superficial learning and engage in deep and transformational learning. Finally, in terms of the career aspect, the course made students reflect upon how they could make use of the new insights in everyday life, in their present careers, and in their vision of their future careers. Hence, the study provides promising results for design thinking as an EE pedagogy, as it not only provides an opportunity for acquiring skills and knowledge, but also offers a platform for personal development and career reflections.

4.5 Main findings of the thesis

Table 7 summarizes the main findings of the papers in the thesis with regards to the overarching research question and the sub-research questions. While the sub-research questions and independent papers produce findings beyond the pure career reflection aspect, there are at the same time parts of all the papers that contribute to answering the main research question on EE impact on students' career reflections.

Table 7: Overview of the main findings of the papers

Paper	Purpose of the study	Main findings	Relation to the overall research question
Paper 1	To explore the application and extent of experimental research design in EE impact research and to summarize the findings of quantitative impact studies with a strong experimental design.	<ul style="list-style-type: none"> • The number of quantitative EE impact studies is growing exponentially. • Only 11.7% of the 145 quantitative studies have a strong experimental design; i.e., a true experimental design or quasi-experimental design. • The exponential growth in quantitative impact studies is primarily within studies with a weak experimental design. • Synthesis of the findings in strong experimental studies shows that they are inconclusive. The majority have a positive impact, but there are also studies with non-significant and negative impacts. 	<ul style="list-style-type: none"> • Quantitative studies on EE career impact should favor strong experimental design. • Studies take a rather narrow approach to studying career impact and primarily focus on entrepreneurial intention and actual entrepreneurial behavior through nascency and new venture creation. • The broader topic of EE's potential as a domain for career exploration and development appears to be an overlooked subject in quantitative EE impact research.
Paper 2	To study the intention constructs of entrepreneurship, intrapreneurship and international mobility and explore the antecedents and interrelationships between these.	<ul style="list-style-type: none"> • Students in the Møre and Romsdal region had quite positive attitudes towards entrepreneurship, intrapreneurship and international mobility. • Entrepreneurship was perceived as an attractive career choice by many, but more so in a team rather than as a sole entrepreneur. • There was a positive relationship between intentions towards entrepreneurship, intrapreneurship and international mobility, indicating common underlying variables. • The results concerning EE impact on entrepreneurial intention were conflicting; EE in higher education had a positive impact, while EE in secondary schools had a negative impact. 	<ul style="list-style-type: none"> • The impact of EE is conflicting in this study, highlighting the challenge of studying educational impact through cross-sectional design. • For this particular sample, EE had a positive impact on students' entrepreneurial intentions for those who had participated in EE in higher education. • EE in secondary schools, on the other hand, had a negative impact on students' entrepreneurial intentions.

<p>Paper 3</p>	<p>To analyse how EE in the form of a business planning course has an impact on students' career choice intentions and career preferences.</p>	<ul style="list-style-type: none"> • Participation in the business planning course reduced entrepreneurial intention. • There was no significant impact on intrapreneurial intentions. • The conjoint analysis captured career reflections that were not visible in the traditional survey scales. • The conjoint analysis showed a significant decrease in the ranking of being sole entrepreneur in a venture. The ranking for being in an entrepreneur team also decreased, but was not significant. There was a significant increase in the ranking of intrapreneurship and employment without intrapreneurial tasks. • The significant changes in the rankings were not seen among students in the control group, indicating that EE is an arena for career reflection which makes students reconsider their career preferences. 	<ul style="list-style-type: none"> • EE does not necessarily have a positive impact on entrepreneurial intentions. On this particular course, it had a negative impact on entrepreneurial intentions. • EE has an impact on the way students reflect upon themselves and their future careers. It can serve as a career exploration intervention that advances career development through reflection.
<p>Paper 4</p>	<p>To explore the learning process of design thinking in an EE course that combines entrepreneurship and technology.</p>	<ul style="list-style-type: none"> • Four main findings emerged through the analysis of students' written reflections on the learning process: <ol style="list-style-type: none"> 1) The students reported to have developed knowledge both of design thinking as a method, as well as commercialization of technology. 2) The learning went beyond subject-specific knowledge and revealed the development of tangential learning skills. 3) The challenge was a major learning opportunity that served as an opportunity for transformational learning and personal development. 4) The course gave students an opportunity to reflect upon application in everyday life, as well as an opportunity to reflect upon their present and future careers. 	<ul style="list-style-type: none"> • The format of the EE course provided students with both subject-specific knowledge and tangential skills that are important for their future careers. • The challenge aspect of the course and the opportunities for reflection appear to have activated reflections on how new insights could be applied in their present and future careers, but also expand their vision of their future careers.

5. DISCUSSION

This chapter discusses the main findings shown in Table 7 in relation to the overarching research question of the thesis, the conceptual model shown in Figure 3 on page 35, and in relation to ongoing discussions in the research field. The conceptual model in Figure 3 depicts how the thesis addresses the overarching research question by examining quantitative impact studies in EE (SQ1), career choice intentions and preferences (SQ2 & SQ3), and students' future work selves (SQ4). Therefore, in the following section the measurement of EE impact in quantitative impact studies is first discussed. Second, the findings on the impact of EE on students' career choice intentions and preferences are addressed. Third, the impact of EE on students' future work selves is considered. Finally, reflections on EE as a career exploration intervention tie the discussion back to the conceptual model and the overall research question. The section concludes by addressing implications for theory, practice and policy, the limitations of the thesis, as well as directions for future research.

5.1 Measuring impact in entrepreneurship education research

The starting point for the PhD project, as well as for the first paper, was to achieve a better understanding of how EE impact should be studied quantitatively in order to avoid reduced internal validity. Prior EE impact research has received considerable criticism due to the lack of methodological rigour (Bae et al., 2014; Fayolle et al., 2016; Lorz et al., 2013; Martin et al., 2013). Revisiting seminal contributions to intervention studies in social science by Cook and Campbell (1979) and Campbell and Stanley (1963), as well as recommendations in educational research (Johnson & Christensen, 2014), the advice on educational impact research is clear: interventions, either pedagogical or otherwise, should be studied through experimental design that employs control groups and pre-test post-test design. If randomization is applicable, true experimental design should be the choice. If not, quasi-experimental design is the next best option. The SLR in paper 1, however, shows that only 17 out of 145 quantitative impact studies apply such methodologies and can be characterized as strong experimental studies. In other words, 88.3% of impact studies apply pre-experimental design, which is less appropriate if their objective is to make inferences about the effects of an intervention.

While the status of strong experimental design is weak in terms of providing evidence-based accumulated knowledge on EE impact, it is however understandable. It can be challenging to organize pre-tests before a course starts since students might not be on campus. In addition, dropout between pre-test and post-test for both treatment and control groups can result in small samples. This is a particular challenge in EE courses, where classes tend to be small from the outset. Moreover, impact

studies are often conducted by lecturers teaching the course, with the associated limitations in terms of objectivity and access to control groups outside the course. Therefore, the practical challenges of EE impact research are understandable. Nonetheless, it has severe implications for what we can claim to know about EE impact. As the SLR in paper 1 shows, narratives about the accumulated knowledge on EE impact cannot be supported by evidence-based studies. This is a critical challenge for an area in search of legitimacy, as a research field, in education institutions, and among governments and policymakers (Fayolle, 2013; Fayolle et al., 2016; Kuratko, 2005; Nabi et al., 2017). If EE is to continue its growth, it is vital to provide robust empirical evidence to its stakeholders.

A second issue in terms of measurement is the outcome measures that are focused upon. It has been argued that these are often subjective and short-term (Nabi et al., 2017; Rideout & Gray, 2013; Mwasalwiba, 2010), and the findings of the SLR paper support this claim. Long-term impact outcome measures, affective outcome measures, nascent behavior and venture start-up deserve more attention in EE impact research, as does the career perspective adapted in the thesis. As the SLR reveals, the career focus in quantitative impact studies has been rather narrow. It can also be questioned whether the right things are being measured. For instance, entrepreneurial intention and the theory of planned behavior have been immensely important in the development of EE impact research, but the availability of validated scales and a well-founded theoretical model can distort the preference of other outcome measures and perspectives. In qualitative research, there has been a much wider register of studied outcome measures, and more dynamic synergies between qualitative and quantitative research streams, which could provide fruitful input to both research streams.

5.2 EE impact on students' career choice intentions and preferences

Career choice as defined by Katz (1992), i.e. the decision on whether to become self-employed or employed in a company, has received considerable attention in the quantitative EE impact literature. In fact, 10 out of the 17 studies in paper 1 address entrepreneurial intention as an outcome measure. The results are quite conflicting; five studies report a positive impact (Gielnik et al., 2015; Rauch & Hulsink, 2015; Sánchez, 2011, 2013; Souitaris et al., 2007), two found no significant difference after EE (Nabi et al., 2018; Volery et al., 2013); one found both non-significant and negative impacts depending on the pedagogics (Varamäki et al., 2015), and two found a negative impact (Huber et al., 2014; Oosterbeek et al., 2010). Equivocal findings are also an issue in the quantitative impact studies in this thesis. Paper 2 shows a negative impact of EE in secondary schools and a positive impact of EE in higher education, although the findings need to be interpreted with caution. A significant correlation can

accordingly be observed, but due to the cross-sectional design it is not possible to draw any conclusions about causality from the study. For example, it could be that EE in secondary education has been mandatory and those who took part in it already had a relatively low entrepreneurial intention level (which could have been reinforced if EE was mandatory and perceived as forced). At the same time, the positive relationship between EE in higher education and entrepreneurial intention could be attributed to self-selection; i.e., that those already motivated self-select into courses in greater numbers. As described by Lorz et al. (2013), it is important to acknowledge that selection bias is a major issue in EE studies. Hence, the empirical findings are clear in paper 2, but interpretation is challenging when the research design only represents a snapshot of the situation.

A limitation of this type of cross-sectional study is that although a significant effect is observed, there is no explanation of the mechanisms surrounding it. Paper 3 aimed to overcome this challenge by applying conjoint analysis, which gave access to students' underlying decision structures when considering entrepreneurship as a career option. Therefore, the study did not just look at changes in intentions, but enabled investigation of students' relative preferences for different career choices. Accordingly, the conjoint analysis in paper 3 shows that the decrease in preference for entrepreneurship led to an increase in preferences for intrapreneurship and employment without intrapreneurship. Consequently, while some students reconsidered and dismissed both entrepreneurship and intrapreneurship as a career choice, there were also students who did not want to start a company, but preferred entrepreneurial behavior in an existing company through intrapreneurship. Additionally, it must also be emphasized that many kept entrepreneurship as their main preference. This is in line with Porfeli et al.'s (2011, 2013) definition of the career development process as consisting of sub-processes; i.e., career exploration, career commitment and career reconsideration. Students were able to explore entrepreneurship as a career, and consequently some remained committed, while others reconsidered. Perspectives similar to the career development perspective have been highlighted in previous studies. For instance, Nabi et al. (2018) argued that EE can be seen as a developmental process in which students are enlightened and become more realistic about their future career choices. Likewise, Von Graevenitz et al. (2010) and Fretschner and Lampe (2018) emphasize that EE does not necessarily have uniform course-induced changes, but could have important sorting and alignment effects which can be socially positive even if entrepreneurial intentions decline after an EE course. Hence, students may become more certain and realistic about entrepreneurship as a career choice, although the level of entrepreneurial intentions decreases. The findings by Nabi et al. (2018), Von Graevenitz et al. (2010), Fretschner and Lampe (2018), and the third paper in this thesis, thereby support the idea of EE as an exploration activity through which students

have the opportunity to test entrepreneurship and make more informed decisions on their future careers.

There is also a need for reflection upon the predominance of entrepreneurial intention in quantitative impact studies. Increasing students' entrepreneurial intentions is only part of the objective of EE. As discussed above, from the career development perspective outlined by Porfeli & Lee (2013), some will remain committed to their career intentions during an EE course, while others will reconsider. Students are therefore making a more informed choice due to their exploration of EE. Therefore, entrepreneurial intention has perhaps been uncritically adopted into EE impact studies. Entrepreneurial intention has made an important contribution to entrepreneurship literature and has been valuable in advancing understanding of entrepreneurial career choice (Kautonen et al., 2015; Krueger, 2017; Krueger et al., 2000; Liñán & Fayolle, 2015). Nevertheless, its application in EE research needs to be carefully considered. The established theoretical framework and the availability of validated scales (Liñán & Chen, 2009; Thompson, 2009) make entrepreneurial intention a frequently applied measure. However, it is the relative importance of EE outcomes that must guide the selection of measures, and not the availability of validated scales. Consequently, the excess application of established scales might pose the risk of taking a too narrow view of EE impact and thereby overlooking other important outcome measures.

5.3 EE impact on students' future work selves

In light of the discussion above, it appears that EE offers a platform for students to reflect upon their future careers and their vision of their future work selves, as described by Strauss (2010) and Strauss et al. (2012). The findings of paper 3 point in this direction, as education *for* entrepreneurship course causes a displacement from entrepreneurship to intrapreneurship and employment without intrapreneurship. The students' experience of entrepreneurship on the business planning course made them reflect upon entrepreneurship as a career and integrate this into the development of their future work selves. This was also seen in the qualitative study in paper 4 of the education *through* entrepreneurship course. Even though the study was exploratory and the notion of 'career' was not mentioned explicitly when collecting the data, this is one of the aspects that students underline as an important part of the design thinking learning process. Through transformational learning, as described by Mezirow (1991), they have changed how they view themselves, their competences, and how they view the world. This was also seen when reflecting upon their careers and their future work

selves, as several emphasized the new opportunities of what they could work with in the future and how they could apply what they had learnt in future work.

As previously discussed, quantitative research on EE impact has only taken such career aspects into account to a small extent. The potential of EE as a space for identity work has, however, been a topic in some qualitative papers (Donnellon et al., 2014; Harmeling, 2011; Hytti & Heinonen, 2013). Entrepreneurial identity construction implies a multiple identity perspective, of which career identity is one identity aspect (Nielsen & Gartner, 2017). Donnellon et al. (2014) argue that the construction of entrepreneurial identity in EE is just as critical as the development of skills and knowledge. In their view, it is essential to internalize EE learning through identity construction. EE, especially in its more action-oriented and experiential forms, offers an identity workspace in which one can experiment with different identities (Harmeling, 2011). Hence, the challenge aspect of the design thinking EE course appeared to be an important trigger for reflections on careers. This challenge was highlighted by several students as the feature of the course that pushed them to their limits and brought about transformational learning. The findings in paper 3 can also be said to be in line with Hytti and Heinonen (2013), who emphasize the importance of facilitating identity work with broad examples of what entrepreneurship might be in terms of intrapreneurship and social entrepreneurship.

A salient future work self is a key career competence in the 21st century (Strauss et al., 2012), and EE, at least the two EE courses studied in the thesis, appears to be one way to stimulate this development. Understanding more about such development and how to best support it is accordingly an important direction for future studies on EE and career development.

5.4 EE as a career exploration intervention

The overarching research objective of the thesis was to explore how participation in EE impacts students' career reflections. The papers in the thesis indicate that such reflections can indeed be affected by EE, and that this takes place through changed career choice intentions, changed career choice preferences and changed visions of future work selves. EE thereby becomes a potential career exploration intervention, as argued by Porfeli and Lee (2013), by which students can develop career-related identities through reflections upon new experiences and insights. The cumulative hierarchical model of EE categories in chapter 2 identifies learning *for* and *through* entrepreneurship as holding the upper two places in the hierarchy. Hence, pedagogies within these categories involve more active approaches to EE than the lower placed learning *about* entrepreneurship. Nevertheless, EE is not a black box and it is important to recognize that EE courses within the same category can be quite

different (Brentnall et al., 2018). Therefore, the empirical studies of the thesis find that in the specific context of studies, EE functions as a career exploration activity and a space for exploring careers and career identities. Further research on EE as a career exploration intervention will show if this is generalizable to other EE settings. Perhaps are there courses, for instance ones applying the learning *about* entrepreneurship category, that do not engage students across cognitive domains in the same manner (Bloom, 1956). Accordingly, the potential of EE as a career exploration intervention might be different for such EE courses. Previous research on entrepreneurial identity (Donnellon et al., 2014; Harmeling, 2011) supports the idea that more experiential approaches are appropriate for such identity work. Hence, it is reasonable to assume that, for instance, the challenge aspect in paper 4 has been important for triggering career reflection among students on the design thinking EE course.

Reflection emerges as a vital concept in this setting. In order to transform experience to knowledge, reflection is the key. This was described by Kolb (1984) in his work on the experiential learning cycle. EE is often quite action- and practice-driven, but it is equally important to allow space for reflection on experiences in order to achieve an abstract conceptualization that informs future actions (Hägg & Kurczewska, 2016). Without reflection, EE faces the threat of imposing a cognitive overload on students, as described by Hägg (2017). If students are to use their experience in EE for exploration of their career development, it is essential to organize reflection activities in which students can reflect upon their experiences during EE courses. Career exploration can lead to both career commitment and career reconsideration (Porfeli et al., 2011). Especially in terms of career reconsideration, reflection has an important function. Career reconsideration can occur as a reorientation towards more suitable career alternatives, but might also lead to a confused state of self-doubt and career indecisiveness. Consequently, career reflection plays an important role in helping students go from indecisiveness to more exploration and new commitments.

The view of EE as an intervention that ‘produces’ entrepreneurship can accordingly be said to be somewhat narrow. Obviously, it is still an important aspect of EE, but the potential of EE goes beyond this in the 21st century workplace. In an uncertain and volatile world, where external circumstances are changing rapidly, focusing on one definite career choice is becoming less relevant (Arthur & Rousseau, 1996). Instead, reflecting upon different career choices and constructing various visions of possible future work selves can be beneficial in students’ career development. EE can provide an opportunity for this and serve as a career exploration intervention for students who take part in such courses.

5.5 Contributions and implications

The thesis began with a review of the development of EE as a practice and research field, concluding with the development of a conceptual model. This model was thereafter tested through four empirical studies and resulted in novel insights into EE career impact. The theoretical contribution of these insights, as well as their implications for practice and policy, are accordingly elaborated below.

5.5.1 Theoretical contributions

In order to make a theoretical contribution, scientific work needs to contribute to advancing the ‘what’, ‘how’, ‘why’ and ‘when’ of existing theories (Whetten, 1989), while at the same time fulfilling the criteria of originality (incremental or revelatory) and utility (scientific or practical), as outlined by Corley and Gioia (2011). This thesis advances knowledge of the ‘what’, ‘how’, ‘why’ and ‘when’ of EE impact by focusing on its potential as an arena for career reflection, thereby contributing in terms of incremental originality by introducing a novel theoretical lens through which to view EE impact. This has implications for both the scientific study of EE and for the practice of its teaching and learning.

More specifically, the thesis started by highlighting the *confusion* concerning quantitative impact studies on EE, as well as *neglected areas* within the research, as described by Sandberg and Alvesson (2011) in their categorization of research gaps. In terms of confusion, the SLR revealed that the quantitative impact studies within the field have failed to reach agreement and the SLR thereby makes a consolidatory contribution to EE literature. Findings have been mixed and inconclusive, and the SLR concluded by calling for more rigorous experimental design in the continued research on EE impact, the need for the use of new outcome measures to expand knowledge on such impact, and development of a theoretical foundation for EE impact in order to better understand the conflicting findings. In terms of neglected areas in EE literature, the thesis as a whole underlines that EE career impact is an under-researched area that has predominantly focused on entrepreneurial intention, nascency and venture creation. While several studies exist on the outcome measures discussed, impact studies that take a broader view are lacking. Moreover, career literature in general and career development specifically are identified as overlooked areas. Having established the current situation of EE career impact research in the SLR paper, the thesis set out to provide new empirical studies that add to the limited number of rigorous impact studies in EE, to examine new outcome measures that have previously been unaddressed, and finally to introduce career development as a novel lens through which to view EE career impact.

A combined perspective is consequently applied, meaning that alternative perspectives are included to overcome shortcomings of current theories and perspectives (Sandberg & Alvesson (2011). For instance, intrapreneurship has become an established concept in entrepreneurship research (Antoncic & Hisrich, 2003; Blanka, 2018). Although some studies use the construct in entrepreneurship research (Douglas & Fitzsimmons, 2013), it has been overlooked within quantitative EE research. Including intrapreneurial intentions in the discussion of EE impact on career choices leads to greater understanding of the conflicting findings on which several researchers have called for more research (Fayolle, 2013, 2018; Lorz et al., 2013; Nabi et al., 2017). The realization that a decline in entrepreneurial intentions after an EE course is not a necessarily a rejection of a career with entrepreneurial behavior is important. Further, the application of conjoint analysis provides an alternate view and expansion of Katz's (1984) definition of career choice. By including intrapreneurship and employment without intrapreneurship in a conjoint analysis, it becomes apparent that there is a trade-off effect that underlines the importance of understanding career choices as being relative to one another.

Following the call to provide explanations for the conflicting findings on EE impact, the conceptual framework of the thesis combines EE and career development literature, thereby challenging the assumption that the objective of EE is mainly to make students commit to becoming entrepreneurs, and problematizing the widespread application of entrepreneurial intentions, which appears to have been uncritically adopted from entrepreneurship research. The thesis proposes that the career development implications of EE are more extensive. Therefore, the career development perspective of Porfeli et al. (2013) is introduced, along with constructs such as career reflection (Akkermans et al., 2012; Kuijpers et al., 2006) and future work selves (Strauss et al., 2012). In this framework, reflection is of the essence. Therefore, the main proposition of the thesis is that EE functions as an arena for career reflection, in which students will explore entrepreneurship through EE and thereby understand more both about themselves and about entrepreneurship as a career choice. Subsequently, some might make entrepreneurship a career choice and be more committed and realistic about the choice than before, while others might reconsider and prefer entrepreneurship in an employment setting through intrapreneurship. This perspective is a novel one in EE literature, where career impact has commonly been defined simply as becoming an entrepreneur or not. The integration of career development theory further sets the scene for the inclusion of other relevant models and constructs from this established field of research. Looking at established literature is a familiar practice in both EE and entrepreneurship literature. In a fragmented and fast expanding field, it is challenging to develop one's own theories, but also unnecessary if it implies reinventing the wheel. In EE, the education field has provided valuable insight in terms of experiential learning Kolb (1984), constructive alignment

(Biggs, 1996) and cognitive load theory (Sweller, 1988). However, established frameworks from career development theory have been left mostly untouched, although EE impact on students' careers have been an important topic from the start of EE research. In entrepreneurship research, there have been contributions that combine the fields of entrepreneurship and career theory; for instance, entrepreneurship and career orientations (Marshall & Gigliotti, 2018), and entrepreneurship and social cognitive career theory (Liguori et al., 2019). Nevertheless, to date the same has not been done in EE research. The thesis is an initial attempt to do this and thereby makes a theoretical contribution to the understanding of EE career impact.

5.5.2 Implications for practice

The thesis has implications for teachers and higher education institutions which develop, implement and teach EE courses, as well as for the students who take part in them. The view of EE as a career exploration intervention is a new one, but an important perspective to integrate in practice. For teachers, this perspective has implications for how teaching is planned and conducted. Being a teacher on EE courses entails great responsibility, as many courses tend to push the students out of their comfort zone. This provides an opportunity for growth through overcoming challenges (Dweck, 2008) as described in paper 4, but also adds the risk of students ending up in the panic zone and thereby dropping out of courses having experienced failure and feeling that they were not able to master the context. Hence, it becomes essential for EE teachers to balance the challenge and support aspects of EE courses. While challenges should not be avoided by any means, it is essential to ensure that these become opportunities for growth. In this sense, reflection is key. Leaving time for reflection in class and between classes is important for the processing that is necessary to transform experience into knowledge, as described by Hägg (2017). Reflective activities should also include career reflection. As the thesis provides empirical evidence of the potential of EE as a space for career reflection, it is important to include reflective activities that promote identity work, as suggested by Donnellon et al. (2014), Harmeling (2011) and Hytti & Heinonen (2013), and that focus on the future application of experiences and learning for future careers. For educators, it is an important responsibility to introduce frames of reference that have a wide, rather than narrow perspective. Entrepreneurship should not be presented as only starting a company. Intrapreneurship and social entrepreneurship are also important arenas for entrepreneurial behavior and should be introduced to EE students (Hytti & Heinonen, 2013). Thereby, a broader frame of reference is provided for students to develop future work selves from that are accessible for a larger share of them. This also needs to be reflected in the

choice of role models and case descriptions to expand students' understanding of entrepreneurship as a career alternative. This can be particularly important for students who are led to career reconsideration after an EE course, in order to encourage further career exploration and new career commitments, instead of them remaining in a confused state of career indecisiveness. For students, it is important to make use of EE as an arena for individual career reflection and on the opportunities in the environment, regardless of whether they wish to become an entrepreneur or not.

For higher education institutions, the value of EE for career development is an important issue to consider. Career development beyond the acquisition of knowledge and skills has been suggested as an important task for such institutions to prepare students for the 21st century work market (Kuijpers & Meijers, 2012). This can, for example, take place through career counselling services on campus, career days, guest lectures, collaboration on projects with external partners that could be future employers, as well as practical training through internships. Seeing EE as an activity in which the same mechanisms are at play is a novel perspective and one that must be included when higher education institutions are planning career development activities. Moreover, when implementing EE courses and programs, education institutions should ensure that they include activities that support career reflection among EE students beyond encouragement to pursue entrepreneurship.

5.5.3 Implications for policy

There has been a substantial growth in EE courses and programs worldwide in the recent decade, and much of this growth can be attributed to strategies by governments and policymakers (Valerio et al., 2014). In the European Union, EE has been emphasized in the policy framework for education and training (EC, 2006) through the definition of entrepreneurship as one of eight key competences for lifelong learning (EC, 2006) and has become a priority in the EU's Europe 2020 strategy (EC, 2012). In Norway there have been two dedicated EE policies to ensure its implementation at all education levels (KD, 2004; 2009). In the Norwegian policies, there are two main objectives: 1) to learn business-specific competences for start-ups; and 2) to develop skills and attitudes through EE that can be in contexts beyond start-ups, for example in existing organizations, in volunteer work, in the cultural sector and through social entrepreneurship. However, there is no focus on whether the EE experience has implications for how students reflect about their careers. The policy's main focus is on the development of knowledge and skills, and on how to implement EE more widely at all study levels and in all study fields.

With the insight from this thesis, a recommendation for Norwegian policymakers would be to include the perspective of EE as a career exploration intervention. This perspective has been missing from previous policies, although career development is an important task for young people and adolescents to prepare for the work market of the 21st century and needs to be included in policies. Policymakers' toolbox to stimulate career development has mainly limited itself to career counselling. Having EE as an additional opportunity for enhancing students' career development should provide additional benefits of EE beyond the acquisition of knowledge and skills.

The findings on the marked methodological deficiencies in EE impact studies are also important for policymakers. The formulation of policies should be followed by evaluation of how the policies have been received, their impact and if there is room for improvement. In terms of following up the impact of EE initiatives quantitatively, the thesis provides evidence that indicates that this is not being measured appropriately. This is an important insight for policymakers in two ways. First, it is important to specify desired outcomes and targets that can serve as impact measures in policy, while also specifying rigorous impact criteria that need to be met in impact evaluations of policy. Second, the existing EE impact research that met the criteria of rigorous experimental design in the SLR paper did not comprise policy-initiated empirical studies. Conducting an impact study according to rigorous criteria is, however, a demanding task. Ideally, there should be large samples due to the requirements of both a treatment and a control group, and due to the occurrence of drop-out between pre-test and post-test. Moreover, it is beneficial to have samples from across regions and countries in order to enhance the generalizability of findings. Therefore, conducting rigorous impact studies is a demand on resources, both in terms of time and finances. Policymakers and governments consequently have an opportunity to support research initiatives through larger research projects in order to enhance the quality of the research conducted and thereby acquire evidence-based knowledge on whether EE initiatives are delivering what they aim to do.

5.6 Limitations and avenues for further research

While I believe that the thesis makes novel contributions to research on EE impact, it is also important to acknowledge its limitations. First, the EE courses examined in the empirical studies both take place in Norway, and data were collected from EE students and control groups in three Norwegian cities, i.e. Aalesund, Tromsø and Trondheim. According to Bae et al. (2014), culture acts as a mediator of EE impact, and a one-country study is accordingly not necessarily generalizable to other cultures. Moreover, Walter and Dohse (2012) and Walter and Block (2016) find that EE impact is contingent on

the level of entrepreneurial activity in a region. Thus, the empirical findings of the thesis must be interpreted with caution in terms of generalizing and transferring the findings to other contexts, and further research is necessary to examine whether they are consistent across regions, countries and cultures.

Second, a further contextual limitation is the EE courses and their characteristics. EE is multifaceted and differs in terms of target students, teachers, guest lecturers, objectives, pedagogics, subject-specific content, course materials, assessment methods, class size, and whether courses are mandatory or elective. Consequently, findings on one EE course cannot automatically be assumed to be valid for other such courses. Although I do believe that the findings of the empirical studies are important for EE impact literature in general, I also believe that it is also important to recognize that the differing characteristics of other EE courses might lead to different results. At the same time, this indicates the potential for further research. Replicating studies in other contexts or comparing two or more EE pedagogics in one study could be an important future direction. Further, one would expect that having to do a mandatory EE course would have a different impact than self-selecting onto a course; comparing this empirically could provide valuable insight. The small number of rigorous experimental studies in the SLR papers suggest that there is a need for more studies on a variety of EE pedagogics to advance the knowledge of EE impact. In addition, the mechanisms of EE impact are complex and difficult to isolate in quantitative studies. It is therefore important to put some of the existing high-quality qualitative research in EE literature to use when explaining quantitative findings. Moreover, the conflicting and inconclusive findings in quantitative EE impact research should provide fruitful avenues for in-depth qualitative studies to explain the mixed results.

Third, conducting research is about making choices. In the thesis, I chose to focus on EE career impact, since this is something that intrigues me greatly. However, making a choice to pursue one outcome also necessitates the dismissal of others. As the SLR paper shows, there are many different outcomes to study and several of these would have been interesting to study in the EE courses included in this thesis. Hence, the concentration on EE career impact is not an indication of other outcome measures being less important. Referring to the SLR paper again, it is apparent that there is a need for a larger pool of EE impact studies, as called for by, for example, Rideout & Gray (2013). In order to understand the complexity of EE impact, it is necessary to study EE courses with different characteristics, along with different kinds of outcome measures. If studied in a rigorous manner, it is a task for future SLRs and meta-analyses to sum up knowledge and give better insight into the impact of varying categories of EE courses on the different outcomes. Therefore, in light of the finding in the SLR paper, there is a substantial need for more EE impact studies which apply rigorous methodology in order to advance knowledge on EE impact.

Fourth, focusing on particular outcomes implies involvement with specific parts of the EE literature. For this thesis, the focus on career impact meant that the literature on entrepreneurship as career choice needed to be explored. A limitation of the thesis is the level of immersion in the theoretical frameworks of the theory of planned behavior. One reason for not doing so is that this has been adequately covered in previous studies (e.g. Fayolle et al., 2006; Rauch & Hulsink, 2015). Another more practical issue was the length of the survey. Due to the 20 minute-long survey, it was important to limit the number of constructs in order to avoid respondent fatigue. However, it is important to acknowledge that there may have been information lost due to not including antecedents of entrepreneurial intention according to the theory of planned behavior. The investigation of these in combination with a conjoint analysis on career choice in future research could provide findings that explain the antecedents through which the changes and career preferences are induced.

Fifth, like the theoretical frameworks surrounding entrepreneurial intentions, those surrounding career development also had to be limited. This is a consequence of applying an eclectic theoretical framework, which instead of engaging in-depth with one theoretical framework aimed to combine different ones. I believe this is both a limitation and a strength of the thesis. It is a strength due to its novelty, but at the same time it brings about the risk of leaving important theoretical models and constructs out. As this is a first attempt to unite EE impact research and career development theory, there is still much to be explored in this regard. In entrepreneurship literature, there has been research on career orientation theory (Marshall & Gigliotti, 2018) and social cognitive career theory (Liguori et al., 2019). Both could be fruitful avenues for further research in EE impact studies. Moreover, an important empirical field within career development theory is career construction theory, which has been developed by Savickas and colleagues (Savickas, 2005; Savickas et al., 2009). Career construction theory recognizes that careers are not necessarily about making a definite choice, but are constructed through adaption to the environment and by attributing meaning to occupational experiences. Career construction narratives and life stories are a well-developed research field and could provide opportunities for qualitative inquiry into EE impact research. Further, recognized constructs such as career adaptability (Savickas & Porfeli, 2012) and career decision self-efficacy (Betz et al., 1996) are established and validated measures, which could be directions for achieving new insight into EE career impact.

In conclusion, I recognize that the thesis has its limitations through the context of the studies, the methodologies applied and through the decisions that have been made regarding the theoretical framework. Nevertheless, I believe that it serves as a first step towards closer integration of EE and career development theory, and that it thereby contributes novel insight to a research field that is in need of stronger theoretical foundations.

6. CONCLUSION

The thesis set out to explore whether EE has an impact on students' career reflections. The empirical findings of the papers suggest that the EE courses examined did so. Although EE does not necessarily convince students of careers as entrepreneurs of new companies, EE has a function as a career exploration intervention through which students have the chance to reflect upon themselves and their future careers. As described in career development theory, career exploration becomes an space for reflection upon career choices and preferences, as well as future work selves. Students can thereby continue to either commit to or reconsider entrepreneurship as a career choice. Consequently, EE does not necessarily 'produce' entrepreneurs. In fact, the findings of the thesis are in line with several previous empirical studies, which show that entrepreneurial intention in fact decreases. From a career development perspective, this is however not surprising if EE is seen as an arena for career reflection. Students might decide to commit to entrepreneurship after an EE course, or they might choose to reconsider, but as a result of the career reflection they will be able to make more informed decisions about their future careers and have a clearer view of the opportunities that exist. This demonstrates the importance of viewing EE through a career development lens and suggests a rewarding direction for further research. The thesis should accordingly be viewed as a contribution to expanding the field of EE impact research by emphasizing the comprehensiveness of EE career impact and the potential of career development theory.

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PART 2
PUBLICATIONS

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Measuring impact through experimental design in entrepreneurship education: a literature review
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Measuring impact through experimental design in entrepreneurship education: A literature review and research agenda

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Abstract

True experimental design and quasi-experimental design are considered to be rigorous research designs appropriate for assessing the impact of pedagogical interventions. This study explores the extent and application of experimental design in impact research on entrepreneurship education (EE) based on a systematic literature review. The findings reveal a substantial lack of methodologically rigorous studies on EE impact, which has severe implications for the accumulated knowledge on the subject. Furthermore, the article summarizes the findings from the body of experimental impact studies with a strong research design and concludes by indicating fruitful avenues for future research.

Keywords

Education impact, entrepreneurial learning outcomes, entrepreneurship education, experimental design, systematic literature review

Entrepreneurship is recognized as an important driver of economic growth (Audretsch et al., 2006). There has, consequently, been an increasing propensity in government policy to promote entrepreneurship education (EE) as a means of stimulating economic growth (Martinez et al., 2010; O'Connor, 2013). The introduction and development of EE courses demand substantial investments, in terms of both time and money, from faculty, educational institutions, sponsors, policymakers and other stakeholders. It is accordingly important to understand the impact that EE can have on students: for example, whether they develop an entrepreneurial mindset through such courses or whether EE actually contributes to increased start-up rates after graduation.

There has been substantial growth in impact research on EE as stakeholders seek to understand its consequences for students and society as a whole (Bae et al., 2014; Blenker et al., 2014; Martin et al., 2013; Nabi et al., 2016a). However, empirical research has produced rather mixed results on the impact of EE using various measures of entrepreneurial outcome (Bae et al., 2014; Lorz et al., 2013; Martin et al., 2013). While some scholars have found a positive impact on, for instance, entrepreneurial attitudes and

intentions (Fayolle et al., 2006; Kolvereid and Moen, 1997; Wilson et al., 2007) and entrepreneurial behaviour (Elert et al., 2015; Kolvereid and Moen, 1997; Lange et al., 2011), others have obtained mixed results (Oosterbeek et al., 2010; Souitaris et al., 2007). Some have even found indications of a negative impact on entrepreneurial orientation (Mentoor and Friedrich, 2007) and entrepreneurial intention (Oosterbeek et al., 2010; Von Graevenitz et al., 2010). Therefore, how EE affects students, and via which mechanisms, remains unexplained.

The growing body of impact studies on EE has, therefore, received considerable criticism. A major concern has been the lack of empirical studies that are methodologically robust (Bae et al., 2014; Fayolle and Linan, 2014; Martin et al., 2013), a weakness that has also been highlighted in research on management education in general (Köhler

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et al., 2017; Rynes and Brown, 2011). Köhler et al. (2017) argue that, to gain legitimacy for a field and publish impactful research, impact studies need to be designed in a way that provides strong evidence for such effects. Rigorous experimental design is, according to Slavin (2002: 18), ‘the design of choice for studies that seek to make causal conclusions, and particularly evaluation of education innovations’ and ought to be the preferred choice when addressing educational impact (Johnson and Christensen, 2012). In this study, we define rigorous or strong experimental design as true experiments or quasi-experiments that make use of a longitudinal design (as opposed to a cross-sectional design) and have control groups for comparison (Cook and Campbell, 1979; Shadish et al., 2002). Accordingly, these would be suitable research designs for studying the impact of EE as a pedagogical intervention. The degree to which strong experimental design is actually applied in EE impact research is, however, not known, although EE impact research has been criticized for reporting impact without the necessary level of methodological rigour. This can have severe implications for the accumulated knowledge about impact in EE research, on which educators and policymakers have to base their actions. Thus, it is critical to establish a strong experimental design for EE impact research when providing stakeholders with empirical evidence about the relationship between EE and entrepreneurial learning outcomes.

Based on the above, we believe that the use of experimental research design in EE impact research requires further investigation. The twin objectives of this systematic literature review (SLR) are, therefore, (1) to explore the diffusion of experimental impact studies in EE research and the extent to which those studies have a strong experimental research design (i.e. apply a true experimental design (TED) or a quasi-experimental design (QED)) and (2) to synthesize the findings on entrepreneurial outcome measures in studies with a strong experimental research design.

To address these objectives, we use an SLR approach to explore published research reported in 65 journals listed by the Association of Business Schools (ABS). By applying established categories of experimental research design, we are able to classify quantitative EE impact studies according to the robustness of their research design and to provide an overview of the status quo in EE impact research. While our review highlights examples in which experimental research design has been applied successfully, it also sheds light on the scarcity of strong experimental design in EE impact studies and the threat this poses for the reliability of previous empirical findings. Furthermore, we provide a synthesis of empirical studies with strong experimental research design in order to establish the cumulative knowledge in EE that can be traced back to methodologically robust quantitative studies. Our study contributes to EE scholarship from both methodological and theoretical

perspectives by furthering our understanding of the use of experimental research design in EE impact studies. We propose key avenues for further research that hold the potential to strengthen and build legitimacy for the field of EE research, and the findings from the study should be of value to scholars applying experimental design in their empirical work, as well as practitioners and policymakers who are seeking to better understand the impact of EE as a pedagogical intervention.

The content of the rest of the article is as follows. The next section addresses the use of EE outcome measures and outlines findings in earlier reviews and meta-analyses of EE. Thereafter, the methodological approach is presented along with a recap of seminal contributions on experimental research design to draw up experiment classifications. Next, the descriptive and qualitative findings of the SLR are reported, and then the article concludes with a discussion of the findings, our conclusions and the implications of our work for future research on EE.

Research context: Measuring the impact of EE

Impact studies on EE aim to establish whether a pedagogical intervention has caused any change in specific outcome variables. The outcomes measured need to be carefully aligned with the intended learning outcomes for the EE course (Kamovich and Foss, 2017) and may address changes in students’ hearts, minds and behaviour (Souitaris et al., 2007). The importance of evaluating the outcomes of EE has been widely acknowledged (Mets et al., 2017), and different frameworks have been suggested for categorizing entrepreneurship learning outcomes. Fisher et al. (2008) developed a tripartite framework drawing on seminal contributions in the education literature (Bloom et al., 1956; Kraiger et al., 1993), which categorizes entrepreneurial learning outcomes as cognitive, skill-based or affective. Cognitive outcomes refer to knowledge, comprehension and critical thinking about entrepreneurship; skill-based outcomes are linked to the skills necessary to start a business; and affective outcomes comprise entrepreneurial attitudes, volition and behavioural preferences.

An alternative framework for teaching and learning entrepreneurship was suggested by Kyrö (2008). The framework consists of three constructs: cognition, affection and conation. Compared with the framework of Fisher et al. (2008), skill-based learning outcomes do not comprise a separate category, but rather are included in cognitive learning outcomes. Furthermore, affective learning outcomes are divided into affection and conation. While affection refers to emotions and perceptions, conation takes the mind one step closer to behaviour, as it describes how one acts on thoughts and feelings via impulse or directed effort (Ajzen, 1989).

Four EE outcomes drawn from the above sources are shown in Table 1, along with behavioural outcomes as a

Table 1. Categories of outcome measures in EE impact studies.

Outcome measure	Examples of constituents
Cognitive	Knowledge: comprehension about entrepreneurship; business basics Traits: need for achievement, proactiveness, self-esteem, risk propensity
Skill-based	Business modelling; opportunity recognition; creative thinking; teamwork
Affective	Passion/inspiration; attitude to entrepreneurship; subjective norm
Conative	Entrepreneurial intention; entrepreneurial self-efficacy
Behavioural	Nascency; venture creation; intrapreneurship; social entrepreneurship; employability

EE: entrepreneurship education.

fifth category. After all, developing cognitive, skill-based, affective and conative entrepreneurial outcomes should ultimately lead to entrepreneurial behaviour and socio-economic outcomes in real life; for example, through employability, business creation, intrapreneurship or social entrepreneurship (Kozlinska, 2016; Mets et al., 2017). Hence, it is essential to establish an understanding of the impact of EE in all five outcome categories of EE impact research.

There have been several previous attempts to summarize findings on EE impact through SLRs and meta-analyses. In 2007, Pittaway and Cope reviewed 184 papers published between 1970 and 2004 in an SLR and concluded that EE appeared to have an impact on student propensity and intentionality towards entrepreneurship. They emphasized that there was a lack of research on whether EE actually led to entrepreneurial behaviour and, more specifically, on the link between different forms of pedagogy and student entrepreneurial outcomes. Their findings are supported by Mwasalwiba (2010), who in his literature review also highlights the substantial focus on attitudes and intentions and the failure to link these to actions. He further calls for broader outcome definitions.

A positive impact on skills and knowledge, attitudes, intentions and nascent entrepreneurship is also acknowledged in SLRs by Rideout and Gray (2013) and Lorz et al. (2013). Both reviews draw attention to the methodological weaknesses and deficiencies found in most EE impact studies. This tendency is further confirmed in two meta-analyses on EE by Martin et al. (2013) and Bae et al. (2014). Using human capital as a theoretical lens in a meta-analysis of 42 studies, Martin et al. (2013) found a significant positive association between EE/training and entrepreneurial human capital as well as between EE/training and entrepreneurship outcomes. Closer examination of the findings did, however, reveal that studies without a

strong experimental design tended to overestimate the positive association. When studies with pre- and post-measurement and control groups were isolated, the effect size was substantially reduced.

Bae et al. (2014) report similar findings on how methodological rigour influences empirical findings on EE. Their meta-analysis of 73 studies found a small significant correlation between EE and entrepreneurial intention. However, after controlling for the intentions that students had before EE, the association was no longer significant. Hence, when controlling for self-selection bias by introducing pre-intervention measurement, the actual impact of EE becomes unclear. Bae et al. (2014) further established the role of cultural values as moderators in the relationship between EE and entrepreneurial intention.

A recent SLR by Nabi et al. (2016a) of 159 impact studies of EE in higher education also recognizes that there are substantial methodological weaknesses in those studies. However, their main critique concerns the outcome measures and the lack of detail on the pedagogical interventions. The authors argue that there is too much focus on short-term subjective impact measures as opposed to long-term behavioural measures such as venture creation and performance. They also lobby for novel impact indicators related to, for example, affective measures such as emotion and mindset. Furthermore, in line with Martin et al. (2013), they call for more research to explain the contradictory findings of impact studies, for instance, by including person-, context- and model-specific moderators.

Thus, despite the increasing body of impact studies on EE, it appears that we still have scant knowledge on this matter. While there are several insightful indications about impact and outcomes in existing empirical studies, there are also rather ambiguous findings that require further investigation. Hence, in the remainder of this article, we first set out to explore the application of experimental research design in EE impact research. Subsequently, empirical studies with a strong experimental design are examined to establish what can actually be considered reliable knowledge about the impact of EE as a pedagogical intervention.

An SLR approach

This study is based on an SLR approach, which aims to make the literature search and review process transparent and replicable. According to Pittaway and Cope (2007) and Nabi et al. (2016a), SLRs have become a well-established methodological approach in the fields of both entrepreneurship and EE and are especially valuable when attempting to sum up evidence over long periods. Figure 1 documents the different stages of our SLR process, for which the starting point was our research objectives: first, to identify experimental impact studies on EE and, subsequently, to review extant knowledge on EE impact produced by rigorous studies with a strong experimental design.

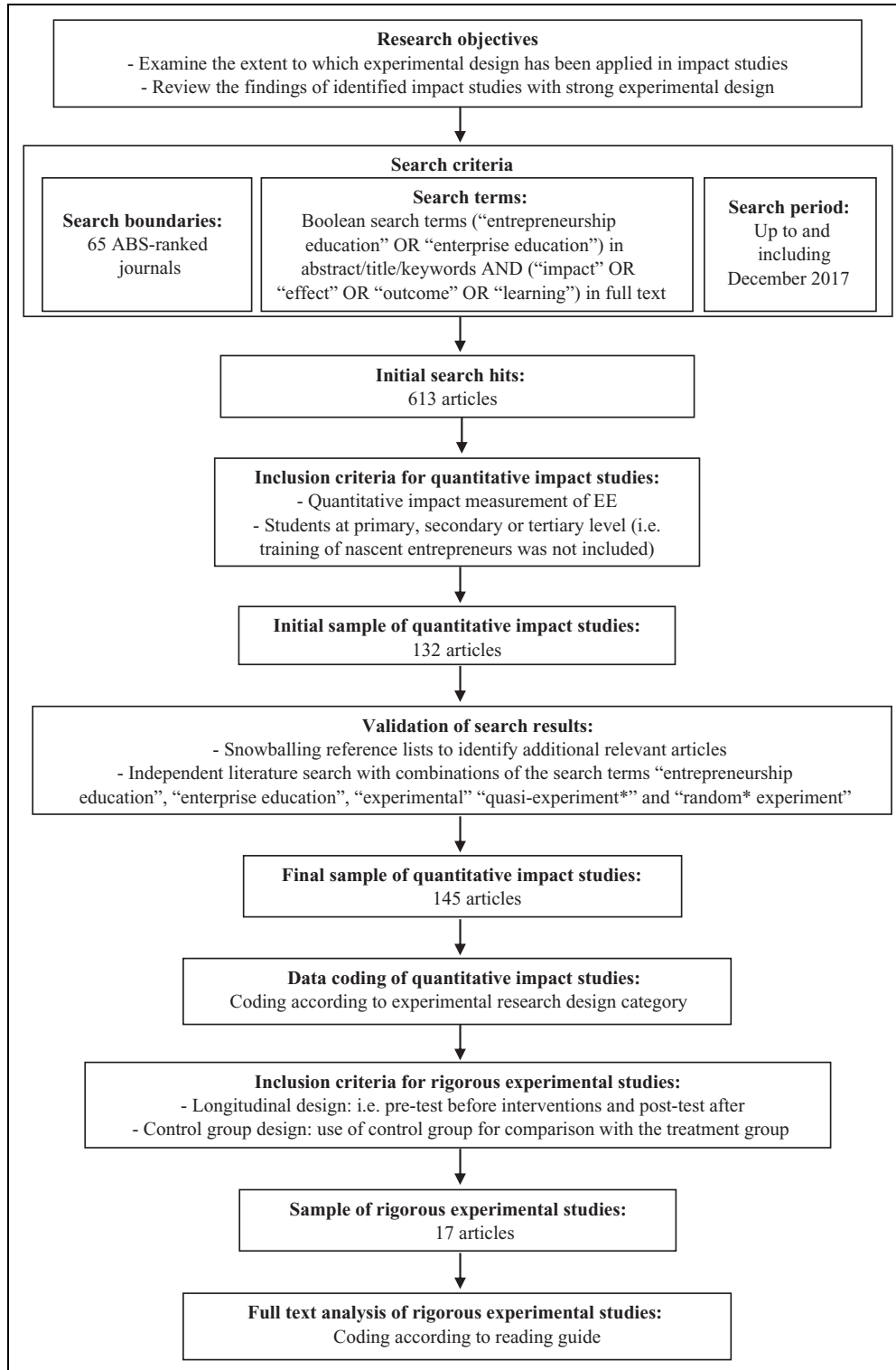


Figure 1. Stages in the SLR process.
SLR: systematic literature review.

Our SLR is based on a journal-led search in selected peer-reviewed journals. While admittedly this approach may have certain limitations in terms of potentially excluding relevant articles outside the selected journals, it was

necessary to ensure the feasibility of the SLR by generating hundreds rather than thousands of hits. It was also essential to target high-quality and impactful EE research; hence we followed Blenker et al. (2014) and Wang and Chugh (2014)

in applying the ABS Academic Journal Quality Guide to identify journals, as the Guide provides an indication of the quality and impact of the scientific contribution of articles included in the listed journals. As EE is a research field at the interface between entrepreneurship and business and management education, the literature search included all journals in the ABS subject areas ‘entrepreneurship’ and ‘management development and education’. The journal searches were conducted using the databases Science Direct, Elsevier Scopus, ABI Inform and Business Source Complete for articles published up to and including December 2017. Journals that were not accessible through the databases were searched manually. Titles, abstracts and keywords were searched using the primary Boolean search term (‘entrepreneurship education’ OR ‘enterprise education’), and the secondary search term (‘impact’ OR ‘effect’ OR ‘outcome’ OR ‘learning’) was used for a full-text search to identify quantitative impact studies on EE. The first database search, after the removal of duplicates, resulted in 613 articles.

Subsequently, we reviewed titles, abstracts and the methodology sections of the articles and excluded those that did not meet the inclusion criteria for quantitative impact studies described in Figure 1. This process left 132 articles. While SLRs have advantages over traditional ad hoc narrative reviews in that they provide a set of clear steps to systematically generate evidence (Tranfield et al., 2003), a potential drawback is the risk of excluding relevant articles. Hence, as an additional measure to validate the search results and ensure that relevant publications had not been overlooked, we conducted independent literature searches. We also applied snowballing to identify other relevant ABS journals by searching the reference list of the other identified articles. Through this process we expanded our search to include in addition the *European Economic Review* and the *Journal of Economic Behavior & Organization*, which are included in the subject area ‘economics, econometrics and statistics’ in the ABS list.

After validation of the SLR search results, the final sample consisted of 145 articles that met the inclusion criteria for quantitative impact studies. These were coded according to the experimental research design category as described in the following section, and a subgroup of 17 articles that could be classified as rigorous experimental studies with a strong research design were accordingly subjected to a full-text analysis.

Analysis

Drawing on Blenker et al. (2014) and Wang and Chugh (2014), among others, we constructed a thematic reading guide for reviewing and coding the articles (see Appendix 1). The 145 quantitative studies were coded according to general information (author(s), year, title and journal) and the type of experimental design. If a study was classified as

being either a true experiment or a quasi-experiment, it was further coded in accordance with the remainder of the reading guide by focusing on the outcome variables utilized and recording contextual variables stated in the studies, such as the characteristics of pedagogical intervention, sample characteristics and time frame.

The SLR applies three categories of experimental design following Cook and Campbell (1979) and Shadish et al. (2002): TED, QED and pre-experimental design (PED). Within these three categories, there are various types of experimental design. The ones that were used for coding impact studies in this SLR are depicted in Figure 2.

Experimental designs differ with respect to three characteristics: (1) whether the experiment makes use of control groups; (2) whether randomization into treatment and control groups is applied; and (3) whether the research design is longitudinal as opposed to cross-sectional. The upper half of Figure 2 illustrates the classic true experiment – the randomized pre-test–post-test control group design, in which all three of the above characteristics are present. Here, participants are randomly assigned to either a control group, C, or a treatment group, T, and thereafter are given a pretest O_{T1} or O_{C1} to ensure that the groups do not differ from the outset. Then group T undergoes treatment X (e.g. in the form of an EE course), while group C does not take part in the course. Afterwards, a post-test O_{T2} or O_{C2} is completed, and any difference between group T and C is assumed to be due to the treatment X. The lower half of Figure 2 exemplifies the design of the randomized pre-test–post-test control group design, together with other experimental designs relevant to EE impact research.¹

The reason for making use of control groups, randomization of participants and longitudinal design is to control for confounding variables that threaten internal validity. As the key objective of an impact study of education is to find evidence of a causal link between the education intervention and the observed outcomes, it is advisable to apply strong experimental research that controls for confounding variables and, thereby, to exclude alternative explanations and rival hypotheses for observed effects (Johnson and Christenson, 2012; Mertens, 2010). According to Johnson and Christenson (2012), TED and QED could consequently be considered strong experimental designs, while a PED is characterized as a weak experimental design. The presence of randomization, control groups and longitudinal design in TED controls for confounding variables such as *history* (when environmental events during an experiment influence the dependent variable), *maturity* (biological or psychological changes during an experiment due to the passage of time), *testing* (participants becoming test-wise post-test due to earlier pre-tests), *mortality* (participant drop-out during an experiment), *statistical regression* (when diverging scores of extreme groups regress towards the mean when testing is repeated) and *selection* (systematic differences between treatment and control groups due to

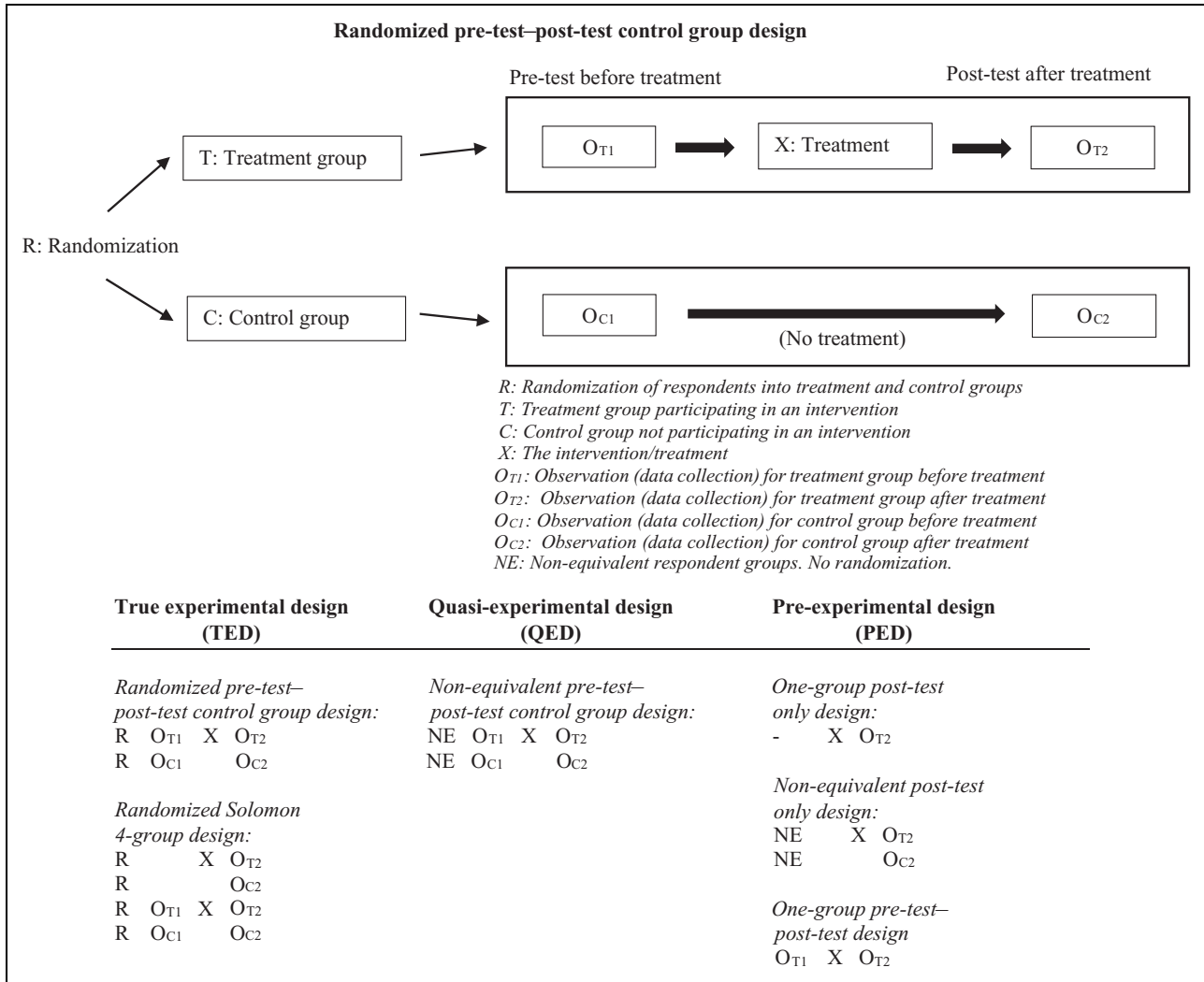


Figure 2. Types of experimental research design as described by Cook and Campbell (1979).

self-selection) (Campbell and Stanley, 1963; Cook and Campbell, 1979). The randomized pre-test–post-test control group design and the randomized Solomon four-group design² shown in Figure 2 are accordingly considered to be strong experimental designs as they apply randomization, control groups and longitudinal design (Shadish et al., 2002), and findings based on a TED would consequently provide strong evidence of causal links between EE courses and entrepreneurial learning outcomes.

In many educational real-life settings, random assignment is not a realistic option. Following Cook and Campbell (1979), the quasi-experiment would then be the recommended design. The non-equivalent pre-test–post-test control group design is the most relevant QED in EE impact studies, as it enables comparison of EE and non-EE students. In this case, students attending an EE course would constitute the treatment group. The control group would comprise students not attending an EE course, but otherwise would be as similar to the student treatment group as possible. Without

randomization, the internal validity of the design faces challenges in terms of selection, maturation, history and statistical regression (Shadish et al., 2002). Nonetheless, with the presence of both control groups and a longitudinal design, it can still be considered a strong experimental design with which it is reasonable to claim causality between an EE course and observed outcomes.

PEDs are considered to be weaker experimental research designs due to their limited control of potentially confounding variables (Johnson and Christenson, 2012; Shadish et al., 2002). The one-group post-test only design is considered to be the weakest among these alternatives. With this research design, students attending an EE course would take a post-test after finishing it. The design poses many threats to internal validity and has been referred to by Campbell and Stanley (1963: 5) as having ‘... such a total absence of control as to be of almost no scientific value’. The design is subject to threats of history, maturation and mortality as it does apply neither a control group nor a pre-

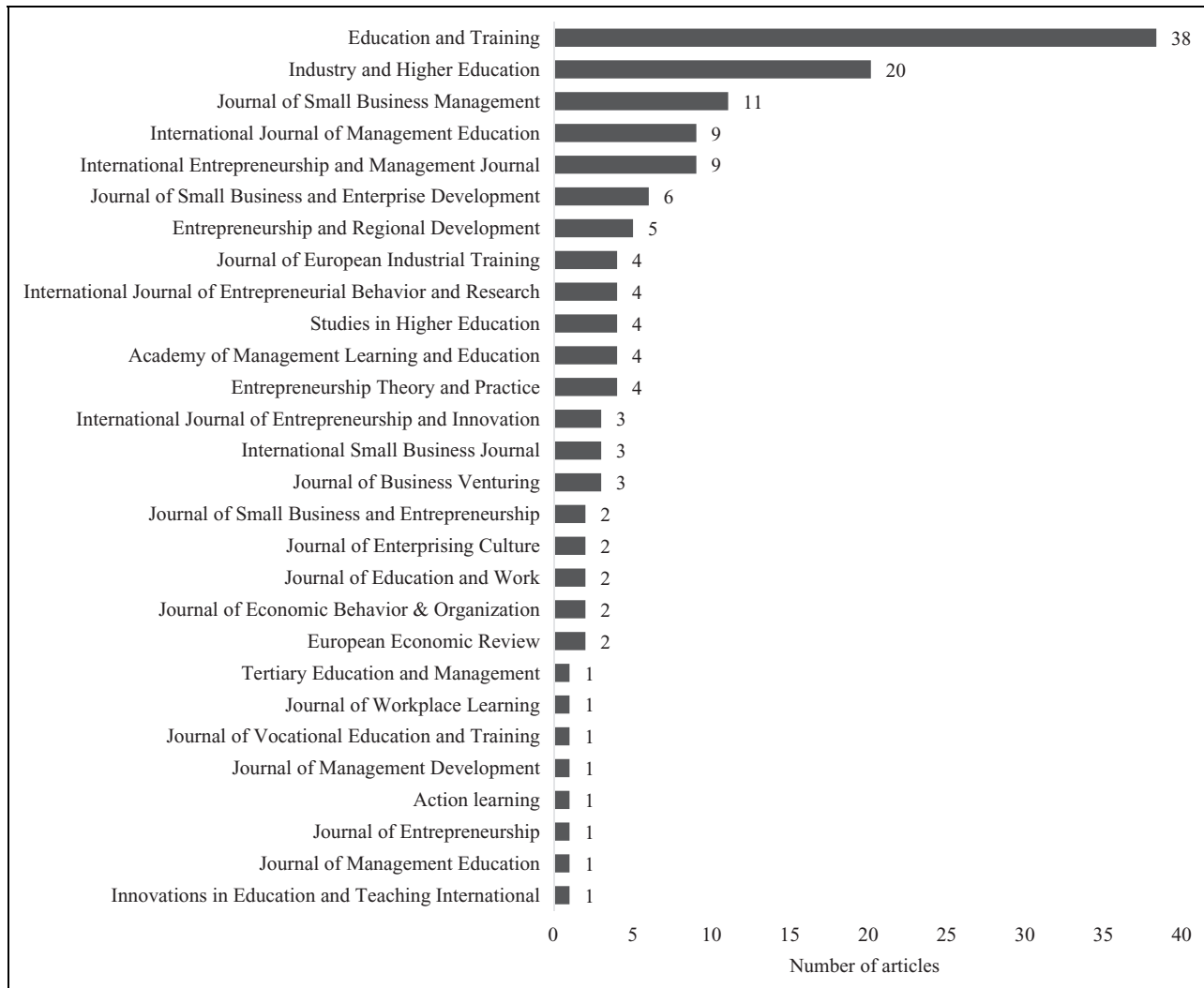


Figure 3. Overview of ABS-listed journals that have published EE impact studies ($n = 145$).
ABS: Association of Business Schools; EE: entrepreneurship education.

test. The non-equivalent post-test only design introduces comparison groups, and the one-group pre-test–post-test design makes use of measurements before and after EE interventions. However, both research designs still face basic problems due to threatened internal validity. Thus, relying on a PED when attempting to address the impact of EE courses can be problematic in terms of claiming causality. Therefore, a TED or a QED should be the preferred alternative in quantitative impact studies on EE, and the following section presents the degree to which these rigorous experimental designs are being applied in EE impact studies.

Findings

Descriptive analysis

As noted above, the systematic search in ABS-listed journals resulted in 145 identified quantitative impact studies on EE. Figure 3 shows the journals in which these were

published. The figure identifies two major outlets for quantitative impact studies on EE: *Education and Training*, which has published 38 articles, and *Industry and Higher Education*, with 20 published quantitative impact studies on EE.

The coding of the 145 quantitative impact studies revealed that only 17 articles were experimental studies with a strong design; that is, a TED or a QED. The remaining 128 quantitative impact studies were described as having a weak PED (see Figure 4). Among the studies, 28% had the weakest of the PEDs, the one-group post-test only design, while 28% had the non-equivalent post-test only design and 32% had a one-group pre-test–post-test design. Among the 17 experimental studies, four had a TED, while there were 13 quasi-experimental studies with a non-equivalent pre-test–post-test control group design. Hence, the analysis showed that only 11.7% of the quantitative impact studies met the standards for a strong experimental design.

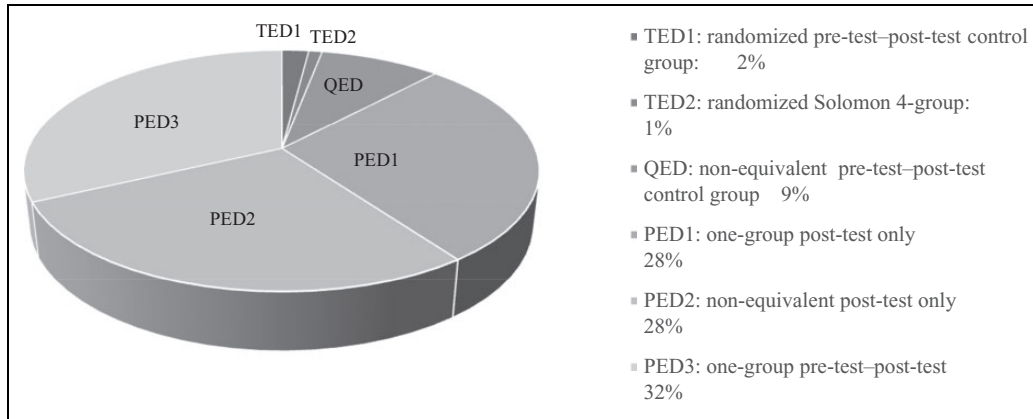


Figure 4. Types of experimental design in EE impact studies ($n = 145$). EE: entrepreneurship education.

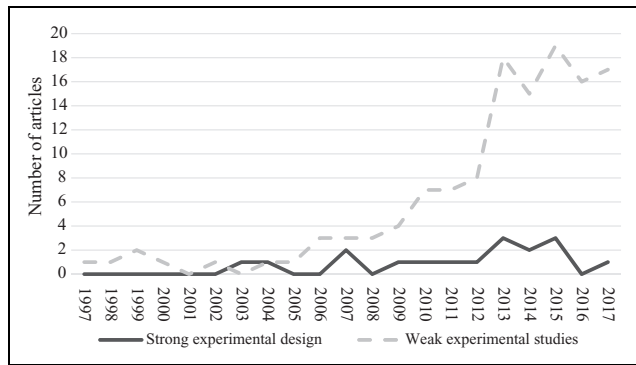


Figure 5. Twenty-one years of quantitative impact studies (1997–2017; $n = 145$).

Figure 5 illustrates the increased amount of quantitative impact studies in recent decades and depicts the rather limited application of experimental design in comparison. Especially in the last 10 years, there has been a considerable yearly increase in the amount of impact studies. There has, however, not been corresponding growth in impact studies with a strong experimental design.

The descriptive findings therefore point towards considerable challenges for impact research on EE. On a positive note, the amount of EE impact studies is increasing and there are high-quality journals in which this discussion is taking place. Nevertheless, the rigour of the research design is a substantial issue when building accumulated knowledge in the field. When only 11.7% of quantitative impact studies apply a strong experimental design, this has severe implications in terms of making inferences about EE impact.

Qualitative analysis

Entrepreneurial outcome measures. The findings from the analysis of the 17 identified studies applying a strong experimental design illustrate how conative outcomes in terms of entrepreneurial self-efficacy/feasibility and

entrepreneurial intention are the most frequently applied outcome measures (Table 2). Of the 17 studies, 12 use either one or both of these as outcome variables. Cognitive outcomes such as knowledge and traits (six studies), as well as skill-based outcomes (seven studies), have also received attention. In terms of affective outcomes, seven studies apply attitude to entrepreneurship as an outcome variable, while subjective norm and passion/inspiration have received less attention. In fact, only two studies (Souitaris et al., 2007; Varamäki et al., 2015) make use of subjective norm to measure EE effect, while only Nabi et al. (2016b) and Gielnik et al. (2017) have recently addressed impact on entrepreneurial inspiration and entrepreneurial passion, respectively. With regard to actual entrepreneurial behaviour, the impact on nascency has been examined in only three studies (Gielnik et al., 2015; Karlsson and Moberg, 2013; Rauch and Hulsink, 2015), while actual venture creation remains almost unaddressed, with two honourable exception (Gielnik et al., 2015; 2017).

Although the majority of the 17 studies report a positive impact on the various outcome measures, the findings are still mixed – see Table 3 for a summary.³ In terms of entrepreneurial knowledge, Volery et al. (2013), Gielnik et al. (2015) and Nabi et al. (2016b) find a positive impact of EE, while Huber et al. (2014) find no significant relationship. The findings are also mixed with regard to entrepreneurial traits. While Huber et al. (2014) report a positive impact on traits such as need for achievement, social orientation and proactivity, studies by Mentoor and Friedrich (2007), Oosterbeek et al. (2010) and Volery et al. (2013) all report non-significant impacts on traits such as the need for achievement, the need for autonomy, the need for power, endurance, risk propensity and innovation propensity.

The impact on skills is, however, mainly positive, and EE is reported to have a positive impact on opportunity identification and exploitation (DeTienne and Chandler, 2004; Thursby et al., 2009; Volery et al., 2013); proactiveness and risk-taking (Huber et al., 2014; Sanchez, 2011,

Table 2. Overview of the 17 rigorous experimental impact studies on entrepreneurship education.

Authors	Year	TED	Research design			Outcome measure								
			QED	Cognitive		Skill-based		Affective		Conative		Behavioural		
				Knowledge	Traits	Skills	Passion/ inspiration	Ent. attitude	Subjective norm	Ent. intention	Feasibility		Nascency	Venture creation
Gielnik et al.	2017	x							+			+		
Nabi et al.	2016		x		+				+			n.s.		
Gielnik et al.	2015	x			+							+		+
Rauch and Hulsink	2015		x							+		+		+
Varamäki, Joensuu, Tornikoski and Vijamaa	2015		x							n.s./-	n.s./-	n.s./-		n.s.
Huber, Sloof and van Praag	2014	x			n.s.	+			+					+
Sanchez	2013							+						+
Volery et al.	2013		x		+							+		+
Karlsson & Moberg	2013		x			n.s.		n.s./+				+		+
Athayde	2012		x							+		+		n.s.
Sanchez	2011		x					+				+		+
Osterbeek, van Praag and Ijsselstein	2010		x			n.s.		n.s./+						+
Thursby, Fuller and Thursby	2009		x					+						
Mentoor and Friedrich	2007		x											
Souitaris, Zarbinati and Al-Laham	2007		x			n.s./-				n.s.	+	+		n.s.
DeTienne and Chandler	2004			x				+						
Peterman and Kennedy	2003			x						+				+

(continued)

Table 2. (continued)

Authors	Country	Course duration	Time of post measurement	Final sample size	Course characteristics					Education level			Compulsory	
					About	For	Through	Primary	Secondary	Undergrad.	Postgrad.	Yes	No	Unknown
Gielnik et al.	Kenya	12 weeks	T2: right after T3: 12 months after T4: 28 months after	125 treatment 102 control		x			x					x
Nabi et al.	UK	12 months	T2: right after	89 treatment 61 control			x							x
Gielnik et al.	Uganda	12 weeks	T2: 1 month T3: 9 months after T2: 6 months	162 treatment 142 control			x							x
Rauch and Hulsink	Netherlands	1 year	T2: 6 months	62 treatment 18 control			x						x	
Varamäki, Joensuu, Tornikoski and Vijamaa	Finland	Several courses	T1: 1st year T2: 2nd year	66 treatment 131 control			x							x
Huber, Sloof and van Praag	Netherlands	2-4 weeks	T2: right after	1727 treatment 684 control			x							x
Sanchez	Spain	8 months	T2: right after	347 treatment 363 control				x						x
Volery et al.	Switzerland	6-12 months	T2: right after T3: 4-5 months after T2: right after	291 treatment 102 control			x							x
Karlisson and Moberg	Denmark	9 months	T2: right after	51 treatment 21 control			x							x
Athayde	London, UK	9 months	T2: right after	200 treatment 76 control			x							x
Sanchez	Spain	8 months	T2: right after	404 treatment 460 control				x						x
Osterbeek, van Praag and Ijsselstein	Netherlands	2 semesters	T2: right after	104 treatment 146 control			x							x
Thursby, Fuller and Thursby	US	2 years	T2: right after	71 treatment 15 control post										x
Mentoor and Friedrich	South Africa	1 semester	T2: right after	418 treatment 45 control			x							x
Souitaris, Zarbinati and Al-Laham	France and UK	5 months	T2: right after	124 treatment 126 control			x							x
DeTienne and Chandler	US	1 semester	T2: right after	71 treatment 59 control			x							x
Peterman and Kennedy	Australia	5 months	T2: right after	109 treatment 111 control										x

n.s.: non-significant; TED: true experimental design; QED: quasi-experimental design.

Table 3. Findings on outcome measures.

Outcome measure		Positive	Non-significant	Negative
Cognitive	Knowledge	3 (<i>n</i> = 542)	1 (<i>n</i> = 1727)	
	Traits	1 (<i>n</i> = 1727)	3 (<i>n</i> = 813)	1 (<i>n</i> = 418)
Skill-based	Skills	7 (<i>n</i> = 3015)	2 (<i>n</i> = 395)	
Affective	Passion/inspiration	2 (<i>n</i> = 214)		
	Attitude to entrepreneurship	5 (<i>n</i> = 713)	2 (<i>n</i> = 190)	1 (<i>n</i> = 66)
Conative	Subjective norm	1 (<i>n</i> = 124)	1 (<i>n</i> = 43)	1 (<i>n</i> = 23)
	Entrepreneurial intention	5 (<i>n</i> = 1099)	3 (<i>n</i> = 446)	3 (<i>n</i> = 1897)
Behavioural	Feasibility	9 (<i>n</i> = 3278)	2 (<i>n</i> = 190)	
	Nascency	2 (<i>n</i> = 224)	1 (<i>n</i> = 51)	
	Venture creation	2 (<i>n</i> = 287)		

2013); and analysing, motivating and creativity (Huber et al., 2014). However, Oosterbeek et al. (2010) report non-significant results on entrepreneurial skills.

The studies on entrepreneurial attitude are, with two exceptions (Souitaris et al., 2007; Varamäki et al., 2015), overwhelmingly positive regarding the impact of EE. Studies on other affective outcome measures, however, remain scarce. Nevertheless, two recent studies report a positive impact on entrepreneurial passion (Gielnik et al., 2017) and entrepreneurial inspiration (Nabi et al., 2016b), while Souitaris et al. (2007) establish a positive impact on subjective norm, in contrast to the non-significant and negative findings of Varamäki et al. (2015).

With regard to conative outcomes, nine studies report a positive impact on feasibility/perceived behavioural control/entrepreneurial self-efficacy. Souitaris et al. (2007), and Varamäki et al. (2015) are the only studies that present non-significant findings. The most equivocal results derive from the studies that address entrepreneurial intention: five report a positive impact, two found no significant difference (Nabi et al., 2016b; Volery et al., 2013), one found both non-significant and negative impacts depending on the pedagogics (Varamäki et al., 2015) and two even found a purely negative impact (Huber et al., 2014; Oosterbeek et al., 2010). By far the largest sample size is to be found in the study by Huber et al. (2014). Therefore, when summarizing the samples and results, we find the following distribution of EE impact on entrepreneurial intention: positive impact (*n* = 1099), non-significant impact (*n* = 446) and negative impact (*n* = 1897). Accordingly, although it is the most frequently applied outcome measure in impact studies, evidence of the actual impact of EE on entrepreneurial intention remains highly inconclusive.

Studies on actual entrepreneurial behaviour signal positive findings about entrepreneurial nascency (Gielnik et al., 2015; Rauch and Hulsink, 2015) and new venture creation (Gielnik et al., 2015, 2017). There is, however, a sample size issue here as the studies on nascency had a total sample size of only 224 and the studies on venture creation had a total sample size of 287.

Therefore, although the majority of studies report positive impacts, there are also several with non-significant findings and some even with a negative impact. Consequently, it becomes difficult to conclude anything on the basis of such equivocal findings, and this is a matter that is further complicated by the variety of contextual factors in the studies.

Contextual factor: Pedagogical interventions. The characteristics of the pedagogical interactions are diverse and indicate many gaps for further examination. The duration of the courses ranges from 2 weeks to 2 years. While the majority of studies examine EE interventions lasting between 3 months and 10 months, only one investigates the impact of a short intervention of 2–4 weeks (Huber et al., 2014). Moreover, only two studies look at EE lasting for more than an academic year – Thursby et al. (2009) study a 2-year programme, and Varamäki et al. (2015) followed a cohort through its first 2 years of a Bachelor's degree course.

Furthermore, when separating the studies into the traditional categories of learning *about*, *for* and *through* entrepreneurship (Jamieson, 1984), it becomes evident that none of the pedagogical interventions can be categorized as learning *about* entrepreneurship. The 17 impact studies are evenly distributed between learning *for* entrepreneurship (nine studies) and *through* it (nine studies),⁴ and no particular differences in terms of positive or negative impact can be observed between these in the SLR sample.

Contextual factor: Sample characteristics. Different sample characteristics could have a major impact on how a course is experienced by the participants and the effect of the EE intervention. The educational level of the EE participants is, for instance, a topic for further exploration. One example is EE impact on primary school students, as only one study addresses this (Huber et al., 2014). Of the remaining 16 experimental studies, 4 are about secondary school students, 3 concern postgraduate students and 9 examine the impact on undergraduate students. Whether or not a course is compulsory could also have an impact on its effect, and both categories are covered equally in the experimental impact studies.

Bae et al. (2014) show in their meta-analysis that cultural values serve as a moderator of the relationship between EE and entrepreneurial intentions. Hence, the cultural context is another important characteristic that can impact the effect of an EE course. Based on the 17 experimental impact studies, it appears that EE impact studies have predominantly been a Western European exercise (11 studies). There are, however, also three from Africa, two from the United States and one from Australia.

Contextual factor: Time frame. In the majority of the 17 experimental impact studies, the post-measurement time is immediately after the completion of the pedagogical intervention. Recent contributions by Volery et al. (2013), Rauch and Hulsink (2015), Gielnik et al. (2015) and Gielnik et al. (2017) have, however, also collected data several months after the intervention. Gielnik et al. (2017), for instance, combine measurement right after an EE course with measurements 12 and 28 months after course completion, thereby enabling longitudinal follow-up of development after an EE programme.

Discussion

The findings of this study show that the number of experimental impact studies has increased considerably in recent decades. Nevertheless, 88.3% of the studies can be classified as having a weak experimental design that does not really allow causal claims to be made. This is a major concern in a field that is rapidly expanding and is in search of legitimacy among stakeholders such as policymakers, sponsors and educational institutions (Fayolle et al., 2016). In fact, our SLR reveals that only 17 impact studies up to and including 2017 apply a strong experimental design either through TED or QED. Hence, there are not that many rigorous studies for policymakers and educators to draw on when making decisions regarding investments and the future development of EE. Obviously, several insightful qualitative studies on outcomes, as well as PED studies, provide a valuable understanding of relationships between variables. However, in a fast-moving field in which action and intervention are developing quickly, it is critical that the theory and research needed to justify and explain EE develop simultaneously. Our findings indicate that this has not been the case for strong experimental impact studies on EE. While this is also a challenge for both general and management education (Köhler et al., 2017), the issue is even more pronounced for EE as a young and emerging field. EE scholars are researching new and innovative education initiatives (often with small samples), while established education fields provide more stable conditions to undertake research.

In fact, the qualitative analysis indicates that there is still scant knowledge about the effects of EE as a pedagogical intervention. In general, the majority of the strong

experimental impact studies point towards a positive relationship between participation in EE and cognitive, skill-based, affective, conative and behavioural outcomes. However, the SLR also identifies studies that report non-significant and even negative relationships between EE and the impact indicators. The few studies and the small sample sizes of the single studies further complicate the equivocal findings. For example, only 4 of the 17 studies have a treatment group of more than 200 students. This complicates the application of, for example, meta-analysis, which is a well-recognized approach to summarize effect by combining empirical studies on interventions. For instance, two recent meta-analyses by Bae et al. (2014) and Martin et al. (2013) had to include studies with a weak experimental design in order to draw conclusions. Hence, it is hard to draw categorical conclusions based on the sample of 17 articles, since their findings appear to point in several different directions, even when the same outcome variables are studied.

Furthermore, with mixed findings, low numbers of experimental studies and small sample sizes, we question whether findings are valid for other populations in different contexts. EE cannot be treated as a black box, and it is necessary to acknowledge the nuances of EE offered across the world, at different education levels and with quite diverse pedagogics. We agree with Rideout and Gray (2013: 348), who call for a larger pool of methodologically adequate EE studies in order to answer questions such as ‘What type of EE, delivered by whom, within which type of university, is the most effective for this type of student, with this kind of goals, and under these sets of circumstances?’. It is essential to acknowledge the diversity of EE interventions. A compulsory course about entrepreneurship theories offered to first-year Bachelor’s students in general business would obviously have a different impact than an elective course in an entrepreneurship Master’s in which students start their own companies. There is great variance in EE pedagogics and their impacts will most likely be quite different. By not treating EE as a black box, it will be possible to draw nearer to a more complex understanding of the actual impact of EE interventions.

Thus, the summary of experimental research findings in Table 2 defines important research gaps and points towards future research opportunities. For example, two Spanish impact studies by Sanchez (2011, 2013) concern compulsory courses for secondary and undergraduate students who learn *for* entrepreneurship throughout an 8-month pedagogical intervention. His findings show significant increases in intention, self-efficacy, proactiveness and risk-taking by EE students. However, when applying Table 2 to identify gaps, there is still much to be explored. Little is known about how Spanish students or those in neighbouring countries will develop during a self-selected elective course or through EE courses for primary education. Furthermore, we do not know anything about the potential long-term

impact, affective outcome measures or whether EE actually results in entrepreneurial behaviour.

Numerous research gaps could be identified by applying Table 2 in this way. However, we especially want to draw attention to some particularly under-researched issues. For instance, there are no experimental impact studies on courses *about* entrepreneurship. All the identified studies concern learning *for* or *through* entrepreneurship. It is often claimed that learning *about* entrepreneurship does not impact on students, as opposed to the two other approaches (Honig, 2004; Neck and Greene, 2011). However, due to the absence of experimental impact studies on this pedagogical approach, there is no robustly researched knowledge to support this view. Moreover, only one study (Huber et al., 2014), from the Netherlands, reports on EE in primary education, which also remains a major research gap. There is also an over-representation of impact studies from Western European countries. Bae et al. (2014) found that the impact of EE is moderated by cultural values, and methodologically rigorous studies from, for example, Eastern Europe or Asia could provide interesting insights into how EE impacts students in other cultural settings.

Accordingly, our findings could serve as an overview of where rigorous EE impact studies are still needed. Furthermore, in line with Nabi et al. (2016a), we find that the majority of impact indicators are short-term, subjective impact measures. As the proof of the pudding is said to be in the eating, there is still major potential for examining long-term impacts such as venture creation and performance. Furthermore, the objective of EE is not necessarily only to increase start-up rates but also to develop the entrepreneurial mindset of students, which can then be used in, for example, existing companies and to enhance students' employability. Thus, novel outcome measures such as intrapreneurial intentions, personal development, social entrepreneurship, employability and career decision-making could be fruitful indicators to advance our understanding of EE impact.

The mixed results from impact research also provide an interesting opportunity for further research in order to offer explanations for the equivocal findings. The scenario design by Nabi et al. (2016b) is, for example, an important contribution that sheds light on how the same EE intervention can have different impacts on different students. The suggestion by Von Graevenitz et al. (2010) of a sorting effect, where students become more confident about whether entrepreneurship is a suitable career path for them, also has potential for further exploration. Thus, a decrease in entrepreneurial intentions after EE is not necessarily negative if it is due to enhanced career maturity among participants.

Conclusion

The two objectives of this article are (1) to review the use of experimental research design in EE impact research and (2)

to offer insights into the findings of impact studies that apply a strong experimental design through either TED or QED. In doing so, we hope to shed light on the value of applying a strong experimental design in EE impact research and to lay the foundation for a future research agenda. When it comes to the first research objective, the main finding from the study is that there is a substantial lack of strong experimental design in EE impact studies. Of 145 quantitative impact studies identified in ABS-listed ranked journals, only 17 have a TED or QED, accounting for 11.7% of the studies. Hence, 88.3% of quantitative impact studies can be characterized as having a weak experimental design. This lack of rigour has severe consequences for the possibility of making inferences and for the generalizability of existing research findings.

Furthermore, with regard to the second research objective, it is evident in the synthesizing of findings from the 17 rigorous impact studies that we still know rather little about the causal link between EE and entrepreneurial outcome measures. While the majority of impact studies indicate a positive impact, there are also studies with non-significant and even negative impacts on EE outcomes. Hence, based on the findings from the SLR, we call for more true and quasi-experimental studies that can provide robust findings on EE impact. There is a need for more research on the outcome measures identified in the SLR, but there is also potential for exploring novel impact indicators. Intrapreneurship, social entrepreneurship and employability are, for example, outcome measures that remain unexplored in rigorous experimental studies.

An expanding body of rigorous impact studies would also contribute to the development of a more fine-grained understanding of EE and the influence of contextual factors. Context matters in education and EE cannot be treated as a black box. More strong experimental impact studies on the variety of pedagogics, course durations and student samples would accordingly enhance understanding of the nuances of EE impact. As a result, one could get closer to answering important questions such as which pedagogics to apply for a certain group of students if the ambition, for example, is to increase nascent entrepreneurship.

Therefore, although there have been many important research contributions towards an understanding of the complex phenomenon of EE in recent decades, EE impact research has not yet delivered the required empirical findings to EE stakeholders. Teachers and educational institutions need robust evidence on which to base decisions as to when they introduce, execute and develop EE courses. Correspondingly, governments across the world are including EE in educational policies and investing heavily in the implementation of EE. They cannot be expected to continue to do so if EE research does not provide robust evidence of its impact. Hence, the EE research community should take a critical look at the research being conducted

and strive to provide EE stakeholders with empirical evidence acquired through methodologically rigorous studies.

Like any methodology, the SLR has its limitations. We acknowledge that the decision to do a journal-led search will deliver different results to those of an open database search, as would the selection of other search strings. However, by searching impactful journals within EE research, our review highlights a fundamental problem in EE impact research: knowledge about the impact of EE as a pedagogical intervention is scarce. The quality of the research on EE impact is currently lagging behind the thriving development of EE at educational institutions worldwide. As EE continues to spread, it becomes increasingly important for research to justify and explain what is taking place during and after EE courses. For the future, the challenge for EE scholars is to do this with methodologically rigorous studies that can help EE to gain legitimacy both as an educational element and as a research field.

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Notes

1. For an in-depth discussion of the various experimental designs, see, for example, Campbell and Stanley (1963), Cook and Campbell (1979) and Shadish et al. (2002).
2. The Solomon four-group design was developed to overcome threats of testing in pre-test–post-test design, as the two extra control groups allow researchers to test whether the pre-test itself has an impact on the participants (Cook and Campbell, 1979).
3. Some studies use multiple outcome measures and their sample can therefore be found more than once in Table 3.
4. Varamäki et al. (2015) studied both education *for* and *through* education in the same study.

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Appendix I

Reading guide								
1. General information								
1a. Author(s)								
1b. Year of publication								
1c. Article title								
1d. Journal								
2. Theoretical positioning								
2a. Theoretical framework								
3. Impact								
3a. Impact measures	Cognitive Knowl.	Cognitive Traits	Skill-based Skills	Affective Passion Inspo.	Affective Ent. att.	Affective Sub. Norm	Conative Ent. int.	Conative Feasib.
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Behavioural Nascency	Behavioural Start-up						
	<input type="checkbox"/>	<input type="checkbox"/>						
3b. Measurement items								
3c. Reported impact								
3d. CV								
3e. Reported CV effect								
4. Methodology								
4a. Research design	TED: RPPC <input type="checkbox"/>	TED: RS4 <input type="checkbox"/>	QED: NEPPC <input type="checkbox"/>	PED: IPO <input type="checkbox"/>	PED: NEPO <input type="checkbox"/>	PED: IPP <input type="checkbox"/>		
4b. Data collection method	Questionnaire <input type="checkbox"/>						Other:	
4c. Follow-up length								
5. Sample characteristics								
5a. Sample size								
5b. Education field	Business	Science	Humanities	Social	Health	Education		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
5c. Education level	Primary	Secondary	Tertiary					
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5d. Country								

(continued)

Appendix I (continued)

Reading guide							
6. Intervention characteristics							
6a. Course description	About	For	Through	JA-YE		Other	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
6b. Compulsory	Yes	No					
	<input type="checkbox"/>	<input type="checkbox"/>					
6c. Duration							
6d. Total work hours							
6e. Team work	Yes	No					
	<input type="checkbox"/>	<input type="checkbox"/>					
7. Analysis							
7a. Data analysis method							
7b. Key findings							

CV: control variable; TED: true experimental design; QED: quasi-experimental design; PED: pre-experimental design.

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In Hogset, H., Berge, D. M. & Dale, K. Y. (eds.) *Det regionale i det internasjonale – Fjordantologien 2018*. Universitetsforlaget.

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Kapittel 14

Hope for the future?

Students' attitudes towards entrepreneurship, innovation, and international mobility

KJERSTI KJOS LONGVA
NTNU

SAMANDRAG Møre og Romsdal er historisk ein innovativ og internasjonalt orientert region og er avhengig av ei arbeidsstyrke som kan vere entreprenøriell, vere innovative i eksisterande bedrifter og som kan utvikle relasjonar mot internasjonale markadar. Denne studien undersøker om studentar i Ålesund er klare for oppgåva. Funna er lovande for Møre og Romsdal og indikerer at studentane har positive haldningar til både entreprenørskap og intraprenørskap, samt til internasjonal mobilitet.

ABSTRACT Møre and Romsdal (M&R) is historically an innovative and internationally oriented region, which is dependent on a workforce that can act entrepreneurially, be innovative within existing companies, and cultivate connections with international markets. This study explores whether students at the Norwegian University of Science and Technology (NTNU) in Aalesund are up for the task. The findings are promising for M&R and indicate that students have fairly positive attitudes towards entrepreneurship, intrapreneurship, and international mobility.

NØKKEWORD Entreprenørskap | intraprenørskap | internasjonal mobilitet | karriereintensjon | studenthaldning

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INTRODUCTION

According to a recent report from GEM Global Entrepreneurship Monitor (Alsos, Clausen, Isaksen & Åmo, 2015), entrepreneurial activity has been declining in Norway over the last decade. In 2005, 9,1% of the adult population were involved in starting ventures, while this value had declined to 5,7% in 2015. Norway is accordingly ranked 21st of 29 countries compared to other innovation-driven economies. Only 30,8% of Norwegians believe that they have skills and competences relevant for starting ventures. Furthermore, new ventures are characterized by low ambitions in terms of product innovation, exports, and employment. On a more positive note, Norway has the third highest level of intrapreneurship among the GEM countries and Norwegians are accordingly involved in innovation processes at the work place to a relatively high degree (Alsos et al., 2015).

Entrepreneurship and innovation have been recognized as important drivers for economic growth (Audretsch, Keilbach & Lehmann, 2006) and are especially important during times of economic recession. Readjustment through entrepreneurship and innovation, as well as expansion into international markets, is critical in times of stagnation and decline, such as the decline recently experienced in Norway due to an abrupt decrease in oil prices. Owing to its maritime cluster, Møre and Romsdal (M&R) has been particularly affected by this and is dependent on both entrepreneurial and intrapreneurial activity to find a way out of this challenging situation (Melbye, Jacobsen & Baustad, 2017).

M&R has a reputation for being among the most entrepreneurial regions in the country, and one with a distinct mercenary spirit. Research has however indicated that this is not necessarily confirmed by statistics. Spilling, Fraas, Hervik, & Bræin (2005) concluded that while M&R was average in terms of innovation activities, the county had a relatively low number of new business start-ups, with 1600 new businesses recorded each year. This accounted for 3,7% of all new ventures in Norway. A follow-up study by Hansen, Meltevik, Brastad & Røiseland (2011), revealed that, although there was an increase in the number of new ventures in M&R in 2005–2009, with an average of 1800 a year, this still represented only 3,8% of all newly registered ventures in Norway. Furthermore, the number of people employed in new ventures had decreased during the same period and this was seen as an indication of the limited growth potential of new ventures in M&R. Of ventures established in 2005, 49% survived their first two years, while the national average was 45%. In 2016, 2238 new ventures were established in M&R, which accounted for 3,8% of all new ventures in Norway (Statistics Norway, 2017a). With regard to the survival of ventures established in 2012, the national average is 46%, compared with 51% for M&R. Entrepreneurial

activity in M&R is accordingly increasing in terms of number of both companies and survival rate, but M&R's percentage of new Norwegian ventures has remained constant. Hence, in light of the recent economic downturn, it is crucial to have a continuous increase in the number of new ventures, and a high survival rate, as well as to increase the number of people employed in new companies. M&R is dependent on an entrepreneurial workforce that can contribute to this.

Internationalization has been vital to business in M&R and the county was the second largest mainland-exporting county in 2016, with exports totaling more than 39 billion NOK (Statistics Norway, 2017b). International markets have historically been important for the region in order to create new opportunities for economic activity. Hence, employees with cross-cultural experience are of major importance for regional companies that are competing in international markets. Cross-cultural skills such as language skills, cultural understanding, market knowledge, and willingness to engage in international mobility are vital in this competitive environment. Such competencies can be developed by living abroad for a period, for example by studying abroad as part of an academic degree. Thus, having positive attitudes towards international mobility can be seen as an advantage both for students in terms of their future employability, and for the companies they will end up working for.

The workforce's attitudes towards entrepreneurship, innovation, and international mobility are accordingly critical to the future development of M&R. M&R will need individuals who are ready to contribute when they enter the workforce and who can create new opportunities in national and international markets. Despite this, little is known about whether this is the case for the future workforce of the region. Since regional higher education institutions have been found to play an important role in the recruitment of personnel to a region (Sæther et al., 2000; Arnesen, 2003; Gythfeldt & Heggen, 2012), the attitudes of regional students may provide insight into this matter. Thus, this study seeks to explore whether students at NTNU in Aalesund see themselves as employees who will contribute to entrepreneurship, innovation, and internationalization. This is done through a survey that included a conjoint analysis survey involving 210 undergraduate students that addresses the following research question: *What are students' attitudes towards entrepreneurship, intrapreneurship and international mobility as career choice alternatives?*

The study therefore explores students' interest in entrepreneurship, intrapreneurship, and international mobility as features of a prospective career. The ambition is to understand antecedents of the constructs entrepreneurial, intra-preneurial, and international mobility intentions. The literature suggests that there are several variables that can serve as predictors for these intentions. However, the literature is somewhat conflicting in terms of the explanatory power of those

variables and more research is needed to establish this. This study examines whether the previously identified predictors are explanatory variables for this specific undergraduate student sample. Furthermore, it is particularly interesting to gain insight into how intention constructs are interrelated. Previous research suggests associations between the constructs and, accordingly, it is of interest to explore potential explanations for this relationship.

The paper starts with a review of the literature on career choice preferences in terms of entrepreneurship and its relation to intrapreneurship and international mobility, which serve as a basis for developing hypotheses. Thereafter, the methodology section outlines how a conjoint analysis survey was employed to gather data. The results section follows, in which the quantitative findings are summarized. The paper concludes with a discussion of the findings, a conclusion, and the implications and main limitations of the study.

THEORETICAL BACKGROUND AND HYPOTHESES

CAREER CHOICE PREFERENCES

In transition from education to the labor market, students face several choices in terms of their preferences for prospective jobs. A major decision is the career-status choice of whether to be employed in a company or to become a self-employed entrepreneur (Katz, 1992). As entrepreneurship has increasingly been recognized as an engine for economic growth (Audretsch, Keilback & Lehmann, 2006), policy makers and scholars have devoted much effort to trying to understand why some people make the career-status choice of becoming an entrepreneur, how this can be predicted, and how entrepreneurship can be cultivated. Entrepreneurial intention has been identified as a key antecedent to understanding future entrepreneurial behavior (Bird, 1988; Krueger, Reilly, & Carsrud, 2000), implying that becoming self-employed is an intentional behavior. Building upon the work of Ajzen (1991) and his theory of planned behavior, it is assumed that intentional behavior can best be predicted by the intentions towards that behavior. Hence, intentions are assumed to shape subsequent action. According to Ajzen (1991), the antecedents subjective norm, attitude towards the behavior, and perceived behavioral control can explain intentions, which again enables the prediction of future behavior. Entrepreneurship in the form of establishing a company is a behavior that is often several years in the future when, for instance, one is a nascent entrepreneur or a student. Entrepreneurial intention and the theory of planned behavior have accordingly become an important model for predicting the probability of future start-ups. The explanatory power of this model was supported by a recent study by Kautonen,

Gelderen & Fink (2015), who found that entrepreneurial intention and perceived control over the behavior explained 31% of the variance in subsequent entrepreneurial behavior.

Entrepreneurial behavior can also take place in existing companies in the form of intrapreneurship. Intrapreneurship (Pinchot III, 1987) is also referred to as corporate entrepreneurship (Sharma & Chrisman, 1999; Kuratko, Hornsby & Hayton, 2015) and takes place when an intrapreneur acts as an entrepreneurial employee by being innovative and turning new technologies into new ventures, enabling cost reductions and new features, and creating competitive advantages. The notion of intention can also be extended to intrapreneurship, assuming that intrapreneurial behavior is intentional. Intrapreneurial intention can accordingly be an instrument to understand whether an employee or a student has ambitions to act intrapreneurially in future jobs, as was done by for example Douglas & Fitzsimmons (2012). They found that, as a construct, intrapreneurial intentions are in fact separate from entrepreneurial intentions, and that although the intentions have a common antecedent in terms of self-efficacy, they also have distinct antecedents in terms of income, ownership, autonomy, and risk.

The theory of planned behavior has also been applied to investigate intentions to work (Andresen & Margenfeld, 2015; Remhof, Gunkel, & Schlaegel, 2014) and to study (Hackney, Boggs, & Borozan, 2012; Presley, Damron- Martinez, & Zhang, 2010; Schnusenberg, de Jong, & Goel, 2012) abroad. As organizations increasingly operate in global markets, having employees with cross-cultural experience and skills is becoming ever more important. It is accordingly central to understand the intentions for international mobility, both among prospective employees as well as for students who consider studying abroad.

Previous research has found several predictors of intentions towards entrepreneurship, intrapreneurship, and international mobility that will serve as a basis for formulating hypotheses for this sample. Gender is one such variable and has been identified as a predictor of all three intentions. The same applies to previous experience with an issue, since having experience of something will have implications for attitudes towards a behavior. In this paper, previous experience is defined as previous international experience and previous entrepreneurship education. Entrepreneurial self-efficacy and self-employed parents have also been found to be an important predictors of entrepreneurial intention (Krueger, Reilly & Carsrud, 2000; Verheul, Thurik, Grilo & van der Zwan, 2012). In the light of the theory of planned behavior, this can be explained by self-efficacy being a measure of perceived behavioral control, while parents are role models who are particularly important in terms of the social norm. This study tests whether entrepreneurial self-efficacy and self-employed parents are also relevant for

predicting intrapreneurial and international mobility intentions. Finally, as suggested by Douglas & Fitzsimmons (2012), there are both similarities and differences in the career preferences of entrepreneurially and intrapreneurially oriented individuals. This is tested for the student sample in order to find whether there are common attribute preferences that indicate an association between the three intention constructs.

The literature suggests that there are also personality factors that can predict intentions towards entrepreneurship (Schmitt-Rodermund, 2004; Verheul et al., 2012) and international mobility (Bakalis & Joiner, 2004; Remhof, Gunkel & Schlaegel, 2014; European Commission, 2014). Openness to experience, tolerance of ambiguity, and extraversion have, for instance, been identified as being associated with entrepreneurship and studying abroad, and may provide insights into the relationship between entrepreneurial, intrapreneurial, and international mobility intentions. Addressing this issue was, however, seen as being beyond the scope of the survey in this paper.

GENDER DIFFERENCES IN INTENTION LEVELS

Previous research shows that there are distinct gender differences in terms of preferences for entrepreneurship. Females in both Europe as a whole (Grilo & Irigoyen, 2006; Verheul, Thurik, Grilo, & van der Zwan, 2012) and in Norway in particular (Alsos & Kolvereid, 2011) have been found to have lower preferences for entrepreneurship than males. It is unknown whether this association can also be extended to apply to intrapreneurship. Furthermore, the literature suggests that females have a higher willingness to study abroad short-term (Hackney et al., 2012) and are also more likely to actually study abroad than males (Kim & Goldstein, 2005; Salisbury, Umbach, Paulsen, & Pascarella, 2009). Taken together, this leads to the following hypotheses on the association between gender and intentions:

- H1a:** *Males will have higher entrepreneurial intention than females.*
- H1b:** *Males will have higher intrapreneurial intention than females.*
- H1c:** *Females will have higher international mobility intention than males.*

PREVIOUS INTERNATIONAL EXPERIENCE

A recent study by Vandor and Franke (2016) indicates that there is a link between entrepreneurship and international experience and that having cross-cultural experience might actually be a predictor of entrepreneurial behavior. Their quasi-experimental study on Austrian students studying abroad showed that inter-

national experience can increase a person's capabilities to identify profitable entrepreneurial opportunities. Research into immigrant entrepreneurship also suggests such an association. Business ownership is, for example, higher among foreign-born than native-born individuals (Xavier, Kelley, Kew, Herrington, & Vorderwülbecke, 2013), and self-employment rates in the USA are increasing among immigrants but decreasing among natives (Fairlie & Lofstrom, 2014). This pattern also extends to those who have relocated abroad temporarily, for example to study or work there (McCormick & Wahba, 2001). Thus, there appears to be a link between international experience and entrepreneurship. We believe that this can also be extended to intrapreneurship and to the propensity to go abroad again (Van Mol & Timmerman, 2014) and hypothesize as follows:

H2a: *Having international experience relates positively to entrepreneurial intention.*

H2b: *Having international experience relates positively to intrapreneurial intention.*

H2c: *Having international experience relates positively to international mobility intention.*

We would further like to examine if it is international experience in itself that is linked to entrepreneurship or if it is the propensity towards international mobility that produces a relationship between internationalization and entrepreneurship/intrapreneurship. This leads to the following hypotheses:

H2d: *International mobility intention relates positively to entrepreneurial intention.*

H2e: *International mobility intention relates positively to intrapreneurial intention.*

PREVIOUS ENTREPRENEURIAL EXPERIENCE THROUGH ENTREPRENEURSHIP EDUCATION

Entrepreneurship education has been identified as a means of providing entrepreneurial experience for students and thereby increasing entrepreneurial and intrapreneurial activity in society. There is empirical evidence suggesting that it contributes to increasing intentions among participating students (Kolvereid & Moen, 1997; Fayolle, Gailly, & Lassas-Clerc, 2006), but there is also evidence indicating the opposite (Oosterbeek, Van Praag, & Ijsselstein, 2010; Von Graevenitz, Har-

hoff, & Weber, 2010). Hence, it remains inconclusive whether entrepreneurial intentions increase or decrease during entrepreneurship education. (Bae, Qian, Miao, & Fiet, 2014; Martin, McNally, & Kay, 2013). We therefore hypothesize as follows to examine the relationship between entrepreneurship education and intentions for our sample:

H3a: *Prior entrepreneurship education relates positively to entrepreneurial intention.*

H3b: *Prior entrepreneurship education relates positively to intrapreneurial intention.*

Given the previously hypothesized link between international mobility and entrepreneurship, we also hypothesize that:

H3c: *Prior entrepreneurship education relates positively to international mobility intention.*

SELF-EFFICACY

Self-efficacy has its roots in Bandura's social learning theory and refers to the extent to which individuals believe in their ability to execute a behavior with the skills they possess (Bandura, 1977). In the context of entrepreneurship, entrepreneurial self-efficacy is the extent to which individuals believe that they have the ability to start a venture. Several studies have shown that there is a positive association between entrepreneurial self-efficacy, entrepreneurial intention, and entrepreneurial behavior (Krueger et al., 2000; McGee, Peterson, Mueller, & Sequeira, 2009). Furthermore, Douglas & Fitzsimmons (2012) found that entrepreneurial self-efficacy is actually also a predictor of intrapreneurial intention. Since entrepreneurship research has suggested that there is a link between entrepreneurship and international mobility, we wish to explore this as well. Thus, we hypothesize the following:

H4a: *Entrepreneurial self-efficacy relates positively to entrepreneurial intention.*

H4b: *Entrepreneurial self-efficacy relates positively to intrapreneurial intention.*

H4c: *Entrepreneurial self-efficacy relates positively to international mobility intention.*

SOCIAL NORMS

Subjective norms are antecedents to intention in the theory of planned behavior and represent how an individual perceives that a certain behavior is approved or disapproved of by significant others (Ajzen, 1991). In line with social learning theory, it is believed that individuals are more likely to adopt behaviors observed among family, friends, or mentors (Bandura, 1977). In terms of entrepreneurial intention it has been suggested that having self-employed parents, family, or friends are predictors of preference for self-employment. Previous findings have however been inconclusive as to whether or not this is actually the case. Some authors suggest a positive relationship between entrepreneurial intention and social norm (Kolvereid, 1996; Tkachev & Kolvereid, 1999; Verheul et al., 2012), while Krueger et al., (2000) found no significant relationship in a university student population in the USA. Self-employed parents have been suggested to be the most important significant others in terms of entrepreneurial intention (Verheul et al., 2012). We extend the proposed relationship to also concern intrapreneurial and international mobility intentions, and accordingly hypothesize the following:

H5a: *Having self-employed parents relates positively to entrepreneurial intention.*

H5b: *Having self-employed parents relates positively to intrapreneurial intention.*

H5c: *Having self-employed parents relates positively to international mobility intention.*

IMPORTANCE OF CAREER ATTRIBUTES

Researchers have dedicated much effort to understanding the reasons for why some individuals choose entrepreneurship as a career. Carter, Gartner, Shaver, & Gatewood (2003) identified six career factors that explain career choices for entrepreneurs; self-realization, financial success, roles, innovation, recognition, and independence. In an empirical test of these factors, findings indicated that entrepreneurs rated independence, financial success, and self-realization as more important than recognition, roles, and innovation.

In a Norwegian context, Kolvereid (1996) examined the reasons why business graduates' preferred self-employment to organizational employment. He found that economic opportunity, authority, autonomy, challenges, self-realization and participating in the whole process were factors associated with a preference for self-employment. In contrast, security, social environment, workload, career, and

avoiding responsibility, were factors associated with a preference for organizational employment.

At a more regional level, Nesse, Årethun, & Håvold (2016) investigated career anchors and their association with entrepreneurship among high school pupils in the Sunnmøre (Ulsteinvik and Herøy) and Sogn (Høyanger, and Årdal) regions in Norway. The career anchors of leadership ambitions and innovation were the most important drivers of entrepreneurship in both regions. In Sunnmøre, social capital was also important, while a secure future and professional interests were found to weaken the intention to become entrepreneurial.

A few scholars have attempted to study the trade-off effect between reasons for entrepreneurship. Douglas & Shepherd (2000) found that individuals consider risk, independence, and income when evaluating alternative career options. The level of work effort was not of significant importance. Entrepreneurial intentions were stronger for those with more positive attitudes towards risk and independence. Douglas & Fitzsimmons (2012) extended the study by examining how those factors related to entrepreneurial and intrapreneurial intentions. They found that entrepreneurial intention was stronger for those who prefer more income, majority ownership, and independence, but found no significant associations for risk tolerance. Instead, they found that intrapreneurial intentions were higher for those who prefer lower risk.

Work attributes that were particularly important for our sample when considering prospective job opportunities have been explored in a study by Longva & Strand (2018), namely, income, work hours, job security, work environment, and career opportunities. Accordingly, this leads us to the following hypotheses:

H6a: *Income relates positively to entrepreneurial intention, intrapreneurial intention, and international mobility intention.*

H6b: *Work hours relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention.*

H6c: *Job security relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention.*

H6d: *Work environment relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention.*

H6e: *Career opportunity relates positively to entrepreneurial intention, intrapreneurial intention, and international mobility intention.*

METHODOLOGY

Empirical data were collected among undergraduate students at NTNU in Aalesund in spring 2017. A survey including conjoint analysis was distributed to all 418 second year students in the business, biology, maritime and engineering departments at NTNU in Aalesund. Of 235 returned questionnaires, 210 were found to be suitable for further analysis, which gave a response rate of 50,2%. Of the participants, 52,4% were male and 47,6% female. In terms of study program, 28,6% of the respondents were in business studies, 18,6% in maritime studies, 20% studied biology and 32,9% did engineering studies. The response rates were 43,3% for males, 60,9% for females, 57,4% for business studies, 37,0% for engineering studies, 57,4% for maritime studies, and 60,3% for biology studies.

Data were gathered via a two-part survey consisting of a standard questionnaire combined with a conjoint analysis section. Conjoint analysis is a statistical technique that is often used in market research to determine how respondents value different attributes in decision-making processes (Orme, 2010). The respondents will, for example, be presented with a product described by different attributes (for example, color, quality, price and brand). Each attribute will have different sub-levels (i.e. color: red, green or yellow) and the respondents' preferences for both attributes and levels are found by analyzing how they make trade-offs when facing different product combinations throughout the conjoint analysis. In this study, adaptive conjoint analysis (ACA) was applied to present respondents with different job opportunities. The job opportunities were composed of the attributes income, work hours, job security, work environment, and possibilities for personal career development. The attribute categories and their different levels were developed based on findings from focus group interviews conducted in a study of Longva & Strand (2018). The respondents were asked to evaluate each job opportunity based on its perceived attractiveness. This allowed us to capture the importance of each attribute and to generate part-worth utilities for attributes at the individual level.

The standard survey part of the questionnaire captured demographics and previous experience with and attitudes towards entrepreneurship, intrapreneurship and international mobility. Having self-employed parents, previous international experience, and entrepreneurship education were all dichotomous variables in the survey. Three validated scales were used to measure items regarding entrepreneurial intention, intrapreneurial intention and entrepreneurial self-efficacy, while three items were tested to construct a scale of international mobility intentions. The survey included an anonymous code which will enable longitudinal studies of the same sample in the future without sacrificing respondent anonymity.

The measurement of entrepreneurial intention used a 5-point scale of six items validated by Thompson (2009) to capture students' intentions to pursue entrepreneurship. The higher the value, the more positive the student is about becoming an entrepreneur. The measure has a Cronbach's α -value of 0,828.

The construct of intrapreneurial intention was developed from a 3-item scale by Moberg et al. (2014) using a 5-point Likert scale. A fourth item, («Developing new products for the company I work in») was added and increased Cronbach's α -value from 0,710 to 0,761.

Entrepreneurial self-efficacy was measured in accordance with the 3-item scale of Schjoedt & Craig (2017). The items refer to a person's belief, on a 5-point scale, that he/she can successfully create a new venture. It has a Cronbach's α -value of 0,811.

The international mobility intention measure was constructed by the author. 3 items («I would like to study abroad for 6 months», «I would like to work abroad for six months», and «I would like to move abroad permanently») constitutes the scale, which has a Cronbach's α -value of 0,810.

RESULTS

The section below presents the findings from our two-part survey. First, we present some descriptive findings on intentions, self-efficacy and career preference. Thereafter, a regression analysis is presented to test our hypotheses.

ATTITUDES TO ENTREPRENEURSHIP, INTRAPRENEURSHIP, AND INTERNATIONAL MOBILITY

The descriptive findings in Figure 14.1 illustrate that entrepreneurial intentions are rather normally distributed, while the population is somewhat more positively skewed in terms of intrapreneurial intention. While 34% would prefer permanent employment working on tasks other than innovation, 32% would like to work with innovation in existing companies. Only 9% would like to be an entrepreneur if they were to start a company alone, but 25% indicated it to be their first choice if they could start with 2–5 others. In terms of intentions to go abroad, we found that the majority of students were quite positive about studying or working abroad for half a year. However, when it came to moving abroad permanently, students were less enthusiastic.

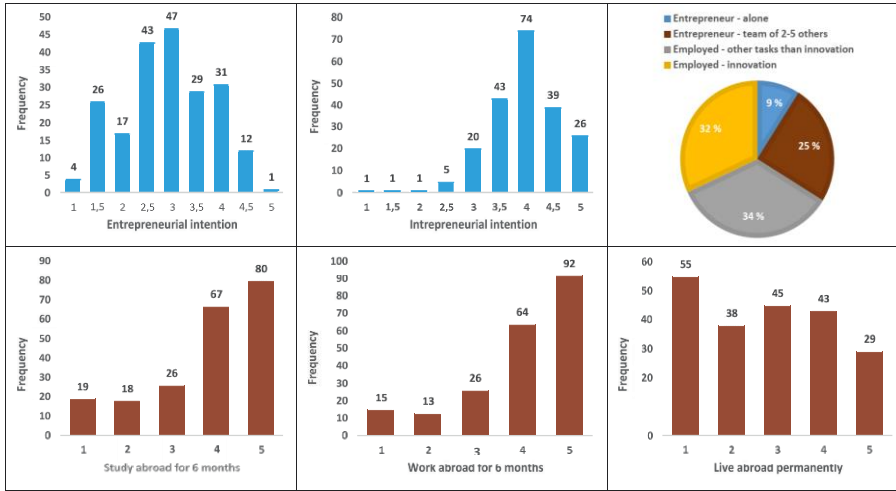


FIGURE 14.1 Intentions for entrepreneurship, intrapreneurship, and international mobility

ANTECEDENTS TO ENTREPRENEURIAL, INTRAPRENEURIAL, AND INTERNATIONAL MOBILITY INTENTIONS

We employed a principal components analysis (PCA) to investigate the underlying structure of the intention items (see Table 14.1). The PCA revealed that three factors accounted for 60,1% of the cumulative variance. These factors were identified as the items relating to entrepreneurial intentions (six items, $\alpha=0,83$), intrapreneurial intentions (four items, $\alpha=0,76$), and international mobility intentions (three items, $\alpha=0,81$).

TABLE 14.1 Factor analysis results

Items	Entrepre- neurial intention	Intrapreneu- rial intention	International mobility intention
I intend to set up a company in the future.	0,83		
I never search for business start-up opportunities.	0,41		
I am saving money to start a business.	0,59		
I do not read books/search the web on how to start a business.	0,71		
I have no plans to launch my own business.	0,82		
I spend time learning about starting a firm.	0,88		
Solve problems in new ways.		0,79	
Work on my own ideas.		0,82	
Define my own tasks.		0,65	
Develop new products for the company I work in.		0,75	
I would like to study abroad for 6 months.			0,88
I would like to work abroad for 6 months.			0,92
I would like to move abroad permanently.			0,76

Thereafter, we utilized SPSS software to perform a standard multiple regression analysis. The descriptive statistics and correlation matrix are shown in Table 14.2, and the regression coefficients for all three models are shown in Table 14.3.

TABLE 14.2 Descriptive statistics and Pearson correlation coefficients between variables (n=210)

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Entrepreneurial intention (EJ)	2,90	0,91														
2. Intrapreneurial intention (U)	3,85	0,67	0,38***													
3. International mobility intention (IMI)	3,52	1,10	0,25***	0,11												
4. Entrepreneurial selfefficacy (ESE)	3,38	0,99	0,67***	0,34**	0,11											
5. Gender	0,48	0,50	-0,06	-0,10	0,07	-0,11										
6. Lived abroad	0,21	0,41	0,08	0,01	0,32***	-0,05	0,15*									
7. Self-employedparents	0,39	0,49	0,19**	0,15*	0,07	0,15*	-0,11	-0,10								
8. EE in lower secondary school	0,21	0,41	-0,08	-0,04	-0,03	-0,01	-0,01	-0,10	0,02							
9. EE in secondary school	0,19	0,39	-0,08	0,02	0,04	0,03	0,08	-0,01	0,00	0,08						
10. EE in higher education	0,25	0,43	0,35**	0,12	0,12*	0,28**	0,12	0,10	0,04	-0,11	0,04					
11. Income importance	15,88	3,98	0,14*	0,06	0,26***	0,07	-0,18**	0,06	0,03	0,04	-0,04	-0,12				
12. Work hours importance	9,53	4,59	-0,18**	-0,26**	-0,14*	-0,11	0,12	0,08	0,00	-0,05	-0,07	-0,01	-0,20**			
13. Job security importance	15,33	4,46	-0,02	0,05	0,07	0,04	-0,01	-0,19**	-0,05	-0,06	0,07	-0,07	-0,11	-0,23**		
14. Work environment importance	18,25	4,10	-0,10	0,11	-0,09	-0,04	0,14*	-0,05	0,02	0,11	-0,04	0,03	-0,43**	-0,02	-0,10	
15. Career opportunities importance	14,86	4,79	0,27**	0,28**	0,01***	0,20**	0,00	0,01	0,01	-0,05	0,05	0,07	-0,05	-0,46**	0,06	0,09

Note: * $p \leq 0,05$ ** $p \leq 0,01$ *** $p \leq 0,001$ $n = 210$

TABLE 14.3 Regression results for entrepreneurial and intrapreneurial intentions

	Entrepreneurial intentions	Intrapreneurial intention	International mobility intention
Entrepreneurial self-efficacy (ESE)	0,58***	0,27***	0,01
Gender	0,03	0,10	0,07
Lived abroad	0,08	-0,06	0,32***
Self-employed parents	0,11*	0,05	0,10
EE in lower secondary school	-0,33	-0,05	0,03
EE in secondary school	-0,11*	0,02	0,03
EE in higher education	0,17***	0,03	0,11
Income importance	0,07	0,08	0,34***
Work hours importance	-0,07	-0,13	0,08
Job security importance	-0,02	0,04	0,19**
Work environment importance	-0,08	0,16*	0,04
Career opportunities importance	0,13*	0,16*	0,29***
R ²	0,54	0,22	0,30

Note: * $p \leq 0,05$ ** $p \leq 0,01$ *** $p \leq 0,001$ $n = 210$

EE = entrepreneurship education

The correlation matrix indicates that there is in fact a correlation between the three intention constructs as hypothesized in H2d and H2e. For the entrepreneurial intention model, we found an influence of the variables self-efficacy, self-employed parents, entrepreneurship education (EE) in secondary school, EE in higher education, and career opportunities. In the intrapreneurial intention model, we found an influence of self-efficacy, work environment importance, and career opportunities importance. Finally, for the international mobility intention model, a significant influence was found for the variables living abroad, income importance, job security, and career opportunities. Career opportunities importance was the only variable that related positively to all three intention measures. The fit for the models (R^2) was respectively 0,54 for entrepreneurial intention, 0,22 for intrapreneurial intention, and 0,30 for international mobility intention. The hypotheses and results are summarized in Table 14.4.

TABLE 14.4 Hypotheses and results

Hypothesized relationship	Result
H1a: Males will have higher entrepreneurial intention than females	Rejected
H1c: Males will have higher intrapreneurial intention than females	Rejected
H1c: Females will have higher international mobility intention than males	Rejected
H2a: Having international experience relates positively to entrepreneurial intention	Rejected
H2b: Having international experience relates positively to intrapreneurial intention	Rejected
H2c: Having international experience relates positively to international mobility intention	Accepted
H2d: International mobility intention relates positively to entrepreneurial intention	Accepted
H2e: International mobility intention relates positively to intrapreneurial intention	Accepted
H3a: Entrepreneurial self-efficacy relates positively to entrepreneurial intention	Accepted
H3b: Entrepreneurial self-efficacy relates positively to intrapreneurial intention	Accepted
H3c: Entrepreneurial self-efficacy relates positively to international mobility intention	Rejected
H4a: Having self-employed parents relates positively to entrepreneurial intention	Accepted
H4b: Having self-employed parents relates positively to intrapreneurial intention	Rejected
H4c: Having self-employed parents relates positively to international mobility intention	Rejected
H5a: Prior entrepreneurship education relates positively to entrepreneurial intention	Partly accepted
H5b: Prior entrepreneurship education relates positively to intrapreneurial intention	Rejected
H5c: Prior entrepreneurship education relates positively to international mobility intention	Rejected
H6a: Income relates positively to entrepreneurial intention, intrapreneurial intention, and international mobility intention	Rejected for EI & II Accepted for IMI
H6b: Work hours relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention	Rejected for all
H6c: Job security relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention	Rejected for EI & II Accepted for IMI
H6d: Work environment relates negatively to entrepreneurial intention, intrapreneurial intention, and international mobility intention	Rejected for EI & IMI Accepted for II
H6e: Career opportunity relates positively to entrepreneurial intention, intrapreneurial intention, and international mobility intention	Accepted for all

DISCUSSION

The aim of this study was to gain insight into the career preferences of the future workforce of the region. Historically, industry and commerce in M&R have been known for their capability to be innovative and internationally oriented. Given the current challenges that parts of the industry are facing, the need for such capabilities will not diminish in the future. The region's adaptability is dependent on a workforce that can act entrepreneurially, be innovative in existing companies, establish connections and excel in international markets. This study indicates that students in Aalesund appear to be up for the task.

The findings are promising for M&R and indicate that regional students have quite positive attitudes towards entrepreneurship, intrapreneurship, and international mobility. Intentions in terms of entrepreneurship were rather normally distributed, while intentions towards intrapreneurship and international mobility were more positively skewed. In terms of international mobility, students were quite positive about going abroad to study or work for a period of time, but somewhat less enthusiastic about moving abroad permanently. Consistent with earlier findings (Van Mol & Timmermann, 2014), those with previous international experience were more positive about going abroad again. Hence, it is important to continue encouraging internationalization through, for example, student exchanges in order to further expand international opportunities for the region's industry and commerce.

Entrepreneurship as a career choice was not perceived as very attractive if the option was to start up alone. Only 9% of students gave this as their first choice. However, students perceived starting up as part of an entrepreneurial team to be a more attractive career choice and 25% gave this as their first choice. Introducing a team aspect into an entrepreneurial career decision scenario has, to our knowledge, not been done before. However, as this apparently has consequences for how attractively entrepreneurship is perceived, this should receive more attention in future career decision studies on entrepreneurship. In spite of media presentations of the entrepreneur as a lone hero, research indicates that entrepreneurship is often a team activity during the start-up phase. This may also have implications for the pedagogics through which entrepreneurship education is provided. By organizing such courses as team-based activities, students can discover that an entrepreneurship career is not necessarily a solitary activity. Pedagogics that support entrepreneurship as a team activity could thereby be more likely to increase students' entrepreneurial intention.

In line with previous research (Verheul et al., 2012), we found that having self-employed parents had a significant positive relationship with entrepreneurial intention. This is consistent with the theory of planned behavior in which the social norm

is an antecedent of entrepreneurial intention (Krueger et al., 2000). Parents often play a particularly important social role in shaping the career trajectories of their children and it appears that this is also the case for students in M&R. In terms of gender, however, the results were contradicted previous findings by for example Verheul et al. (2012) and Nesse et al. (2016). Previous research has indicated that males generally have a higher propensity towards entrepreneurship and a lower propensity towards international mobility than females. Nevertheless, we did not find any significant association between gender and either entrepreneurial, intrapreneurial or international mobility intentions, indicating that the gender difference between students in M&R is perhaps less pronounced than for other samples.

Entrepreneurship education is seen as one way to increase students' preferences for pursuing an entrepreneurial career. Our findings confirm that this appears to be the case for entrepreneurship education in higher education. In lower secondary and secondary school, we did however not find the same relationship. While we found no significant associations with entrepreneurship education in lower secondary school, there was actually a negative significant relationship between entrepreneurship education in secondary school and entrepreneurial intention. This raises questions concerning the long-term effect of entrepreneurship education. Do these entrepreneurship education interventions in fact have no effect on intentions or does a possible effect 'wear off'? Or could there be a sorting effect, as suggested by Von Graevenitz et al. (2010), whereby students are able to test whether entrepreneurship is something for them and make an informed choice. Accordingly, some will become more certain about pursuing entrepreneurship when gaining entrepreneurial experience, while others will realize that it is not for them. In terms of intrapreneurial intention, there was no significant relationship with entrepreneurship education. Stimulating intrapreneurial activity is an important ambition in most entrepreneurship courses; hence, the findings call for reflection regarding whether courses are actually achieving this ambition.

The factor analysis confirmed that entrepreneurial and intrapreneurial intentions can be viewed as two distinct career alternatives, in accordance with the work of Douglas & Fitzsimmons (2012), and that both correlated strongly with entrepreneurial self-efficacy. Furthermore, an important insight is the significant association between the three intention constructs of entrepreneurship, intrapreneurship, and international mobility. This is consistent with previous research on cross-cultural experience and entrepreneurial behavior (Vandor & Franke, 2016; Xavier et al., 2013). The association could however not be explained by any of the control variables, except for career opportunities importance. Hence, while living abroad was positively related to international mobility intentions,

there was no significant association with intentions towards entrepreneurship and intrapreneurship. Likewise, while self-efficacy, self-employed parents, and entrepreneurship education had significant associations with entrepreneurial intentions, this was not the case for international mobility.

Thus, career opportunities importance was the only factor that had significant association with all three constructs. This indicates that those who are ambitious in terms of career development are also more motivated towards entrepreneurship, intrapreneurship, and international mobility, perhaps because they see this as a means of realizing their career ambitions. Contrary to previous findings by Douglas and Fitzsimmons (2012) we did not find a link between entrepreneurial intention and income importance. However, income importance was significantly positively related to international mobility intentions.

Since career opportunities importance only had small explanatory power, there ought to be other underlying variables that can offer additional explanations for this association. According to the literature, personality characteristics could be a potential source of explanation. Openness to experiences, extraversion, and tolerance of ambiguity have for example been associated with both entrepreneurship and international mobility in previous research (Schmitt-Rodermund, 2004; Verheul et al., 2012; Remhof et al. 2014; European Commission, 2014).

Entrepreneurship, intrapreneurship, and internationalization are vital both for regions' competitiveness and an individual's employability. Employers and regions need individuals who are entrepreneurial, innovative, and internationally orientated to ensure economic development and growth. Similarly, as these are competencies that are in demand, students will have advantages in terms of employability if they exhibit such competencies. It is accordingly essential to understand the association between intentions towards such behavior and what underpins those intentions. By finding common antecedents for the intentions, one can also seek to enhance them through targeted initiatives in, for example, education policies. Hence, understanding these associations is important in order to make recommendations for future policies.

CONCLUSION

This paper set out to explore whether students attitudes towards entrepreneurship, intrapreneurship, and international mobility give hope for the future. Findings from the quantitative study indicate that they do. Entrepreneurship is perceived as a relevant career choice by many but, at the same time, it is seen as far more attractive when conducted in a team rather than as a sole entrepreneur. Students were also quite positive regarding both intrapreneurship and international mobil-

ity. In terms of the latter, studying or working abroad temporarily was more desirable than moving abroad permanently, and previous international experience was positively related to intention. Hence, if it is assumed that international mobility should be encouraged due to its benefits, it is important to provide young people with opportunities to travel abroad temporarily during their formative years.

Moreover, a positive correlation between intentions to go abroad, entrepreneurial intention, and intrapreneurial intentions was established. This association could only partly be explained by one of the variables. There is accordingly a need for further research to explain this relationship. Constructs within personality research, such as risk tolerance, ambiguity tolerance and the Big5 personality factors could be relevant constructs with regard to this. When antecedents of such behavior are better understood, it will be possible for policy makers to introduce targeted educational initiatives that can underpin and develop these behaviors.

The findings regarding the relationship between entrepreneurship education and intentions towards entrepreneurship and intrapreneurship were conflicting and call for further research. Previous research on the impact of entrepreneurship education indicates that this phenomenon is not well understood, and our findings add to the body of equivocal empirical results. While there was a positive association between entrepreneurship education in higher education and entrepreneurial intention, there was in fact a negative relationship with entrepreneurship education in secondary school and a non-significant relationship with such education in lower secondary school. Hence, with regard to the substantial efforts made to introduce such courses at all education levels in the recent decades, further research is necessary to advance our understanding of what actually takes place during and after an entrepreneurial pedagogical intervention.

A potential limitation of this study might be its context. The population comprised students of business, biology, maritime studies and engineering education at NTNU in M&R. The findings can accordingly not necessarily be generalized to other students at other education institutions or in other study programs. In addition, the explanatory power of entrepreneurship education in higher education should be studied further, as NTNU in Aalesund has two bachelor degrees in innovation. Hence, the correlation might be due to a self-selection bias whereby students who are already interested in entrepreneurship and innovation and have strong intentions to pursue this, are also the ones who apply for these courses. Furthermore, in order to address causality, cross-sectional studies have obvious limitations. To understand the impact of entrepreneurship education on its participants, longitudinal studies involving measurements both before and after courses are necessary.

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From entrepreneurship to intrapreneurship – the shift of students' intentions for entrepreneurial behaviour after a business planning course.

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Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course

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ABSTRACT

Purpose

The purpose of this paper is to examine the impact of entrepreneurship education (EE) on students' career intentions and preferences. While there is extensive research in which traditional survey scales have been applied to study students' entrepreneurial intentions, this study takes a novel approach by extending the construct of entrepreneurial intention to include preferences for intrapreneurship and team entrepreneurship. Furthermore, the application of conjoint analysis captures students' unconscious decision-making processes when presented with different career opportunity scenarios, thereby overcoming many of the limitations of self-reported survey measures.

Design/methodology/approach

The study applies a quasi-experimental design. A two-part survey combining a traditional questionnaire with conjoint analysis was distributed to students at two campuses of a Norwegian university, resulting in 99 matched pre- and post-test responses.

Findings

Two main findings arise from the study. First, there is a significant decrease in entrepreneurial intention among students in the EE course. Second, the conjoint analysis contributes to a better understanding of this decrease by illustrating how students shift their career preferences from

entrepreneurship to employment during the EE course. This suggests that EE provides a space for students' career reflections where they can explore, commit to and reconsider entrepreneurship as a career.

Research limitations/implications

A limitation of the study is that it focuses on a small sample of undergraduate students from two campus locations in Norway. Thus, further investigation is still necessary to establish whether the findings are valid in other contexts. The research has implications for higher educational institutions, policymakers and researchers in the field of EE.

Practical implications

The study contributes by means of a novel perspective on EE as a trigger for career reflection, a perspective that is important for educators teaching EE courses, as well as for higher education institutions who decide to implement EE in study programmes.

Originality/value

By focusing on the development of students' career preferences through conjoint analysis, the study expands knowledge on the impact of EE on students' careers, while also accentuating the value of the application of conjoint analysis in research on EE.

Keywords: entrepreneurship education, business planning, impact study, quasi-experimental design, conjoint analysis

1.0 Introduction

Entrepreneurship is recognized as an important factor for economic growth and prosperity (Audretsch et al., 2006; Baumol & Strom, 2007) and entrepreneurship education (EE) has been identified as one means of boosting entrepreneurial activity. In recent decades, there has consequently been a considerable growth in EE programmes worldwide at all education levels (Katz, 2003; Kuratko, 2005). The positive impact of EE on socio-economic development can be said to have become conventional wisdom, and it is reported that it can increase entrepreneurial intention (Fayolle et al., 2006; Kolvereid & Moen, 1997), entrepreneurial self-efficacy (Wilson et al., 2007) and entrepreneurial behaviour (Elert et al., 2015; Lange et al., 2007).

One of the most frequently employed pedagogical approaches in EE is business planning courses (Pittaway & Edwards, 2012). Positioned in traditional management theories, business planning courses provide a systematic approach to teach EE that aligns well with the academic tradition within business schools (Honig, 2004). The business planning approach has however been the subject of considerable debate among EE scholars and it is claimed that such courses do not prepare students for the real world of entrepreneurship (Honig, 2004; Jones & Penaluna, 2013; Neck & Greene, 2011). For instance, Neck & Greene (2011) argue that business planning courses belong to the process world of planning and prediction and places too much emphasis on ideas and on entrepreneurship as a linear process. They further argue that students spend a disproportionate amount of time honing secondary research skills rather than learning about actual practice and the complex, chaotic and non-linear aspects of entrepreneurship. With this criticism in mind, it is important to have empirical evidence about the impact of business planning courses in order to determine whether they are an appropriate EE pedagogy in a given context.

Despite this, empirical evidence on the impact of business planning courses is scant. Following Fayolle & Gailly (2015), one reason for this could be multiple teaching methods in EE courses, which complicate the disentangling of isolated effects of EE teaching approaches. However, EE impact research in general is also facing challenges. Research on EE impact has increased in parallel with the exponential growth in EE courses and yet the empirical evidence remains inconclusive and there is a lack of rigorous quantitative studies to support claims of an overall positive impact of EE (Bae et al., 2014; Lorz et al., 2013; Martin et al., 2013). Consequently, there have been several calls for more research to explain the contradictory findings of impact studies, for instance by including person-, context- and model-specific moderators. (Fayolle, 2013; Lorz et al., 2013; Nabi et al., 2017).

This study seeks to answer this call by providing novel insight into the impact of business planning courses in EE. Since business planning is one of the most frequently applied approaches in EE, it is

important to understand its impact. While there are several important outcomes of EE impact, this study takes a career development perspective. The study extends prior research on EE impact on entrepreneurial intentions by introducing intrapreneurship and the team aspect of entrepreneurship. Furthermore, it goes beyond analysing the mere increases and decreases in intention levels and explores the potential of EE as an arena for career reflection. The purpose of the study is to examine whether students' career preferences for entrepreneurial behaviour change during an EE business planning course. In this paper, entrepreneurial behaviour is defined as being an entrepreneur starting up a new venture or being an intrapreneur portraying entrepreneurial behaviour in an existing company. Career preferences refer to the relative importance of a career alternative compared with other alternatives. Thus, the study seeks to answer the following research question: *How does participation in a business planning course impact students' career preference for entrepreneurship and intrapreneurship?*

The study answers the call for more rigorous impact studies on EE by applying a quasi-experimental design with pre-/post-measurement and a control group. Data were collected at two Norwegian university campuses using a two-part survey with conjoint analysis. Conjoint analysis is a marketing research technique for capturing trade-off effects and unconscious decision-making processes (Hair et al., 2014; Orme, 2010). However, the application of this technique in EE impact studies is new and enables research on career choice mechanisms that have not previously been addressed in the EE literature.

Through the study, three main contributions are made. First, the study provides rigorous empirical evidence on the impact of business planning courses. The business plan as a pedagogical intervention has received criticism for being too linear and many have questioned its relevance to the education of entrepreneurial students. However, the empirical evidence for its effectiveness—or lack thereof—remains scarce. Second, the paper questions the widespread use of entrepreneurial intention in EE. By predominantly focusing on one aspect of EE impact on students' careers, there is a risk of neglecting the complexity of entrepreneurship as a career choice, its underlying decision-making processes and the potential of EE as an arena for career reflection. Finally, the study suggests a novel method for investigating the changes in career preferences triggered by EE. To our knowledge, this is the first application of conjoint analysis in the context of EE. The application of conjoint analysis provides valuable information about students' unconscious decision-making processes that cannot be captured by survey rating scales.

The paper proceeds as follows. In the next section, the theoretical background and hypotheses on EE and career impact are introduced. A description of the methodological approach follows, before the

quantitative findings are presented. The paper concludes with a discussion of the findings, their implications for practice and EE research and suggestions for further research.

2.0 Theoretical background and development of hypotheses

An important motivation for investing in the development and implementation of EE courses is the inherent assumption that EE will make students think and act more entrepreneurially in their future careers (O'Connor, 2013; Valerio et al., 2014). EE impact research has consequently focused on impact measures such as entrepreneurial knowledge and skills (e.g. Nabi et al., 2018; Volery et al., 2013), affect and entrepreneurial passion (e.g. Gielnik et al., 2017; Zampetakis et al., 2015), entrepreneurial self-efficacy (e.g. Huber et al., 2014; Karlsson & Moberg, 2013), entrepreneurial intention (e.g. Sánchez, 2011; Souitaris et al., 2007) early-phase entrepreneurship (e.g. Gielnik et al., 2015; Rauch & Hulsink, 2015) and venture creation (e.g. Gielnik et al., 2015; Gielnik et al., 2017). While the outcome measures are many and widespread, careers are a common denominator, since all of the outcomes above have or can have implications for the future careers of EE students. Findings on EE career impact are, however, conflicting and several scholars have called for more research to better understand the phenomenon of EE impact (Fayolle, 2013; Lorz et al., 2013; Nabi et al., 2017). Against this backdrop, three hypotheses are developed below on the impact of EE on entrepreneurial intentions, intrapreneurial intentions and career preferences, with the objective of advancing knowledge of the career impact of EEs.

2.1. Entrepreneurial and intrapreneurial intentions

There has been increasing recognition of the role entrepreneurship can play as an engine for development and economic growth (Audretsch et al., 2006; Baumol & Strom, 2007). Along with this realization, policymakers and scholars seek to understand more about the decision to become an entrepreneur. Research on entrepreneurial intentions has been important in this regard. The construct of entrepreneurial intention was introduced to entrepreneurship research through contributions by Shapero & Sokol (1982), Bird (1988) and Krueger et al. (2000) and can be defined as *“the cognitive state temporally and causally prior to the decision to start a business”* (Krueger, 2017). This implies that entrepreneurship is an intentional behaviour and that entrepreneurial behaviour can be predicted by the intentions towards that behaviour, which has been supported in empirical studies by, among others, Kautonen et al. (2015).

Entrepreneurial intention has also become an important construct in EE research. Today, EE is a priority area at educational institutions worldwide. One desired outcome of EE courses is that they should result in more start-ups after graduation. However, a major challenge for research on the relationship between EE and start-up rates is that, for EE students, starting a company will happen some years in the future (Fayolle et al., 2006). Thus, measuring the impact of EE on start-up rates becomes challenging. Entrepreneurial intention has therefore been suggested as an alternative measure to overcome this challenge (Fayolle et al., 2006; Liñán & Chen, 2009). Entrepreneurial intention is now a frequently applied outcome measure in EE impact studies; however, the empirical evidence remains conflicting. A meta-analysis by Bae et al. (2014) took a closer look at 73 studies on the relationship between EE and entrepreneurial intention and found a small significant positive correlation. However, when controlling for the intentions that students had before EE, the association was no longer significant. These equivocal findings and methodological deficiencies are also supported by a systematic literature review by Longva & Foss (2018), which found that there were only 10 studies with a rigorous experimental design on the relationship between EE and entrepreneurial intentions. Of these 10 EE impact studies, five reported a positive impact (Gielnik et al., 2015; Rauch & Hulsink, 2015; Sánchez, 2011, 2013; Souitaris et al., 2007), two found no significant difference (Nabi et al., 2018; Volery et al., 2013), one found both non-significant and negative impacts depending on the pedagogics (Varamäki et al., 2015) and two found a negative impact (Huber et al., 2014; Oosterbeek, et al., 2010). Accordingly, even if entrepreneurial intention is a frequently applied outcome measure in impact studies, empirical evidence on the impact of EE remains inconclusive. The reasons for the equivocal findings are poorly understood and need to be further researched. This study seeks to contribute to the knowledge base of EE career impact by examining the effect of participation in an EE business planning course and the following hypothesis is proposed:

H1a: At the end of an EE course, EE students will have higher entrepreneurial intention than at the beginning of the course compared with a control group that did not take part in the course.

The career impact of EE has traditionally been viewed as whether or not EE influences the decision to become an entrepreneur. This is in line with the entrepreneurial career choice decision of Katz (1992), which is defined as “the vocational decision process in terms of the individual’s decision to

enter an occupation as wage-or-salaried individual or as a self-employed one” (p. 30). However, entrepreneurial behaviour does not necessarily only take place in new ventures. A third alternative could be introduced to the entrepreneurial career choice, namely intrapreneurship. Intrapreneurs are individuals who act entrepreneurially within an existing organization (Pinchot III, 1985) and thereby use the same skill set as entrepreneurs to create value and help increase competitiveness for the organization they are employed in (Lumpkin & Dess, 1996; Miller, 1983). Intrapreneurship, which is also referred to as corporate entrepreneurship, has received increasing attention from scholars in recent decades and has developed into a sub-field of entrepreneurship (Antoncic & Hisrich, 2003; Corbett et al., 2013; Dess et al., 2003). The impact of EE on intrapreneurship has, however, been given less attention (Heinonen, 2007; Hytti & Heinonen, 2013). In entrepreneurship research, empirical studies on intrapreneurship intention have found it to be a separate construct from entrepreneurial intention (Douglas & Fitzsimmons, 2013), although this insight has yet to find its way into EE impact research. Since the objective of EE is to promote entrepreneurial behaviour in all organizations, and not only in new ventures (Bacigalupo et al., 2016), there is a need to examine the impact that EE can have on intrapreneurial intention. Thus, the following hypothesis is proposed:

H1b: At the end of an EE course, EE students will have higher intrapreneurial intention than at the beginning of the course compared with a control group that did not take part in the course.

2.2. Entrepreneurship education as an arena to explore career preferences

In empirical studies on the career impact of EE, the focus has, as reviewed above, traditionally been on career choice intentions, nascency or start-up rates. A perspective that has received little attention is the value of EE as a space for career reflection. Career reflection is the ability to reflect on personal capacities and motivations, which is an important career competency in the 21st century world of work (Akkermans et al., 2012; Kuijpers & Scheerens, 2006). From a career development perspective, EE can accordingly be seen as an opportunity for career exploration which, along with career commitment and career reconsideration, is one of three processes in the progress towards vocational identity (Porfeli et al., 2013). In career exploration, students' career reflections include both self-exploration and environmental exploration. This perspective is in line with the literature on entrepreneurial identity, which suggests that EE can serve as an arena for identity work (Blenker et

al., 2011; Donnellon et al., 2014; Hytti & Heinonen, 2013). There are also quantitative studies along the same lines that address the sorting (Fretschner & Lampe, 2018; Von Graevenitz et al., 2010) and alignment (Fayolle et al., 2006; Fretschner & Lampe, 2018) effects that EE can have on students' entrepreneurial intentions. The sorting effect refers to the mechanisms in play when students receive signals during EE regarding whether or not they are suited to entrepreneurship. The alignment effect emphasizes that students can receive different signals from the same EE experience and that these can decrease the intentions of students with very high intentions scores and increase intentions for those who had low intentions scores at the outset. Thus, while not directly addressing the concept of career reflection, previous research on entrepreneurial identity work and the sorting/alignment effect indicate that this indeed takes place. This suggests that EE can serve as an arena for career reflection in which students change and adjust their career preferences, and the following hypothesis is proposed:

H2: At the end of an EE course, EE students will have changed their career preferences to a larger extent than a control group that did not take part in the course.

3.0 Methodology

Empirical data were collected from students at two campuses of a Norwegian university in the spring of 2017. Impact studies on EE have received substantial criticism for not being methodologically rigorous (Bae et al., 2014; Lorz et al., 2013; Martin et al., 2013). To overcome methodological deficiencies, we employed a quasi-experimental design with ex-ante/ex-post measurement and a control group as described by Cook & Campbell (1979). The pre-test (T1) was conducted at the beginning of the EE course for both the treatment and control groups. The post-test (T2) was conducted immediately after the teaching component of the course had finished. None of the authors were involved in the teaching of the course. Sawtooth software (Sawtooth Software, Provo, UT) was applied for data collection and for computation of the results of the conjoint analysis. SPSS software (SPSS Inc, Chicago, IL) was applied for other statistical analyses.

3.1 Course description

The EE 'treatment' examined in the study is a business planning course offered to students at two campus locations which lasts for one semester (5 months). During the course, students receive theoretical input on how to develop ideas and start a company, but also work in groups to develop a business plan for their own ideas. The topics covered are evaluation of business ideas, business plan development, market prospects, competitor and sector analysis, business model development, intellectual property rights and basic financial analysis. The teaching methods include lectures, guest lectures, group exercises, workshops and case discussions. While the student assessment is wholly based on a business plan handed in at the end of the semester, students receive faculty guidance on written drafts and oral presentations several times during the semester. Students are also given the opportunity to participate in a business plan competition, in which they pitch their ideas to an external jury.

3.2 Sample

The study draws on a sample of 99 students, 44 of whom attended the EE course and 55 who did not. In the first week of the course, the survey was distributed to 150 treatment group students at both campuses and to 124 control group students in Aalesund. The survey was also distributed to control group students in Trondheim but, as the authors do not have access to lists of students at this campus, it is unknown how many of them received it. The students in the control groups were on the same study programmes as the treatment group (business, biology and engineering), but did not attend the business planning course. In the first round, we received 65 complete survey responses from the treatment group and 74 from the control group. In the second round, 52 survey responses from the treatment group and 73 from the control group were found usable for further analysis. Thereafter, respondents from the first and second surveys were matched according to an anonymous survey code that only the respondents knew. This resulted in 99 matched surveys for pre- and post-measurement, i.e. 44 for the treatment group and 55 for the control group. The sample characteristics of the respondents are presented in Table 1.

Table 1: Characteristics of survey sample (n=99)

Characteristic	Treatment group (n=44)	Control group (n=55)
Gender		
Male	20	12
Female	24	43
Age (years)		
19–22	18	31
23–26	19	15
27–30	5	3
31–34	1	2
35–38	1	3
39–42		1
Study programme		
Business studies	20	25
Biology studies	15	19
Engineering studies	9	11
City of study		
Aalesund	33	44
Trondheim	11	11

3.3 Measurement

The survey consisted of two parts: a conjoint analysis and a standard questionnaire. Conjoint analysis is a statistical technique from market research which is used to determine how respondents value different attributes in a decision-making process (Orme, 2010). In this study, adaptive conjoint analysis was used and respondents were presented with career scenarios comprising seven different job attributes developed in the work of Longva & Strand (2018), i.e. job description, income, working hours, location, job security, work environment and possibilities for personal career development. Each job attribute had three to four attribute levels. For example, the working-hour levels were 38, 44 and 50 hours a week. The students evaluated the attractiveness of different attribute level compositions of career scenarios, which resulted in a part worth utility for each attribute level at the individual level. Conjoint analysis thereby overcomes the challenge of rating everything at the higher end of survey scales by capturing the trade-off that underlies an actual choice. Hence, it offers a technique for obtaining a more realistic understanding of respondents' decision-making processes and for decomposing unconscious structures of the decision policies (Hair et al., 2014). While conjoint analysis has been suggested as a valuable methodology for studying decision making in

entrepreneurship (Lohrke et al., 2010; Shepherd, 2011), it has not yet been applied in EE research. This paper focuses on the attribute 'job description' in the conjoint analysis survey. The attribute levels for the attribute 'job description' were: (1) Entrepreneur—start a company alone; (2) Entrepreneur—start a company with two to five others; (3) Intrapreneur—intrapreneurial tasks in a permanent position in an existing company; and (4) Employee—non-intrapreneurial tasks in a permanent position in an existing company. The conjoint analysis captures the trade-off effect between the four career preference attributes and the relative importance of these pre- and post-test, thereby enabling a comparison of changes among the individual respondents.

The standard survey part of the questionnaire captured demographics, previous experience with entrepreneurship and intentions towards entrepreneurship and intrapreneurship. Two validated scales were used to measure items regarding entrepreneurial intention (EI) and intrapreneurial intention (II). The measurement of EI used a five-point scale of six items validated by Thompson (2009) to capture students' intentions to pursue entrepreneurship. The measure has a Cronbach's α -value of 0.841. The construct of II was developed from a three-item scale by Moberg et al. (2014) and measured on a five-point Likert scale. A fourth item, "Developing new products for the company I work for", as suggested by Longva & Strand (2018), increased Cronbach's α -value from 0.727 to 0.770.

4.0 Results

The analysis considers three EE effects. First, the impact of EE on EI is addressed, followed by the impact on II. Finally, the changes in career preferences are considered in order to test the potential of EE as an arena for career reflection.

4.1 Impact of entrepreneurship education on entrepreneurial and intrapreneurial intentions

The means and standard deviations of the intentions across the two time periods are shown in Table 2. In order to analyse whether there were significant changes among EE students that were not seen in the control group, a mixed between–within analysis of variance (ANOVA) was applied. For EI, there was no significant interaction between the two student groups and time and thus the analysis could proceed to interpret the main effects: Wilks' $\lambda=0.983$, $F(1, 97)=1.71$, $p=0.19$. The analysis of the main effects showed a moderate effect between the pre- and post-test results for the whole sample, Wilks' $\lambda=0.934$, $F(1, 97)=6.87$, $p=0.01$, partial $\eta^2=0.66$, showing a significant decrease

in EI. The main effect comparing the two groups was also significant, $F(1, 97)=65.36, p=0.000$, partial eta squared=0.40, indicating a large effect of EE participation following the guidelines for effect size interpretation suggested by Cohen (1988). The ANOVA analysis for II showed no significant change.

Table 2: Mean and standard deviation (SD) for entrepreneurial intention (EI) and intrapreneurial intention (II) across two time periods (n=99)

Intention	EE students (treatment group) (n=44)				Non-EE students (control group) (n=55)			
	Pre-test (T1)		Post-test (T2)		Pre-test (T1)		Post-test (T2)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
EI	22.00	4.65	20.64	5.29	14.73	4.13	14.27	4.06
II	15.98	3.20	16.00	2.57	14.24	2.40	14.47	2.40

The ANOVA results showed a significant decrease in EI among EE students that was not found in the control group. Accordingly, there was no support for hypothesis *H1a*, since EI actually decreased among EE students. With regard to II, there was no significant change among either EE students or the control group and hypothesis *H1b* was therefore not supported.

4.2 Impact of entrepreneurship education on changes in career preferences

The conjoint analysis provided the relative importance of the four career preferences for T1 and T2. For the EE students, the relative importance at T1 and T2 is portrayed in Figure 1. The Figure shows that starting a company alone was perceived as the relatively least attractive career preference at the beginning of the EE course, and the relative preference was even lower compared with the other three alternatives after the course. Starting up in a team was the most preferred career preference at T1, which was also the case at T2, but relatively less so compared with the other three alternatives. Being an intrapreneur was the second most preferred option at both test times, but the relative importance increased between T1 and T2. Finally, being neither an entrepreneur nor an intrapreneur

was the third most preferred option at both test times, but was perceived to be relatively more attractive after the EE course.

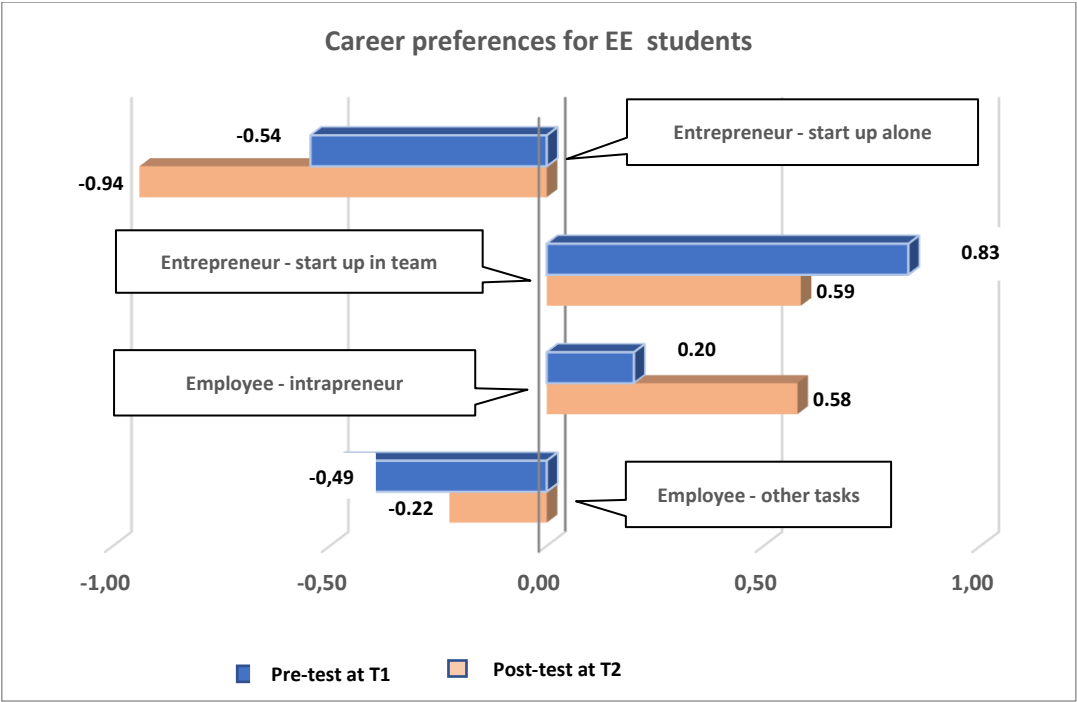


Figure 1: Zero-centred part-worth utilities for EE students at T1 and T2

In order to test the potential of EE as a career reflection intervention, a Wilcoxon signed-rank test was applied. The part-worth utilities did not meet the normality assumptions for the t-test and hence the non-parametric alternative was applied. The part worth for each career preference was ranked from one to four, where one was the most preferred career option and four the least. The results of the Wilcoxon signed-rank test are shown in Table 3.

Table 3: Results from Wilcoxon signed-rank test (n=99)

		Entrepreneur— start up alone	Entrepreneur— start up in team	Employee— intrapreneur	Employee— other tasks
EE students	<i>z</i>	-3.507 a	-1.660 a	-2.185 b	-2.623 b
	<i>p</i>	0.000***	0.097	0.029*	0.009**
Control group	<i>z</i>	-0.715 a	-0.188 a	-0.135 b	-0.293 b
	<i>p</i>	0.474	0.851	0.893	0.769

a. Based on negative ranks

* $p \leq 0.05$

** $p \leq 0.01$

*** $p \leq 0.001$

b. Based on positive ranks

The Wilcoxon signed-rank test showed a significant reduction for EE students in the preference for starting up alone ($z=3.51$, $p<0.001$, with a medium effect size of $r=0.37$) and a significant increase in the preferences for intrapreneurship ($z=2.19$, $p=0.029$, with a small effect size of $r=0.23$) and being an employee with non-intrapreneurial tasks ($z=2.62$, $p=0.009$, with a small effect size of $r=0.27$). Although there was a reduction in the preference for starting up in a team, the change was not significant ($z=1.67$, $p=0.097$). The same analysis for the control groups did not produce any significant differences in rankings between T1 and T2.

Thus, the ranking test shows that there were significant changes in the career preferences of the EE students for three out of four career alternatives. No significant changes were found in the control group. There is accordingly support for hypothesis *H2*, indicating the potential of EE as an arena for career reflection.

5.0 Discussion

This study set out to examine how participation in a business planning course would impact students' career intentions and preferences for entrepreneurship and intrapreneurship. With the rapid increase in EE courses at all education levels and in all education fields, it is important to understand the impact of different EE pedagogical approaches. The business plan as a pedagogical approach has been much debated, but is still poorly understood due to scant empirical evidence. This study examines the impact such a course can have on students' career intentions and preferences, and thereby contributes to a better understanding of the topic of EE impact.

The findings show that, for this sample, participation in the business planning course actually decreased the intention to become an entrepreneur. Previous qualitative research on the impact of business planning courses has primarily been rather positive (Bell & Bell, 2016; Jones & Jones, 2011; Russell et al., 2008) and the same goes for quantitative impact studies, where business planning is a component of the course (Nabi et al., 2018; Sánchez, 2011, 2013). Hence, the results of this study clash with those findings. However, in line with Gorman et al. (1997) and Henry et al. (2005), EE is not a black box to be thrown at students to produce the same result each time. EE needs to be adapted to the learning needs of the target students if particular learning objectives are to be achieved (Fayolle & Gailly, 2008). Thus, if the objective is to increase entrepreneurial intentions then business planning was not the right pedagogic for this sample. Perhaps do such courses have more impact on entrepreneurial intention when they are offered as part of a portfolio of EE according to the recommendations of Neck & Greene (2011). A business planning course also has other objectives besides merely increasing intention. Outcome measures of knowledge, skills and emotions can be relevant for capturing that particular impact.

The results did not show any change in intrapreneurial intentions among the EE students. However, when career preferences were introduced into the conjoint analysis they enabled insight into the evaluations students made about career alternatives. First, the conjoint analysis revealed that the preference for starting up in a team was perceived to be much more attractive than starting up alone both pre- and post-test. This highlights the importance of introducing the team aspect in EE, as it offers students an alternative to the stereotypic lone hero (Hytti & Heinonen, 2013). Second, the conjoint analysis results indicate a shift in students' career preferences from entrepreneurship to employment. Starting up a company alone became significantly less attractive compared with the three other career alternatives. The perceived attractiveness of starting up in a team also decreased, but not significantly so. The findings illustrate how students who perceived entrepreneurship as being less attractive after the EE course shifted their preferences towards employment either as an intrapreneur or without having intrapreneurship tasks. The preferences for both employment alternatives increased significantly from before to after the EE course. Thus, students do not necessarily dismiss the possibility of entrepreneurial behaviour in their future careers, but many would like to do so within an existing company. This might be due to students learning more on the EE course about the challenges of being an entrepreneur. Third, EE students reconsidered their preferences to a much larger extent than the control group. EE students showed significant ranking changes for three out of four career alternatives, while the control group showed no significant changes. This implies that EE can be an experience that makes students explore entrepreneurship as a career, reflect upon their career alternatives and either commit to or reconsider the vision of their

future careers, as described in the career development theory of Porfeli et al. (2013). By learning more about entrepreneurship as a career choice, their capabilities and opportunities in the workplace, EE can function as a career exploration intervention whereby students are triggered to consider who they see themselves as being in their future careers, i.e. their future work selves, as described by Strauss et al. (2012). This is in line with ideas on EE and identity work presented by Donnellon et al. (2014), Hytti & Heinonen (2013) and Blenker et al. (2011), who argue that EE can provide an opportunity for students to learn more about themselves through entrepreneurial identity work. The findings can also be interpreted in the light of empirical studies on the sorting and alignment effect (Fayolle et al., 2006; Fretschner & Lampe, 2018; Von Graevenitz et al., 2010). In this perspective, a decrease in entrepreneurial intention is not a failure of an EE course, but an indication that students have been allowed to explore entrepreneurship as a career choice and to make a more informed decision about whether it is suitable for them or not. Thus, the value of EE as a space for career reflection should not be underestimated, and is an important factor for both educators and policymakers to consider.

From a methodological perspective, an important insight from the study is that the application of conjoint analysis provided more nuanced findings than the traditional survey scales applied for intention measurement. While survey scales are able to indicate decreases and increases in intention scores, conjoint analysis is able to capture both the trade-off effects and unconscious relative preferences that students attach to different career alternatives. There has been a call for more research applying conjoint analysis in entrepreneurship research (Lohrke et al., 2010; Shepherd, 2011), and this study suggests that this can also be an appropriate methodology for studying EE impact.

6.0 Conclusion

This study has made two main contributions to the understanding of EE impact. First, it contributes to the limited body of empirical evidence on the impact of a business planning course on entrepreneurial intention through a methodologically rigorous impact study applying both pre-/post-test measures and a control group. The results revealed a decrease in entrepreneurial intention among EE students. Second, the study demonstrates the potential of EE as an arena for career reflection. EE students changed their preferences to a much larger extent than the control group students, and a shift from entrepreneurship to employment (both intrapreneurship and non-entrepreneurship) was observed in the conjoint analysis results. The perspective on EE as a trigger

for career reflection is an under-researched topic and should provide a fruitful direction in the continued exploration of inconsistent findings regarding the career impact of EE, as called for by Fayolle (2013), Lorz et al. (2013) and Nabi et al. (2017).

Our research has implications for educators, students and policymakers. First, for educators, it is important to consider the potential of EE as a trigger for career reflection. Whilst it may seem contradictory that students have reduced entrepreneurial intentions after an EE course, the experience can be important to their career development. Hence, educators need to be aware of the career reconsideration that might take place during an EE course, for instance by providing input for students' career reflection with perspectives of team entrepreneurship and intrapreneurship. Thus, if starting up a business alone is no longer a preference for students, entrepreneurial behaviour in other settings might still be. For students, the research highlights the importance of engaging in the experiences that EE provides and using them as an arena for exploring different career alternatives. For policymakers, the career reflection perspective has only been included in EE policies to a limited extent. The focus tends to be on increased venture creation and on the acquisition of knowledge, skills and attitudes for entrepreneurship. However, when making policies for higher education institutions, which tend to be rather theory-oriented, EE can be suggested as a counter-effect since it can be a practical and unconventional education experience that triggers students to reflect upon their future careers.

The research is not without limitations, which also indicate areas for future research. For instance, there was a small treatment group consisting of 44 matched respondents. The sample was drawn from two campuses at one university in the same country and EE students were exposed to one type of EE pedagogics. This has limitations for the generalization of the findings. Thus, more research is needed to replicate the research across other geographical locations and for other EE pedagogics. EE should not be treated as a black box, and other EE pedagogics could have produced different results in terms of both intention and career preference changes. Moreover, the post-test in the study took place immediately after the course ended. As there are indications that the long-term effects of EE differ from the short-term effects (Fayolle & Gailly, 2015), longitudinal follow-up after EE courses could provide new insight. A broader perspective on the career impact of EE is also a fruitful avenue for further research. While the literature on entrepreneurial intention has made important contributions to research on the impact of EE and provides a strong foundation, concepts such as intrapreneurship and social entrepreneurship should not be overlooked. Furthermore, career development theory is an established research field that could provide novel perspectives on EE impact research, for example through theories of career construction (Savickas et al., 2009; Savickas & Porfeli, 2012) or career identity (Ibarra, 1999; Skorikov & Vondracek, 2007). Finally, the application

of conjoint analysis in the study suggests that it captures trade-off effects and unconscious decision-making processes that are not revealed by survey scales. Thus, it is a methodology that should be considered in future studies on EE.

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Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process

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ABSTRACT

There has been a growing call to educate scientists and engineers in entrepreneurship. However, how entrepreneurship should be taught to these students is a question that scholars and practitioners are still intrigued with. Design thinking has been put forward as a pedagogy that could be particularly suitable when introducing entrepreneurship to science and engineering students. Empirical evidence to support this claim are scarce. This study therefore seeks to enhance our understanding of this issue through an exploratory case study of students' reflections during and after participation in a course that uses design thinking to teach entrepreneurial skills through a technologically challenging case. The findings indicate that the course constituted a major challenge for the students, but also an opportunity for developing both tangential skills and knowledge about the commercialization of technology. Further, there is evidence of transformational learning as students began to apply design thinking in real-life beyond the context of the course.

1. Introduction

In a volatile and rapidly changing world, students within science and engineering need to have advanced technological skills that meet the demands of our knowledge-based economy. However, scientific and technological skills alone are no longer enough to prosper as an employee in the 21st century (King, 2012; Litzinger et al., 2011). Scientists and engineers cannot solely rely on their technological knowledge but will also be expected to have skills in areas such as problem solving, creative thinking, written and oral communication and teamwork (Jonassen et al., 2006; Passow and Passow, 2017). It is also critical for them to understand how technology can be brought successfully to the market through commercialization (Barr et al., 2009; Bilán et al., 2005). Nevertheless, there have been indications that science and engineering students are not acquiring these skills in their education to the extent that they should (Jonassen et al., 2006; Male, 2010). Design thinking has been proposed as one way of teaching an entrepreneurial mind-set to students (Daniel, 2016; Neck and Greene, 2011; Nielsen and Stovang, 2015) and may represent a way of filling this skill deficiency. Design thinking has gained popularity within entrepreneurship education over recent decades (Huq and Gilbert, 2017; Lahn and Erikson, 2016). Yet, there is limited insight into how students perceive design

thinking as a teaching method. Hence, through an exploratory case study, this paper aims to address the following research question: *How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?*

In order to bridge the gap between science and engineering education and the skills that employees of the 21st century need, there has been a growing call from industry bodies to educate science and engineering students in entrepreneurship (e.g., European Society for Engineering Education, 2012, 2017). Introducing entrepreneurship to these areas of study has accordingly been given increasing attention both in practice and research (Duval-Couetil et al., 2012; Mitchell, 2007; Vest, 2005). With the rapid growth of the new area of engineering entrepreneurship education, there has also been a growing call for research and assessment of education within the field (Bilán et al., 2005; Täks et al., 2014). This is also an issue within the broader field of entrepreneurship education, where scholars are discussing how to teach entrepreneurship and which outcomes to expect from different teaching methods (Fayolle, 2013, 2018; Neck and Greene, 2011; Pittaway and Cope, 2007a).

This study takes a closer look at one teaching method, namely design thinking, that could be suitable for introducing entrepreneurship to science and engineering students. The context of the study is an

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interdisciplinary master's level course in corporate entrepreneurship. Corporate entrepreneurship is defined by the objectives of not only seeing opportunities for starting new ventures, but also of investigating opportunities for renewal or innovation within existing companies (Sharma and Chrisman, 1999). In the course, students were asked to find new entrepreneurial opportunities for a technological service. This required students to grasp both an understanding of the technology, its capacities and limitations, while at the same time searching for entrepreneurial opportunities. By analysing students' reflections during and after the course, we aim to contribute to a better understanding of the value of design thinking as a teaching method for entrepreneurship in general, and especially in a technological setting. As our research is exploratory in nature, it does not seek to categorically prove or disprove whether design thinking works as a pedagogy, but rather to guide the future direction of research on the topic.

The paper is structured as follows. First, we discuss entrepreneurship education and how design thinking has been introduced as a teaching method for entrepreneurship. We continue by describing the methodology used in the case study, before the findings are presented. The paper concludes with a discussion of the findings, our conclusions and the implications of our work for future research on design thinking in entrepreneurship education in general and engineering entrepreneurship education in particular.

2. Literature review

An enhanced understanding of the role that entrepreneurship can have in economic growth and job creation, has resulted in a substantial increase in entrepreneurship courses and programs in higher education institutions worldwide (Katz, 2003; Kuratko, 2005; Pittaway and Cope, 2007a). With the increase, a multitude of teaching approaches within entrepreneurship education has emerged, ranging from traditional courses that teach students about entrepreneurship, to process-oriented courses focusing on business plan development, to more action-oriented courses introducing for example, effectual entrepreneurship, learn start-up or design-based learning (Garbuio et al., 2018; Neck and Greene, 2011; Pittaway and Edwards, 2012). While some have argued strongly that entrepreneurship education should strive to be actionable, others have suggested a more processual approach where learning about, for and through entrepreneurship (Hannon, 2005; Jamieson, 1984) are not mutually exclusive, but are rather complementary pedagogies that can be present in the same course (Blenker et al., 2011; Thrane et al., 2016).

It is generally agreed that it is valuable to have elements of active and practice-based pedagogies in entrepreneurship education courses (Hägg, 2017; Neck and Greene, 2011; Rasmussen and Sørheim, 2006). The action orientation is often different to what the students are used to in other courses and thereby pushes them out of their comfort zones (Sidhu and Deletraz, 2015). Being outside one's comfort zone releases the potential of personal growth and development (Dweck, 2008) and can thereby lead to deeper learning (Marton and Säljö, 1976) and perspective transformation (Mezirow, 1991). As Mezirow (1991) describes, educators need to be facilitators of learning environments that promote transformation through critical reflection on assumptions and beliefs. The strong bias towards action orientation therefore needs to be counterbalanced with reflective thinking to avoid cognitive overload among entrepreneurship students (Hägg, 2017). Applied purposefully, action-oriented pedagogies are expected to prepare students for the real world (Neck and Greene, 2011). After all, in the words of Neck and Greene (2011, p. 55), "entrepreneurship is complex, chaotic, and lacks any notion of linearity", and entrepreneurship educators accordingly have the responsibility to deliver courses that develop the skills that students need to excel in highly uncertain and ambiguous environments.

Science and engineering students also need these skills as employees in the 21st century job market. While their education provides them with strong technological knowledge, they will also be expected to be

skilled in areas such as problem solving, creative thinking, communication, teamwork and commercialization (Bilán et al., 2005; Barr et al., 2009; Jonassen et al., 2006; Passow and Passow, 2017). However, there have been claims that science and engineering education is not providing enough opportunities to acquire these skills in its present form (Jonassen et al., 2006; Male, 2010). Entrepreneurship has been introduced as a way of enhancing the development of such skills in these areas of study (Duval-Couetil et al., 2012; Mitchell, 2007; Vest, 2005). The commercialization aspect has especially received increasing attention, as universities are becoming preoccupied with providing education programs that contribute to the establishment of new ventures or the creation of new business entities within existing companies through corporate entrepreneurship (Barr et al., 2009). The literature on the impact of entrepreneurship education on science and engineering students is limited (Huang-Saad et al., 2018). Although, there are contributions to this literature; for example, Duval-Couetil et al. (2012), who established that technology and venturing self-efficacy, ability to evaluate business ideas and risk tolerance is significantly higher for engineering students with entrepreneurship education than for those without. Further, Bilán et al. (2005) studied an engineering entrepreneurship course and found a significantly higher score for creativity, ability to generate business ideas and presentation skills in students after having taken the course. Maresch et al. (2016) compare business and engineering students, and find that although both have increased entrepreneurial intention after entrepreneurship education, the effect is less for engineering students than business students. They accordingly suggest that the pedagogy of entrepreneurship education should be adapted to fit engineering students better and that a design approach could be a means to do so.

Design thinking is a form of teaching that aims at generating new ideas and exploring alternative solutions, instead of picking between existing alternatives (Beckman and Barry, 2007). Multiple models of design thinking have emerged over the years as design thinking has spread from the design community to a variety of other fields (Dorst, 2011). In this paper, design thinking is portrayed in line with Brown (2008) as a series of five steps: empathize, define, ideate, prototype and test. Design thinking has been regarded as an efficient approach for tackling highly ambiguous situations and unveiling unanticipated problems very early (Fixson and Rao, 2014), and several scholars have argued for its value in management education (Dunne and Martin, 2006; Garbuio et al., 2018), in entrepreneurship education (Daniel, 2016; Garbuio et al., 2018; Neck et al., 2014; Nielsen and Stovang, 2015) and social entrepreneurship education (Kickul et al., 2018). Garbuio et al. (2018) state that students tend to easily handle well-defined processes that require analytical reasoning to reach a single answer with significant guidance from instructors. They argue that design cognition provides a way to introduce students to complex, ill-defined entrepreneurial problems with unclear means-end relationships, and thereby prepare them for what they will meet as graduates. Further, Penaluna and Penaluna (2019) argue that design thinking can be particularly relevant when introducing entrepreneurship education to study programs outside business schools, while Ranger and Mantzavinou (2018) highlight the opportunities it provides for non-traditional engagement with industry partners.

There has been an increased interest in understanding the processes and outcomes that take place when design thinking is used as a teaching approach. As a novel teaching method, the literature on design thinking in business education is still in its infancy. However, there have been studies conducted in other contexts that suggest that design thinking has the potential for making students in secondary education more agentic, inspired, interested in learning and developing themselves, helping them to master new skills and apply their talents responsibly (Carroll et al., 2010; Wagner, 2014). Nevertheless, the same studies indicated that there were also challenges in terms of collaborative learning and time pressure. In an entrepreneurship education context, Daniel (2016) carried out a comparative case study of design thinking

and business planning, and found that students in the design thinking course felt more motivated and content with their performance. Students were however less positive in terms of the activities in the course, the assessment methods and found the course too easy. As the study is based on students' programme evaluation through the university quality assurance system, there is less insight into why this was the case, and the study thereby highlights why using standardized evaluation surveys can be problematic when aiming to understand students' perspectives. Lahn and Erikson (2016) are also advocates for a design-based approach in entrepreneurship education and argue through a thematic analysis of master theses that entrepreneurship education through design appears to strengthen systematic self-reflection and learning, compared to master students that participated in start-up internships. Finally, Huq and Gilbert (2017) emphasize how design thinking can create a learning environment with humour and fewer barriers between students and teachers, empowering the students and thereby contributing to enhanced student satisfaction and learning outcomes.

Although empirical insights on design thinking are emerging within management education, its acceptance among students and teachers may still be questioned (Nielsen and Stovang, 2015). Much is still not well understood and there is a call for further research on student satisfaction and learning outcomes of design-led entrepreneurship pedagogy (Huq and Gilbert, 2017) and how it works in different contexts (Nielsen and Stovang, 2015). Thus, despite a growing interest in using design thinking in entrepreneurship education, there is still a need to explore in-depth how students perceive design thinking. This is the point of departure for this paper, which explores design thinking in a context that combines entrepreneurship education with the commercialization of technology through corporate entrepreneurship.

3. Research design

3.1. Research approach

The study applied a case study methodology (Yin, 2009, 2011) and was conducted at a Norwegian university during a master's level course in Corporate Entrepreneurship in 2015. The course had an intensive format and lasted five weeks. The data collection took place both during the course and after. The limited prior literature on design thinking in an entrepreneurship education setting guided our research design in the explorative case study. Hence, we based our data collection on the principle of triangulation, applying multiple sources of evidence in order to search for converging findings from different sources and thereby strengthen validity (Yin, 2009). The primary source of data was weekly reflective diaries written during the course and reflection essays handed in by the students after course completion. This was supplemented with secondary data, observations, and an interview with the teacher in order to better understand the context of the course.

3.2. Case description

The master's levels course in Corporate Entrepreneurship was run at a Norwegian business school. The intensive format of the course meant that the students were expected to spend the same number of working hours over five weeks that they would otherwise do during a whole semester. The course aimed to provide students with tools and methods in tackling complex problems at the corporate level. The learning outcomes of the course as published in the course catalogue are described in Table 1 below.

The teaching approach in the course relied on several practices substantiated by actionable theory (Neck et al., 2014) and were based on the design thinking process model described by Brown (2008) as a series of five steps: empathize, define, ideate, prototype, and test. The theory behind the course was largely kept hidden from students, as

discussed in Kamovich and Longva (2016), with the course instead emphasising the practical activities of searching and exploring for entrepreneurial opportunities. In an interview, the course teacher emphasized that in his opinion students learned best by *doing design thinking*, rather than *learning about design thinking*. Unlike more conventional university courses where students obtain static knowledge about existing theories and models focusing on "what is" and "what has been", this course required students to be active participants in creating their knowledge with a focus on "what might be" (Dunne and Martin, 2006; Nielsen and Stovang, 2015). The course teacher is a serial entrepreneur with a background from Stanford Graduate School of Business, where he was introduced to design thinking. Besides having a theoretical understanding of the design thinking concept, he also actively applied it in a social enterprise that spun out of the Hasso Plattner Institute of Design at Stanford University (commonly referred to as the d.school). He had taught design thinking within higher education for the 5 years prior to this course. In the course, the teacher was supported by a team of four teaching assistants, who all had previously taken several courses where design thinking had been used as a teaching method.

The students were from several different masters' programmes and had mixed backgrounds, including finance, military, computer science, hospitality, literature, public relations, law and an electrician. In the course, the students were divided into four teams and introduced to four different "real-life" problems prepared by a company. The company is a provider of ground station and earth observation services for polar orbiting satellites with its head office in Norway. The company's services are highly technical in nature and were outside the normal subject matter taught to students. The company agreed to partner with the course in order to create and explore opportunities for the applicability of their remote sensing technology. The technology served as a basis for formulating the initial problems in the areas of the company's interest. The problems varied from predicting macro-economic trends or benefiting commercial organizations to helping commodity or equity traders to make better investment decisions using remote sensing images. The initial problems the students were to tackle were perceived as ill-defined from the outset of the course; thus, mimicking a real-world situation where opportunities and the directions of projects are vague and uncertain. The students were introduced to an existing company's problem instead of working on their own, as this was a setting that many students would be meeting in the work place. However, the problem was ill-defined and needed to be re-defined by the students.

The course was divided into five thematic time blocks, each dedicated to one step in the design thinking process as described by Brown (2008). Despite such partition, the non-linearity and iterative nature of the process was emphasized, encouraging students to freely navigate between the steps. At times, the student groups were interrupted and forced to move onto a different step. In interviews with the teacher, he commented that he actively managed this and pushed student groups that had become stuck or stagnated on a single step to move onto a different thematic block. Design thinking is iterative in nature and implies going forth and back between the five steps in the design thinking process. The feedback loops and shifts that occur foster learning and assist students to make headway towards a solution for the problem space (Nielsen and Stovang, 2015).

Since each stage in the design thinking process has its own logic and requires its own concrete tools, the course employed different activities to introduce a number of tools and methods to support each step. For example, to increase students' aptitude for empathy, several exercises were used to teach them the value of observation. Another exercise introduced them to conducting in-depth interviews. The students paired up and started interviewing each other. They were asked to avoid closed-ended questions, ask for details, ask 'why?' questions at least five times, elicit stories and emotions, and take notes. Tools and methods such as a user journey map and process blueprint, prototyping, and

Table 1
Learning outcomes described in the course catalogue.

Knowledge and comprehension	<ul style="list-style-type: none"> ● Knowledge of the design thinking methodology, and how it can be applied in a corporate environment to develop innovative solutions. ● Comprehension of cutting-edge innovation topics such as crowdsourcing and human-centred design. ● Understanding of how corporate culture is developed and how it can be gradually and purposefully changed towards a more entrepreneurial mind-set.
Skills competence	<ul style="list-style-type: none"> ● Students should gain the necessary skills to inject any corporate environment with creative, innovative, and entrepreneurial solutions. ● Students should be able to serve as successful, creative change agents in business organizations of all types.

storytelling were also used. Unlike the DesUni model (Nielsen and Stovang, 2015) that allows for business-oriented tools and methods, this course did not employ any such tools.

Hence, from an ontological point of view, the course adheres to the “creation” approach in the entrepreneurship literature debate about the nature of opportunities. The creation approach emphasizes experimentation and the ability to learn from it (Alvarez and Barney, 2007), and students are accordingly required to exercise creativity, mental flexibility, as well as the willingness and ability to fail and learn from it (Garbuio et al., 2018). Thus, instead of assuming that opportunities already exist in the environment, design thinking focuses on making new ideas and opportunities emerge through deliberate practices (Nielsen and Stovang, 2015). In this article, given the corporate venture focus of the course with its ill-defined problems tackled by the students, the research took place in the context of entrepreneurial opportunity creation and relied on the design thinking process model by Brown (2008). Corresponding practical activities were used to master each step in the process and help students understand the underlying logic behind each activity. It is important to emphasize that this particular course uses a design thinking approach that has been adapted from design schools to management education. The approach has accordingly been criticized for oversimplifying design thinking (Dorst, 2011; Vinsel, 2018). While reviewing this debate is beyond the scope of this paper, it is important to bear in mind that the findings presented in the remainder of the paper stem from a particular view of the design thinking concept.

None of the authors were involved in teaching the course, although two of the authors observed much of the course. One of these authors acted as a teacher assistant for one of the groups. This involved meeting with the group to discuss the teams' progress once or twice a week. This contributed to a better understanding of how the students experienced the course.

3.3. Data collection

Since our research objective was to understand the students' perceptions of the experience of participating in a course that combines entrepreneurship and technology through design thinking, the primary source of data was weekly student reflective diaries and student reflection essays. The use of student reflections as a justifiable data source in entrepreneurship education has previously been established (Heinonen, 2007; Pittaway and Cope, 2007b). Students were assessed based on a reflection essay after the course, although there were no structured learning activities on reflection during the course. Six of the students in the course agreed to write weekly reflection diaries. These were handed in at the end of each of the five weeks that the course lasted, which resulted in 79 pages of written material. The reflection diaries were not a formal part of the course and were collected specifically for this research. The diaries were guided by questions addressing the students' own perceptions of learning for each week and reflections on the application of design thinking.

The second source of written reflections were the reflection essays handed in by the students two weeks after course completion as part of their formal course assessment. While two weeks after the course is a relatively short time, we consider it balances the need for reflection with the need for the course content and highlights of the course to be

relatively fresh in students' minds. From the 28 students participating in the course, 27 students gave us access to their individual reflection essays. This resulted in 229 pages of written material. Five open-ended questions were used to guide students' personal reflections. The questions revolved around the following themes: (i) Value behind the design thinking process; (ii) Major learning take-aways; (iii) Major challenges during the process; (iv) The application of design thinking in the future; (v) Distinction between design thinking and student's previous way of thinking.

In addition to the written student reflections, the data were supplemented with access to course materials, course descriptions, observations of teaching, observation of group work, as well as an interview with the lecturer in order to better understand the course specifics and the context.

3.4. Data analysis

Recognizing that qualitative analysis is cyclical art, we carried out first and a second cycle coding as suggested by Saldaña (2012). The coding process is illustrated in Fig. 1. The first cycle started with a descriptive coding strategy where the authors attempted to keep an open mind and summarize passages of qualitative data in basic topics using single words or short phrases. Two authors coded essays individually, while one author coded the reflection diaries. After coding five common essays, the coding in three of them was compared, revealing a high similarity in the use of codes. This resulted in an initial list of codes, which were used for the remainder of the essays and diaries. This cross-check of the initial essays allowed us to give sharper definitions, discuss equivocal cases, and do respective reliability checks, which led to the formulation of a common understanding around each code and its fit to the blocks of data (Miles et al., 2014). New codes were discussed and added to the list as they emerged. To aid our process of coding and analysis, we used the computer-based qualitative analysis program NVivo (version 11).

After the first cycle initial coding, we advanced to second cycle coding. With the initial codes from the first cycle coding in mind, we applied focused coding when re-coding the material in the second cycle. The objective of focused coding is to look for recurrent patterns and conceptual similarity among codes (Saldaña, 2012). While coding is a highly iterative process where it is necessary to revise and refine categories and themes throughout the analysis process, the main features of the process can be described as: 1) developing categories from the recoded material, and 2) structuring the categories to arrive at broader themes.

4. Findings

The coding of the data took us from 26 codes and 11 sub-codes in the first cycle coding, to four main themes developed from 12 categories in the second cycle coding. The main themes we arrived at are depicted in Fig. 2 along with the associated categories, and the findings from these are further described in the section below.

4.1. Being challenged

One of the themes that emerged first during our coding and re-

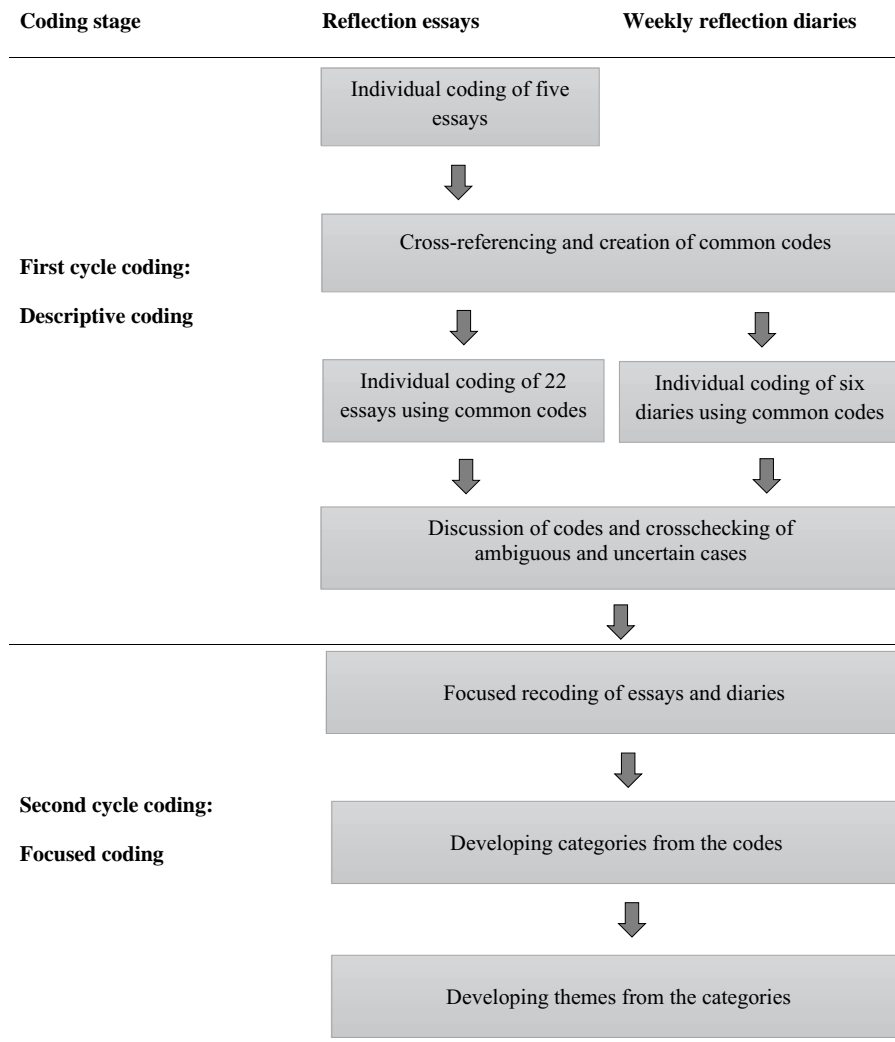


Fig. 1. Stages in the coding process.

coding was how challenging the students found the course. The combination of task complexity in terms of technical and financial knowledge, working in new and rather large teams with a flat structure, and being under time pressure, appears to have caused some frustration in the beginning of the course. One student said, *“I felt powerless, and the chaos led to physical stress, with mouth ulcers and a sore neck as results, to name a few.”* However, the same student said that over time, he became more comfortable, and in the end, he felt it was an overall positive learning experience. Hence, students also describe the course as a developmental experience that has had a fundamental impact. In one of the essays, a student writes, *“Yes it is challenging, and yes it is hard work - but all in all, you get to use your creative side, go out of your comfort zone and try new things.”*

4.1.1. Task complexity

The design challenge was highly technical and represented a substantial challenge for many students. Their ability to grasp two different sectors (satellite services and financial services industry) and attempt to search for profitable intersections in these proved to be a challenge for many. In one of the essays, a student writes *“one of our main challenges was as simple as knowing how we could utilize the technology [The Company] had to solve our task. The reason why we had this challenge was because we did not have knowledge within the group on how the technology worked. As a result of this, we did use a lot of time to understand the capacity of the technology.”* The students found the complexity of the task

in terms of technology and industry knowledge challenging at the beginning of the course. However, following the development in the learning diaries and reflections in the essays, it appears that most students eventually came to terms with the challenge after the first couple of weeks *“Even though the complexity of the assignment at first exceeded what I really thought could be possible, at the end, I had learned so much, and the team came up with several ideas for [The Company]”*. This seems to support the idea that design thinking could be valuable when training students to understand technology, its opportunities and its limitations, while at the same time having them search for commercial opportunities. The reflections suggest that the learning pushed them to the limit of their technical understanding, but that at the end of the course they felt they had come to grips with the technical element of the challenge.

4.1.2. Team dynamics

Teamwork and collaboration among the team was clearly a significant challenge for many students. Many referred to conflicts or difficulties within the team in their reflections. While they were accustomed to group work, the size of the groups was larger than normal, interdisciplinary and composed of students with whom they had not worked before. As stated by one student in the learning diaries: *“My group had members with different nationalities and many strong personalities. This affected the interaction increasingly throughout the process. Overall, I think you learn more about the challenges of working in a team*

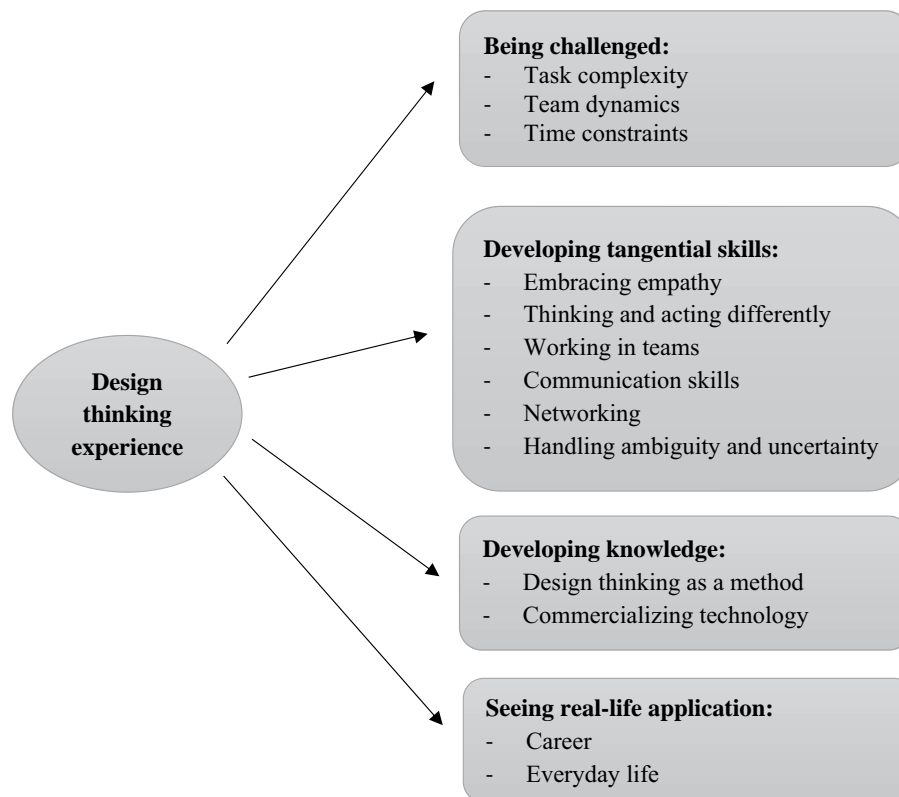


Fig. 2. Main themes with associated categories.

without a strong leader, than the design thinking method in itself. The group was quite divided at the end of the course and worked a lot to keep communication constructive.” Although teams did not experience critical meltdowns, the communication posed a challenge for many “...we mainly worked individually, communicating through social media, and it became more ‘I than ‘team’”. The lack of leadership was emphasized among many of students, as most teams had a flat structure and many were waiting for a leader to emerge. There were also indications of power struggles. The students saw the lack of leadership as frustrating and at times distracting from the overall design challenge. “Whenever I used to do a group-work in the past, there used to be a power hierarchy and structure in the group. I always had a specific task to do and I did that. Usually the teachers corrected what they thought wasn't good enough. This time it was quite different though. There was no structure at all and no interference from the teacher”. While it might be tempting to say the teachers should have stepped in and resolved the teamwork and leadership issues, it seems like this was a key opportunity for learning to take place. One student put it succinctly and summarised the team challenges by saying the course “demonstrates the challenges of implementing design thinking in [a] working environment and at the same time has shown how it works and which kind of challenges it brings”.

4.1.3. Time constraints

Another aspect that students reported as challenging was the time pressure due to the intensity of the design challenge. Several emphasized that time pressure was a major challenge, especially in combination with the complexity of the technology and working in a new team. A student states, “I think that for a task like this, we need more time. We just had five weeks on this challenge... If it is an easy challenge, you maybe not need that much time, but if the challenge is more complex, I definitely think that time is important. Concerning this [the Company] challenge, I felt we just had started when we were finished”. However, many students also saw the potential for learning time management through the induced time limits and one student writes in the final

learning diary week “The fact that the design thinking process has time limit indicates that there is a need to manage the time and get things done quicker than we have been doing. We need to push the prototype out to the market as soon as possible because the empathy drawn on the prototype is as important as the first empathy phase. We had been hearing this a lot in the theory, but the need was much more evident when we actually did it.” Hence, while the time constraints were a factor that really challenged the students, it was a learning opportunity where students could feel a sense of achievement in mastering the challenge despite the demanding time limits.

4.2. Developing tangential skills

As presented above, the challenges that the students met were demanding, but also a foundation for learning. There were many reflections on this in the data, but the main categories turned out to be embracing empathy, thinking and acting differently, working in teams, communication skills, networking and handling ambiguity and uncertainty.

4.2.1. Embracing empathy

Throughout the essays and diaries, there are compelling indications that learning about and practising the empathy skillset was a central feature of the course. When discussing empathy, several students coupled it with their take-aways. For example, “... I really think that any business, or person for that matter, is lost without empathy to either customers or other people, may they be co-workers, employees, friends or just random people. The importance of being able to put yourself in the shoes of another person and trying to see things from her perspective, is priceless”. Another highlighted: “Looking back, I cannot really see how I did not make the connection at once. Now, it is so clear, so obvious; the key to making powerful innovations is understanding and addressing human needs.” The students' reflections illustrate that going through the design thinking process enabled them to embrace a human centred focus and its importance in the entrepreneurial process and other areas.

4.2.2. Thinking and acting differently

Another issue that emerged was how the students contrasted the design thinking process with traditional university education. For example, *“it was quite challenging to get rid of the scientific way of working with a problem and open up for creativity with no theoretical rules on how to solve this assignment”*. Several highlighted the dominance of the scientific method in previous education and that it was challenging to leave the idea of following strict rules for a predefined problem. Instead, they were allowed to define the problem area themselves and discover what the actual issues were, which made them question the limitations of traditional education. It was also experienced as a change of perspective to focus on creating value in the real world instead of focusing on academic measures. A student states, *“This was a really valuable experience for me, because it seemed like no one cared about their own grades; all they cared about was what value we could provide to [the Company].”* In terms of impact, one student writes in the learning diaries *“The insight for me this week is that design thinking process is really worth it. I really believe that it won't be exaggerating if I said this course is a life changing experience for me. It has changed the way I think and the way I look [at the world].”* Overall, the data from students paint the course in the light of having been a developmental experience for the most of them that has changed the way they see the world.

4.2.3. Working in teams

While many emphasized that working in teams was a major challenge, this is also highlighted as a learning opportunity to develop teamwork skills. Some teams worked quite well, and one student describes in the reflection diaries how this surprised her when she was the one holding the final presentation, and everyone stayed until late to help practice. She states *“This was an extremely unique experience for me, as I have always felt alone on presentations prior to this challenge, but now I really felt that I had the whole team in my back. They were amazing.”* Many students describe how positive team experiences will guide how they work in teams in the future. Others had a more challenging time and reflected more on how they would do things differently in the future. One student describes *“Well I've become better at remaining calm and constructive in a very challenging team. Further, I believe it was confirmed that those who talk the loudest is not necessarily those who say the wisest things. If we as a group had made use of everyone's knowledge, we would have come much further, and the solution would have been better.”* The students were accordingly reflecting on their experiences, good and bad, and thinking about how they would focus on team dynamics in future studies and careers.

4.2.4. Communication skills

Several emphasized that they had developed their communication skills when communication took place within the team. In the reflection diaries, one student describes communication in the ideation process *“I learnt that communicating a lot in the group and adding up to people's idea can lead to ideas that would have otherwise been quite elusive. Sometimes, to me, it felt like I knew nothing about certain things. Then we did an ideation session where one of us had an idea and we all built up to that idea. In the process, new and supplementary ideas began to flow in dramatically.”* However, communication skills were also challenged when aspiring to reach informants, doing interviews, as well as during the final presentation for the company. Students reported that they had trained and developed their enquiry skills. Many emphasized the challenge of gaining in-depth information rather than superficial information. In the first week, a student writes in his diary *“I learnt some techniques of drilling down while communicating. Building up a personal touch in communication might be quite fruitful while communicating. Starting up a communication with something exciting or catchy is often better to get the interest of the other person.”* Hence, both communication within the team and communication towards external actors were highlighted as important learning experiences by the students.

4.2.5. Networking

Since the design challenge required students to make contact with people that were not connected to the course, many reported that they had made use of and advanced their networking skills. It also opened their eyes to the value of a good network when searching for information. A student had the following reflections in the second week of the reflection diaries *“The main thing I learned during this week was that I can receive much more information from the different people than I can [by] search[ing] by myself.”* The students did not just advance their networking skills; they also reported having extended their network with fellow students, contacts in the company, and key individuals when searching for information outside the company. A student reflects, *“No doubt this course helped me to extend my network and I'm sure that it will bring result not only in a short-term outlook like obtaining the job but also in a long-term perspective.”* The course appears to have enhanced their understanding of the importance of a network, contributed to their networking skills, and extended the students' networks.

4.2.6. Handling ambiguity and uncertainty

The design challenge was intended to put the students outside of their comfort zones, and this forced them to try to cope with ambiguity and uncertainty. In the reflection diaries, one student describes the beginning of the second week this way *“In the very beginning of this week I had the only one thought in my head: “I understand that I don't understand anything”. It was like a mess.”* However, as the course proceeded, many students also expressed the feeling of mastery in handling ambiguity and uncertainty as they learned to live with it. One student reflected upon this in her final reflection diary week: *“What I have learned will always be helpful in a real-life setting, accepting that ambiguity and uncertainty is not bad, that feeling demotivated and stuck is sometimes what you need to open your mind to other possibilities.”* Hence, it seems that this student felt more prepared for dealing with ambiguity and uncertainty in the future after experiencing the design thinking course.

4.3. Developing knowledge

The design challenge introduced students to new technologies, industries, and methods. This was emphasized as an important aspect for developing knowledge in the students' reflections. The categories that emerged as especially important during the analysis process, was knowledge of the commercialization of technology and the design thinking process itself.

4.3.1. Commercializing technology

Getting to know a large technology company along with the satellite and finance industry was highlighted as an important experience in the course. Some describe acquiring new technological and industry insight *“But the fact that these satellites are orbiting around the earth in a different speed, depending on their altitude, was new to me. I think this industry is really exciting and especially when I feel that I learn new things every week.”* More importantly, many of the students also reflected on the commercial opportunities that the technology could have and saw possibilities for value creation. Students were seeing opportunities for applying the company's technology for the aviation industry, environmental organizations and the farming industry. One student stated, *“I came to know that, among others, one good potential use of satellite images was to use it in agriculture to do precision farming. Here, the satellite images can be used to determine which part of a large tract needs more nutrition and which part is doing well”*. Hence, while students were acquiring technological knowledge, they were also developing insight into how to commercialize technology within a corporate setting.

4.3.2. Design thinking as a method

The students' reflections on design thinking as a method focused on the tools or steps that were used during the course, as well as the philosophy behind it. Although the level of reflection varied, a vast

majority of the students showed good comprehension of the theory behind design thinking. They were not only repeating the theory back but were also critically reflecting on the reasoning behind it and its applicability. For instance, they interpreted the method in their own way with quotes such as *"I have concluded that design thinking is a sensational method that uses the discipline of the designer's sensibility to match people's needs with what is technologically feasible and what a viable business strategy with customer's insights can convert into products or services."* However, there were also some critical reflections on the use of design thinking. Some highlighted that it was not learning the process itself that was most important, but rather the skills they developed by using it. Further, there were also reflections about its appropriateness for different challenges, and one student described this in relation to the complexity of the challenge *"...this week I have learned some potential flaws in the Design Thinking process, and I have realized and learned more about our own mistakes and 'shouldhaves'. For starters, the time restriction in the Design Thinking process didn't quite fit with our challenge."* However, in general, the students highlight the value of design thinking as an alternative to traditional teaching and problem solving methods. One student summarised this as *"The design thinking methodology is not a linear process where you start in one end and keep on going straight forward until you hold the finished product in your hands. You will have to go back and forward between the different stages of design thinking, and make changes to the idea and prototype."* The iterative process and the customer focus appears to have made an impression on students, and several also emphasize the focus on taking action and failing quickly as a new insight for them, as opposed to spending large amounts of time on planning before taking action.

4.4. Seeing real-life application

When discussing real-life applications in the reflection diaries and essays, students focused on how the design thinking process could be relevant for them in current jobs, future jobs, in extracurricular activities, and even in their private relationships. That students were immediately and voluntarily applying lessons learnt to their personal and professional lives stands out as an important impact of the course.

4.4.1. Career

Several of the students saw a potential for applying what they had learned in the course in their present or future careers. This concerned both the skills they had acquired, as well as the knowledge of technology, commercialization and the design thinking process. One student wrote in the final reflection diary week *"we can apply the things we have learned this week in our daily work when we read a lot of information and we have to use only the most important. We can prototype everything we want from an idea to a new product or business. After this project we have more knowledge about the process, and we could apply it for every new project or idea."* Others saw the potential of using insights from the course in their current start-up *"The innovation process is about giving the customer what they need by first defining what this actually is. This was very useful, and I will use it myself. It is apparent that you get a lot of insight if you dare to contact the right people and ask 'stupid' and clever questions."*

4.4.2. Everyday life

The students also saw potential for using what they had experienced in everyday life and some reported doing so both during and after the course. In the reflection diaries, one student writes, *"Also, the course has been quite influential for me as it has got me looking for rooms for improvement in everyday life. From idea of having a foot stand on the back of seats in public buses where passengers sitting can put their legs on, to installing a bus schedule at the airport, I've empathized and found out what problems users are facing and what could be done to comfort them using some tools of design thinking process within my mind."* One student had already used the design thinking process in discussions at a parent meeting at her daughter's school, while others emphasized their

training in communication skills was valuable for personal relationships in general *"Generally, ability to listen the other persons and ask right questions can help not only in the professional environment. These skills are absolutely necessary both in marriage and in the other areas of our lives."*

5. Discussion

Reviewing the results of the students' reflections demonstrates that they have learnt both the design thinking process and acquired knowledge about how to commercialize technological opportunities. This is perhaps not surprising since knowledge of these topics was specified as a learning outcome in the course description. It is an important insight that students confirm this in their reflections, but it was also something that could be expected due to the course description.

The part that seems to have been most significant for students is real world learning, which might also be considered as a tangential benefit of participating in the class. This is demonstrated through learning what we label as tangential skills. Students report that they have embraced the concept of empathy during the process and learnt to take and understand others' perspectives. Further, they describe improvements in their communication skills, their networking skills, and their team working skills, and feel more prepared to handle ambiguity and uncertainty in the future. Finally, students state that the course experience has actually changed their perspective and taught them to think and act differently. Several describe this as a contrast to other courses in their degree, where they are used to pre-defined problems with rules to follow in order to solve them. There were no structured learning activities targeted specifically at acquiring these tangential benefits. Rather, they seem to have appeared as a result of the experience itself and the context it took place in. These tangential skills are similar to the entrepreneurial competencies described in the EntreComp framework (Bacigalupo et al., 2016) which are essential in the 21st century job market, especially for engineers and scientists who are expected to contribute to developing new and improved products and services (Duval-Couetil et al., 2012; Vest, 2005). Newly qualified engineers and scientists will not meet pre-defined problems that traditional analytical approaches to education have tended to focus on, but will face ill-structured challenges where novel solutions must be developed. Hence, the skills identified by students in this study are exactly those that industry are calling for in new graduates. Industry will require workers who are not only technically competent but have human skills. Design thinking in this context has demonstrated that it can be a fruitful training ground for teaching such skills in a technological environment and thereby introducing so called soft skills to students of hard sciences. The students' reflections provide encouraging support for the claims made by those pushing design thinking as a pedagogy for training business, engineering and science students of the future.

The tangential learning that has occurred here is consistent with results reported from other types of experiential learning in entrepreneurship education (Täks et al., 2014). This fact raises the question, are the positive results experienced from a design thinking methodology specifically related to design thinking, or are they results that are the consequence of students taking a greater cognitive ownership of their learning through active experimentation, concrete experiences, reflective observation, and abstract conceptualization as described by Kolb (1984). Our findings do not suggest that design thinking is the best way to teach entrepreneurship, but rather as one of the approaches that appears to support the development of entrepreneurship skills, as well as several generic skills through tangential learning. Yet, the findings suggest that this particular course enabled students to develop these skills, while acquiring a user- and human-centred perspective when solving commercialization problems for technology. Entrepreneurs, and scientists and engineers alike, should strive to create opportunities by understanding the perspectives and latent needs of people they are designing for (Dunne and Martin, 2006; Neck et al., 2014). Design thinking is particularly valuable to promote

this, as it places the user at the centre and encourages students to understand users' needs, acts and thoughts on a deep level (Nielsen and Stovang, 2015). We observed that some students struggled and felt uncomfortable, especially at the beginning of the process, to engage with users and stakeholders. However, towards the end of the course students appeared much more comfortable in this process of finding user needs, which suggests that they have acquired a more human-centred perspective for the technology they were working with. The student's engagement in the task appears to be consistent with them being on a "mission" as described by Amabile and Kramer (2011). Whereby the combination of an important task and time pressure combines to result in creative work. Balancing this sense of urgency so as not to be overwhelming appears to have been a delicate task that the teacher has actively managed.

Another important finding from the reflection material is the fact that the students are not only repeating theory and describing experiences, but are reflecting on underlying principles, critically evaluating the knowledge, and are seeing applicability for the learning experience beyond the course. They describe application both in their everyday life when noticing disharmonies that can form the basis for entrepreneurial opportunities (Blenker et al., 2011), as well as in their present careers and in their vision of their future careers. In the words of Marton and Säljö (1976), the students appear to have moved beyond surface learning and approached learning at a deeper cognitive level. In fact, for several of the students the learning appears to have been transformational as described by Mezirow (1991). They describe their new insights as something that has changed how they view themselves (psychological transformation), how they see the world (convictional transformation), as well as how they actually act (behavioural transformation).

Finally, the challenge aspect of the course received substantial attention in the students' reflections. Traditionally, it has been considered that the teacher's role should be to make learning as easy as possible for students in order to motivate and engage them. The students' reflections tell an alternative story. The reflections emphasize the difficulty the challenge provided to them, and nevertheless describe their motivation and engagement in the task. Hence, it appears that the students found it valuable exactly because it was challenging. By introducing them to a demanding challenge that combined a technical topic with a commercial focus, it has forced them to grow as individuals by rising to the challenge. This is an aspirational outcome for a course, suggesting that students might experience personal growth, and is demonstrated here by quotes from students saying that they will take the learning experience with them for the rest of their lives. One of the ways that we grow as individuals is by having small crises and learning to overcome them (Dweck, 2008; Erikson, 1980). However, developmental experiences do not need to be as profound as a mid-life crises or religious conversion in order to bring about developmental experiences (Krueger, 2007). The course seems to have been an example of how challenges might be used as a form of learning experience. Discussions with the teacher leading the course suggested that this sense of challenge was something he created intentionally, with an awareness that it would force students to rise to the challenge. As described by Sidhu and Deletraz (2015), the course pushes students out of their comfort zone and into the challenge zone. However, if students move too far from their comfort zone, they may end up in a panic zone, feeling overwhelmed and resulting in a negative learning experience. There were indications of this at the beginning of the course, where students described both psychological and physical stress. At the end of the course, most students appeared to have come to terms with the challenge and reported that they felt a sense of achievement. However, for educators it is important to find the right balance between challenge and mastery in such courses. Students may need a push out of the comfort zone, but there should also be a level of support to avoid the panic zone, as well as opportunities for reflection. Reflection is a key component to transform experience into knowledge and can, according to Hägg (2017),

counteract cognitive overload that may arise when novice learners are introduced to complex problems. Seeing that the assessment in the course was a reflection essay, teaching reflection through structured learning activities is something that could be more emphasized in such courses in order to avoid the panic zone. The real world of entrepreneurship is demanding, as is the workplaces for scientists and engineers. Thus, pushing students out of their comfort zone in a safe educational setting can contribute to preparing them for the real world.

Hence, through the design challenge, the students have developed knowledge of the design thinking process, the commercialization of technology and have acquired tangential skills. Although, no student specifically stated having developed an entrepreneurial mind-set, there is ample evidence that this has occurred. Their ability to look for opportunities for the application of technology, and to identify which might have commercial potential comes through as themes in the above findings. An entrepreneurial mind-set is defined as the ability to rapidly sense, act, and mobilize, even under uncertain conditions (Ireland, Hitt, & Sirmon, 2003). This closely describes the process the students went through during the course, starting with unclear instructions, sensing potential opportunities, following those up with potential customers, gaining feedback and synthesising this into a coherent understanding of the commercial applications of a technology. This approach is the kind of entrepreneurial mind-set that will be required of engineers working in industry in the future. They will need to be able to sense where the commercial value lies, to quickly prototype such ideas, and work within interdisciplinary teams to generate results (Duval-Couetil et al., 2012). It is important that students practice working in such a setting. The course appears to have provided the arena to do so, and the students appear to have been engaged and to have enjoyed the opportunity to learn in this manner.

6. Conclusion

Design thinking has been suggested as a promising approach to teaching within entrepreneurship education. This study aims to add to the limited body of research on this topic by investigating how students reflect upon the experience of participating in a course that combines entrepreneurship and technology through design thinking. The data suggests that students found the course valuable and engaging. Four main findings emerged. First, the students highlighted their development of knowledge and skill as an important part of the experience. The reflections emphasized development of knowledge regarding the commercialization of technology, as well as of theoretical aspects of design thinking as a method. Further, much of the learning was tangential in nature, and was therefore based on developing generic skills such as teamwork, interpersonal communication, networking, empathy, changing ways of thinking, and gaining experience with ambiguity. Another important finding was that the students felt that much of the value stemmed from the challenge that the course represented. This might be somewhat counter intuitive, as making learning easy appears to be a more natural approach. However, students found the challenge to be of value in itself. Finally, the students appeared to have gone beyond superficial learning, as it appeared to have been deep and transformational. Students reported that they were thinking and acting differently due to things they had learned in the course and were also seeing potential for applying what they had learned in real life and their future careers.

The findings provide novel insight into students' experiences and reflections during and after participating in a course, which combines technology and entrepreneurship through design thinking. Our findings have implications for how science and engineering students can be taught about entrepreneurship in an engaging manner. While traditional entrepreneurship courses can be something that feels unfamiliar for students in these areas of study, they might feel more at home in a course with a technological context that challenges them to find commercial opportunities for the technology. Hence, students learn that

entrepreneurship is not only about starting a new venture but can also involve corporate entrepreneurship in existing companies. The design thinking method provides an opening for learning to focus on the user of the technology rather than the technology itself, and thereby implies a change of perspective for study areas that are traditionally product focused. As a result, we believe that these nuances are important for educators to keep in mind when planning entrepreneurship education courses for science and engineering students, as well as for policy makers who aim to promote entrepreneurship and the development of generic skills within these areas of study.

The study is not without limitations. First, we acknowledge the challenge of using reflection essays that were part of the students' formal course assessment. To address this limitation, the data has been supplemented with weekly learning diaries that were collected only for the purpose of research and that were not accessible to the teacher. The data collection also included observations, access to course material and an interview with the teacher. Second, critical thinking was encouraged throughout the course and also in the reflection essays. Hence, the grading was not dependent on whether students were positive or negative towards the course, but rather on their abilities to reflect on their experiences. The reflection essays were written two weeks after the course finished. While the students had the course fresh in their minds when writing the reflection essay, it would be valuable to have follow-ups in future research to see whether the course impact was temporary or lasting. Moreover, we acknowledge that the course in question is based on a particular approach to design thinking positioned within business education. As there are different approaches to teaching design thinking in higher education, empirical studies of other courses could provide other findings. Finally, this study was limited to one five-week course in a specific context. To further support the findings, it would be valuable to compare this course to other pedagogies used in entrepreneurship courses for engineering and science students.

Our study also suggests avenues for future research. First, there is a need for more studies on entrepreneurship education for science and engineering students in general, as the existing body of literature is scarce. Further, the potential for multiple case studies of entrepreneurship courses across different contexts is mentioned above, as it would allow for comparison of course characteristics, learning processes, and course outcomes. It would be valuable to understand if our findings are specific to this approach to design thinking or if they would be similar in courses applying different approaches to teaching design thinking or using other experimental learning pedagogies. Also, while our exploratory study indicates promising outcomes for this particular course, there are always opportunities for improvement. Introducing alternative assessment strategies beyond written essays and providing structured learning activities for developing reflective thinking could be some suggestions for course development. Following-up on such course changes could thereby be an opportunity for research. Moreover, the role of the teacher is a potential venue for further research. As the role of the teacher often is more a coach or a facilitator in such courses, more knowledge is needed on the teachers' perspectives and how this influence the way they are teaching. For example, how do they reflect upon challenging students to go out of their comfort zones? And are there differences in how someone from a design background and someone from a business background would teach design thinking? Finally, doing larger quantitative studies applying randomized or quasi-experimental design would enable generalization of the findings and could provide important insights into the impact of contextual factors such as culture, course duration, teachers' roles or team dynamics.

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APPENIDICES

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APPENDIX I – SIGNED CO-AUTHOR STATEMENTS



AUTHOR DECLARATION

14.08.2019

Paper title: Measuring impact through experimental design in entrepreneurship education: a literature review and research agenda.

Authors: Kjersti Kjos Longva and Lene Foss.

Authors' contributions:

Kjersti Kjos Longva is the first author of the paper and had primary responsibility of all developmental phases of the paper. She developed the idea for the paper, the research design, conducted the systematic literature search, analysed all articles and prepared the manuscript. Lene Foss is the second author of the paper and contributed with critical revision of the content of all finished paper drafts.

Developmental phase	Kjersti Kjos Longva	Lene Foss
Concept and idea	x	
Study design and methods	x	
Data collection	x	
Analysis and interpretation	x	
Manuscript preparation	x	
Critical revision of the intellectual content	x	x

With my signature I confirm the contributions of each author to this article and consent that it can be a part of the PhD thesis of the other authors.

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AUTHOR DECLARATION

14.08.2019

Paper title: Entrepreneurship education as an arena for career reflection: the shift of students' career preferences after a business planning course.

Authors: Kjersti Kjos Longva, Øivind Strand and Mark Pasquine.

Authors' contributions:


Kjersti Kjos Longva is the first author of the paper and had primary responsibility of all developmental phases of the paper. Øivind Strand is the second author of the paper and contributed with advice on concept development, interpretation of the statistical analysis and critical revision of the content of all finished paper drafts. Mark Pasquine is the third author of the paper and contributed with advice on study design, interpretation of the statistical analysis and critical revision of the content of the final paper draft.

Developmental phase	Kjersti Kjos Longva	Øivind Strand	Mark Pasquine
Concept and idea	x	x	
Study design and methods	x		x
Data collection	x		
Analysis and interpretation	x	x	x
Manuscript preparation	x		
Critical revision of the intellectual content	x	x	x

With my signature I confirm the contributions of each author to this article and consent that it can be a part of the PhD thesis of the other authors.


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AUTHOR DECLARATION

02.07.2019

Paper title: Combining technology and entrepreneurial education through design thinking: students' reflections on the learning process

Authors: Matthew Lynch, Uladzimir Kamovich, Kjersti Kjos Longva and Martin Steinert

Authors' contributions:

Matthew Lynch, Uladzimir Kamovich and Kjersti Kjos Longva all contributed equally to the paper and share first authorship. The three authors have contributed in all developmental phases of the paper as illustrated in the table below. Martin Steinert contributed with input in the manuscript preparation phase.

Developmental phase	Matthew Lynch	Uladzimir Kamovich	Kjersti Kjos Longva	Martin Steinert
Concept and idea	x	x	x	
Study design and methods	x	x	x	
Data collection	x	x	x	
Analysis and interpretation	x	x	x	
Manuscript preparation	x	x	x	x
Critical revision of the intellectual content	x	x	x	

With my signature I confirm the contributions of each author to this article and consent that it can be a part of the PhD thesis of the other authors.

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APPENDIX II – PRINTED VERSION OF THE SURVEY

Thank you for participating in the survey.

The survey has questions about what you value as important in a job after graduation, in addition to questions on your attitude towards entrepreneurship, intrapreneurship and internationalization.

It takes about 15-20 minutes to complete the survey. If you complete the survey, you will have the opportunity to participate in a prize draw of 1 gift card of NOK 1.000 and 4 gift cards of NOK 500 for Amfi Moa/www.dittgavekort.no.

All personal data will be treated confidentially and answers will be anonymized. E-mail addresses will be registered separately from the survey answers, and it will not be possible to identify you and your answers in the results from the study.

The survey is part of a Ph.D. project at NTNU. The survey has been reported and authorized by NSD - Norwegian Center for Research Data in line with NTNU guidelines.



Explanation of job descriptions:

Being an entrepreneur: starting up a new company by yourself or as part of a team.

Being an intrapreneur: working in an existing company with tasks such as developing existing or new products, services, markets or production methods.

On a scale from 1 (not important) to 7 (very important), how important are these job characteristics to you in a future job?

	1 Not important	2	3	4	5	6	7 Very important
Entrepreneur - start a company by yourself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entrepreneur - start a company with 2-5 others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employment in existing company - work with intrapreneurship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employment in existing company - work with tasks other than intrapreneurship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale from 1 (not important) to 7 (very important), how important are these job characteristics to you in a future job?

	1 Not important	2	3	4	5	6	7 Very important
Work hours: 38 hours a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work hours: 44 hours a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work hours: 50 hours a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale from 1 (not important) to 7 (very important), how important are these job characteristics to you in a future job?

	1 Not important	2	3	4	5	6	7 Very important
Job security: 100% certain to still be employed in a year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job security: 50% certain to still be employed in a year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job security: 10% certain to still be employed in a year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



On a scale from 1 (not important) to 7 (very important), how important are these job characteristics to you in a future job?

	1 Not important	2	3	4	5	6	7 Very important
Very good opportunities for career development for professional development and promotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some opportunities for career development for professional development and promotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No opportunities for career development for professional development and promotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale from 1 (not important) to 7 (very important), how important are these job characteristics to you in a future job?

	1 Not important	2	3	4	5	6	7 Very important
Location: In your home county	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Location: In Oslo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Location: Abroad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



If two job descriptions were similar in all other ways, how important would this difference be for you?

	1	2	3	4	5	6	7
	Not important						Very important
<p>[%ACABEST();%] —instead of— [%ACAWORST();%]</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If two job descriptions were similar in all other ways, how important would this difference be for you?

	1	2	3	4	5	6	7
	Not important						Very important
<p>[%ACABEST();%] —instead of— [%ACAWORST();%]</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If two job descriptions were similar in all other ways, how important would this difference be for you?

	1	2	3	4	5	6	7
	Not important						Very important
<p>[%ACABEST();%] —instead of— [%ACAWORST();%]</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If two job descriptions were similar in all other ways, how important would this difference be for you?

	1	2	3	4	5	6	7
	Not important						Very important
<p>[%ACABEST();%] —instead of— [%ACAWORST();%]</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



If two job descriptions were similar in all other ways, how important would this difference be for you?

	1 Not important	2	3	4	5	6	7 Very important
<code>[%ACABEST();%]</code> <i>—instead of—</i> <code>[%ACAWORST();%]</code>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If two job descriptions were similar in all other ways, how important would this difference be for you?

	1 Not important	2	3	4	5	6	7 Very important
<code>[%ACABEST();%]</code> <i>—instead of—</i> <code>[%ACAWORST();%]</code>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If two job descriptions were similar in all other ways, how important would this difference be for you?

	1 Not important	2	3	4	5	6	7 Very important
<code>[%ACABEST();%]</code> <i>—instead of—</i> <code>[%ACAWORST();%]</code>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



If everything else about these two jobs were the same, which would you prefer?

Income: 600 000 NOK a year

Job security: 10% certain to still be employed in a year

or

Income: 450 000 NOK a year

Job security: 100% certain to still be employed in a year

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right

If everything else about these two jobs were the same, which would you prefer?

Job security: 50% certain to still be employed in a year

Acceptable work environment: No problems in relationship with colleagues and management

or

Job security: 10% certain to still be employed in a year

Poor work environment: Poor relationships with both colleagues and management

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right

If everything else about these two jobs were the same, which would you prefer?

Acceptable work environment: No problems in relationship with colleagues and management

Work hours: 50 hours a week

or

Great work environment: Very good relationship with both colleagues and management

Work hours: 44 hours a week

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right

If everything else about these two jobs were the same, which would you prefer?

Entrepreneur - start a company by yourself

Work hours: 38 hours a week

or

Employment in existing company - work with tasks other than intrapreneurship

Work hours: 50 hours a week

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right



If everything else about these two jobs were the same, which would you prefer?

Income: 450 000 NOK a year

Employment in existing company - work with intrapreneurship

Poor work environment: Poor relationships with both colleagues and management

or

Income: 300 000 NOK a year

Entrepreneur - start a company with 2-5 others

Great work environment: Very good relationship with both colleagues and management

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right

If everything else about these two jobs were the same, which would you prefer?

Work hours: 44 hours a week

Entrepreneur - start a company with 2-5 others

Job security: 50% certain to still be employed in a year

or

Work hours: 38 hours a week

Entrepreneur - start a company by yourself

Job security: 100% certain to still be employed in a year

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right

If everything else about these two jobs were the same, which would you prefer?

Acceptable work environment: No problems in relationship with colleagues and management

Work hours: 44 hours a week

Income: 300 000 NOK a year

or

Poor work environment: Poor relationships with both colleagues and management

Work hours: 50 hours a week

Income: 600 000 NOK a year

1 Strongly prefer left
 2
 3 Somewhat prefer left
 4
 5 Indifferent
 6
 7 Somewhat prefer right
 8
 9 Strongly prefer right



If everything else about these two jobs were the same, which would you prefer?

Income: 600 000 NOK a year

Job security: 10% certain to still be employed in a year

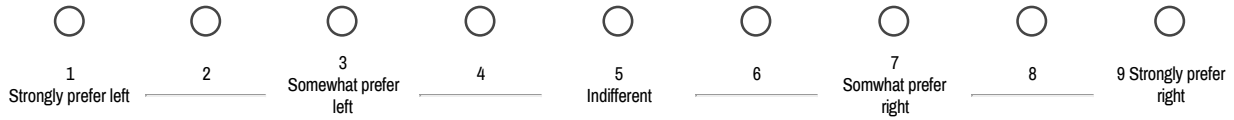
Employment in existing company - work with tasks other than intrapreneurship

or

Income: 450 000 NOK a year

Job security: 50% certain to still be employed in a year

Entrepreneur - start a company with 2-5 others



If everything else about these two jobs were the same, which would you prefer?

Employment in existing company - work with intrapreneurship

Great work environment: Very good relationship with both colleagues and management

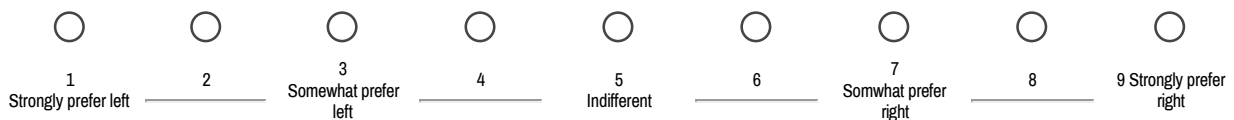
Job security: 100% certain to still be employed in a year

or

Employment in existing company - work with tasks other than intrapreneurship

Poor work environment: Poor relationships with both colleagues and management

Job security: 50% certain to still be employed in a year



If everything else about these two jobs were the same, which would you prefer?

Income: 300 000 NOK a year

Work hours: 38 hours a week

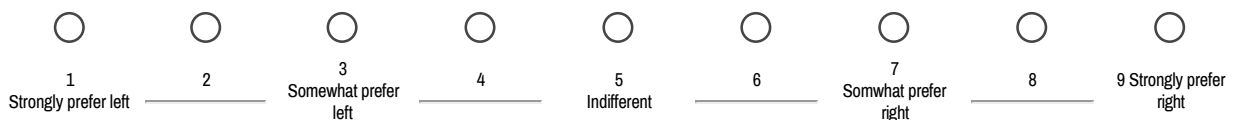
Great work environment: Very good relationship with both colleagues and management

or

Income: 450 000 NOK a year

Work hours: 44 hours a week

Acceptable work environment: No problems in relationship with colleagues and management



You will now see 5 job descriptions. For each description, please tell us how likely it is that you would accept a job offer with this description. Answer using a scale from 1-100, where 0 means not likely at all and 100 means definitely would accept it.

How likely is it that you would accept this job offer?

Income: 600 000 NOK a year
Job security: 10% certain to still be employed in a year
Poor work environment: Poor relationships with both colleagues and management
Work hours: 50 hours a week
Employment in existing company - work with tasks other than intrapreneurship
<input type="text"/>

You will now see 5 job descriptions. For each description, please tell us how likely it is that you would accept a job offer with this description. Answer using a scale from 1-100, where 0 means not likely at all and 100 means definitely would accept it.

How likely is it that you would accept this job offer?

Income: 300 000 NOK a year
Job security: 100% certain to still be employed in a year
Great work environment: Very good relationship with both colleagues and management
Work hours: 38 hours a week
Entrepreneur - start a company with 2-5 others
<input type="text"/>



You will now see 5 job descriptions. For each description, please tell us how likely it is that you would accept a job offer with this description. Answer using a scale from 1-100, where 0 means not likely at all and 100 means definitely would accept it.

How likely is it that you would accept this job offer?

Income: 600 000 NOK a year
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<input type="text"/>



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How likely is it that you would accept this job offer?

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Job security: 10% certain to still be employed in a year
Great work environment: Very good relationship with both colleagues and management
Work hours: 38 hours a week
Entrepreneur - start a company with 2-5 others
<input type="text"/>



I have previously lived abroad for a semester/half year or more.

- Yes
- No

On a scale from 1 (strongly agree) to 5 (strongly disagree), to which degree do you agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I would like to study abroad for six months.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to work abroad for six months.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to live and work abroad on a permanent basis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Home county:

- Møre og Romsdal
- Sør-Trøndelag
- Nord-Trøndelag
- Nordland
- Troms
- Finnmark
- Sogn og Fjordane
- Hordaland
- Rogaland
- Vest-Agder
- Aust-Agder
- Telemark
- Buskerud
- Hedmark
- Oppland
- Oslo
- Akershus
- Vestfold
- Østfold



Age:

Gender:

- Male
- Female

Study program:

- Business and Economics
- Biology
- Engineering
- Other

Are you participating in Venture Cup spring 2017?

- Ja
- Nei



On a scale from 1 (strongly agree) to 5 (strongly disagree), to which degree do you agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I intend to set up a company in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I never search for business start-up opportunities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I save money to start a business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not read books on how to set up a firm.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no plans to launch my own business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I spend time learning about starting a firm.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale from 1 (strongly agree) to 5 (strongly disagree), to which degree do you agree with the following statements? I would like to have a job that lets me...

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Solve problems in new ways.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work on my own ideas.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define my own tasks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Develop new products for the company I work for.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale from 1 (strongly agree) to 5 (strongly disagree), to which degree do you agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Overall, my skills and abilities will help me start a business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My past experience will be very valuable in starting a business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I can put in the effort needed to start a business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Thank you for participating in the survey!

We would like to match this survey with future surveys. In order to avoid gathering personally identifiable information such as name or students number, we hope that can fill in letters/numbers in the boxes below. This enables us to match surveys without gathering information that breaks your anonymity.

In the boxes below, please fill in the following letters and numbers:

The first letter in your mother's first name.

The first letter in your father's first name.

The number of the month you were born (1=January, 12=December).

If you would like to participate in a prize draw of 1 gift card of NOK 1.000 and 4 gift cards of NOK 500 at Amfi Moa/www.dittgavekort.no, please fill in your e-mail address at the next page.

This sends you to a second survey. The e-mail address you type in will not be linked to your answers in the survey.



0%  100%

Note:

When respondents take the survey in regular mode this page will not be displayed. Respondents will be redirected to the link below:

<https://EpostA2.sawtoothsoftware.com/login.html>

Powered by Sawtooth Software, Inc.

0%  100%

