Exploring the influence of sustainable entrepreneurship education on sustainable opportunity recognition.

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Abstract

This study explores the influence of sustainable entrepreneurship education (SEE) on the ability to recognize sustainable business opportunities. Using a series of semi-structured qualitative interviews, data was collected from participants in a SEE program at Lund University. The findings reveal that SEE enhances the ability of students to identify and evaluate sustainable business opportunities through three mechanisms: knowledge and skill development, entrepreneurial ecosystem embeddedness, and mindset and motivation development. We propose a framework that captures the dynamic interaction of these mechanisms, forming a continuous reinforcing cycle. Our findings suggest that tailored sustainability education enables sustainable entrepreneurship. Contributing to the literature on sustainable entrepreneurship by providing empirical evidence of the influence of SEE on sustainable opportunity recognition. Future research directions include validating these findings across diverse educational settings, exploring the long-term impacts of SEE on entrepreneurial outcomes, as well as extending the exploration of SEE's effect on the entire sustainable entrepreneurial process.

Keywords: Sustainable Entrepreneurship Education, Sustainable Opportunity Recognition, Sustainable Entrepreneurial Process

> *"It is a necessity for future leaders to have sustainability knowledge […]*
> *and it definitely begins with education"*
>
> ~ Jesper Brodin, CEO of IKEA

Abbreviations

Entrepreneurial process - EP

Sustainable entrepreneurial process - SEP

Entrepreneurship education - EE

Sustainable entrepreneurship education - SEE

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1. Introduction

Humanity is confronted with a complex and multifaceted challenge: Balancing the social, economic and ecological factors within the production and consumption sphere (Govindan, 2018). Sustainable entrepreneurship has the potential to play a vital role in establishing a balance between these economic, social, and ecological goals (Hall et al., 2010; Belz & Binder, 2017; Enthoven, 2023). This balance, the triple bottom line approach, is embedded in the concept (Cohen et al., 2008), as sustainable entrepreneurship can be described as "the discovery, creation, and profitable exploitation of opportunities to create future goods and services that sustain the natural and/or communal environment and provide development gain for others" (Patzelt & Shepherd, 2011, p. 632).

While there are major similarities between traditional entrepreneurship and sustainable entrepreneurship, the differences caused the emergence of a distinct literature stream. Sustainable entrepreneurship can be seen as a distinct category within the domain of entrepreneurship (Majid et al. 2017), in which the entrepreneurial process, from idea generation to venture growth, unfolds distinctively (Enthoven, 2023). Opportunity recognition for example, is considered a key step in the entrepreneurial process in both the domain of traditional and sustainable entrepreneurship, but it is evident that traditional opportunity recognition and sustainable opportunity recognition differ conceptually and empirically (Argade et al., 2018; Eller et al., 2020).

Sustainable opportunity recognition can be defined as the process of identifying and evaluating business opportunities that are derived from, and contribute to environmentally sustainable development (Patzelt & Shepherd, 2011). The earliest stage of the sustainable entrepreneurial process (SEP), namely opportunity recognition, is the basis for (sustainable) venture creation and thus the starting point to potential positive environmental impact. The ability to recognize a sustainable versus traditional opportunity is set into relation with distinct intentions and additional competencies (Belz & Binder, 2017; Hanohov & Baldacchino, 2018). Consequently, to unlock the potential of sustainable entrepreneurship, it is essential to investigate the enablers which foster these intentions and competencies, allowing entrepreneurs to recognize sustainable opportunities successfully. Studies on the matter are scarce (George et al., 2016).

Entrepreneurship education (EE) presents itself as a factor to positively and significantly influence traditional opportunity recognition (Abuzuhri & Hashim, 2017). EE, which incorporates teaching the triple bottom line approach, instead of the more traditional double

or single bottom line approach, is characterized as sustainable entrepreneurship education (SEE) (Terán-Yépez et al., 2020). Recent research suggests that SEE can specifically nurture attributes, and foster the skills, knowledge, and attitudes related to the ability to identify and exploit business opportunities that contribute to sustainable development (Diepolder, Weitzel, & Huwer, 2024), but how the effect unfolds is yet to be uncovered. Following this, and the strong evidence on the positive effect of EE on traditional opportunity recognition, SEE presents itself as a potential enabler of sustainable opportunity recognition.

There is little research on the process of sustainable opportunity recognition and notably little research that investigates the effect of education on the process. Hanohov and Baldacchino (2018) call for research investigating the influencing factors on sustainable opportunity recognition practically, aiming to further validate Patzelt and Shepherd's conceptual model of sustainable opportunity recognition proposed in 2010.
Sharma et al. (2020) emphasize that with the implementation of SEE a gap exists in measuring and assessing the outcomes of it.

We will conduct a series of semi-structured qualitative interviews to collect data on the impact of sustainability-focused entrepreneurship education on the ability to recognize market inefficiencies related to ecological sustainable development as business opportunities. This study aims to further uncover the role of sustainable entrepreneurial education in the sustainable entrepreneurial process. Specifically, we strive to take a first step towards creating a framework which captures the potential influence of SEE on sustainable opportunity recognition.
The expected outcome of this research is to discover mechanisms through which sustainability focused entrepreneurship education positively influences aspiring entrepreneurs' ability to recognize sustainable opportunities. Thereby we aim to enhance the understanding of how the sustainable opportunity recognition process unfolds as an outcome of the implementation of SEE. We expect to find parallels to the mechanisms previously uncovered in the context of retrospectively investigating the opportunity recognition process of actual sustainable entrepreneurs, conceptualized by Patzelt and Shepherd in 2010, and empirically underlined by Hanohov and Baldacchino in 2018.

This paper aims to contribute and address the aforementioned gaps in literature by answering the following research question: *How does sustainable entrepreneurship education influence sustainable opportunity recognition among aspiring entrepreneurs?*

2. Theoretical foundation

2.1 Opportunity Recognition in Entrepreneurship

An entrepreneur can be described as "an actor who innovates by recognizing opportunities, [who] makes moderately risky decisions that lead into actions requiring the efficient use of resources and contributing an added value" (Filion, 2008, p. 7). Therefore engaging in entrepreneurship requires the ability to detect market opportunities and the capability to develop an actionable plan to newly, but profitably combine existing resources (Schumpeter, 1934; Shane & Venkataraman, 2000; Shane, 2003). It also entails the active engagement in various actions, from opportunity recognition to acquiring resources, developing a solution which creates, captures and delivers value by taking calculated risks (Baron, 2006). This subsequent process, the entrepreneurial process (EP), which entails recognizing and acting upon opportunities as the basis of new venture creation, is fundamental to research on entrepreneurship (Westhead & Wright, 2013).

The field of entrepreneurship research cuts across multiple disciplinary boundaries to understand how the entrepreneurial process unfolds (Cullen & De Angelis, 2021; Chang et al. 2014). The findings are not definite, as different research divides the EP into different sequences and does not position all sequences in the same relationship or order to each other. There is, however, broad consensus that the process unfolds as subsequent steps (Cullen & De Angelis, 2021).

Venkataraman (1997) describes the EP as a sequence of opportunity recognition, product creation and opportunity exploitation. Adding to this definition other scholars consider the intention to engage in entrepreneurial activities as the starting point of the EP (Iakovleva & Kolvereid, 2009; Wurthmann, 2014). According to Bygrave (2011) "all the functions, activities, and actions associated with perceiving opportunities and creating organizations to pursue them", characterize the EP; a broad but vague definition.

This thesis refers to the entrepreneurial process as the engagement in opportunity recognition, and opportunity exploitation by actors that possess or acquire the necessary motivations and mindset, skills and knowledge. Hence, a process definition of entrepreneurship characterizing the entrepreneurs as the possessor of intentions and competencies which can be obtained or learned.

The entrepreneurs' intentions are found to be a determining element towards initially engaging in entrepreneurial activities (Fayolle & Degeorge, 2006; Thompson, 2009). The methodological advancements over time in investigating intentions allow for a sharpened perspective on their effect on the EP (Liñán et al., 2010). The entrepreneurial intention plays a vital role, specifically in persisting to follow along the entire process (Su et al., 2020). Also, they are found to affect the subsequent elements throughout the entire EP as they alter the emotional and cognitive patterns of entrepreneurs (Baron, 2008). Opportunity recognition and opportunity exploitation are thereby influenced by entrepreneurial intent.

The initial impulse to engage in the entrepreneurial process can be cultivated. Galloway and Brown (2002), and Miller et al. (2009), have shown that students who are subject to entrepreneurial education develop stronger entrepreneurial intentions and report more positive attitudes toward entrepreneurs, as opposed to students who did not receive a comparable education (Gieure et al., 2020). In other words, entrepreneurial intentions and motivations can be fostered institutionally, which then increases the likelihood of becoming an entrepreneur.

As established, successfully engaging in the entrepreneurial process requires entrepreneurial intentions on the one hand, and necessary competencies on the other.

Recognizing an entrepreneurial opportunity is the ability to detect "situations in which new goods, services, raw materials, and organizing methods can be introduced and sold at greater than their cost of production" (Shane and Venkataraman, 2000, p.220). The sources of an entrepreneurial opportunity can be various. Macro-societal, economic changes or micro-economic inefficiencies can offer the possibility to newly combine resources to create novel market offerings. The process of newly combining resources to ideate a solution which fills a recognized gap in the market is called idea generation (Ahmad et al., 2022). The process of developing and acting upon the solution, creating a willingness to pay for the fit between the solution and the demand thereby evaluating an opportunity is subsequent in the EP to a process called opportunity exploitation (Kuckertz et al., 2017). In other words, recognizing an opportunity signifies generating an idea to create new value in the market and evaluating how the value can be delivered to subsequently exploit an opportunity to capture the value created.

Opportunity recognition is "widely viewed as a key step in the entrepreneurial process" (Baron, 2006). Logically, detecting an opportunity is prior to developing an idea based on an opportunity. The same logic applies for the exploitation; an opportunity that is not recognized

cannot be exploited. Therefore opportunity recognition can be considered the key step on which, in many cases, all else follows (Kirzner, 1979).

Opportunity recognition embodies a process through which individuals identify and evaluate potential markets or innovations that can be transformed into profitable ventures. How this multifaceted process unfolds has been subject to an extensive interdisciplinary discussion (Mary George et al., 2014).

Central to the exploration of opportunity recognition is the Cognitive Framework, which suggests that the entrepreneur's ability to perceive, process, and act upon information is decisive (Baron, 2006). External events, trends or changes are perceived and interpreted through an entrepreneur's cognitive framework which depends on prior knowledge and experience. Processing these impulses, being alert of or actively searching for patterns, then leads to recognizing a potential business opportunity. This perspective is complemented by the Social Network Framework, suggesting that an entrepreneur's networks are instrumental in identifying opportunities through the flow of asymmetric information and resources (Burt, 1992). Additionally, the Environmental/Contextual Framework highlights the influence of external factors, such as market dynamics and technological advancements, on opportunity recognition (Zahra et al., 2008).

Scholars like Shane and Venkataraman (2000) have been fundamental in defining the entrepreneur's role in opportunity recognition, emphasizing the nexus between enterprising individuals and valuable opportunities. Ardichvili et al. (2003) further refine this by proposing a model that integrates prior knowledge, market inefficiencies, and social networks. Sarasvathy (2001) highlights the role of entrepreneurs' actions in shaping opportunities, complementing the Cognitive, Social Network, and Environmental frameworks. This perspective underscores the proactive aspect of opportunity recognition, where entrepreneurs leverage their resources, networks, and creativity to construct new market possibilities. Emerging discussions around Discovery and Creation Theory (Alvarez & Barney, 2007) offer a distinct perspective, differentiating between opportunities that exist independently and those created through entrepreneurial action.

Drawing from the discussion of different perspectives on the process of opportunity recognition there seems to be consensus that the ability to detect possibilities to create value in the market depends on certain (prior) knowledge and skills. Competencies that can be possessed or acquired. Enhancing analytical thinking, market awareness and creative problem-solving for example amplifies the ability to recognize opportunities (Shane &

Venkataraman, 2000). In turn, these skills can be learned and developed through simulations, real-world experience, and targeted education (Baggen et al., 2017).

2.2 Entrepreneurship education and opportunity recognition

If entrepreneurship is something that can be learned or taught has been subject to debate in entrepreneurship literature (Fiet, 2001). Though, there is a consensus among scholars that at least some parts of entrepreneurship can be taught through education and training (Henry et al., 2005). Suggesting that while certain traits can influence entrepreneurial abilities, education still plays a major role in developing entrepreneurial skills and an entrepreneurial mindset. Just as entrepreneurship is defined in various ways, it follows that there is also no universal definition of entrepreneurial education (EE) (Bechard & Toulouse, 1998; Henry et al., 2005; Fayolle & Lassas-Clerc, 2006; Wilson, 2008). Drawing from these various sources, entrepreneurial education involves the pedagogical approaches to help students acquire an entrepreneurial mindset, skills and knowledge to exploit and recognize opportunities, either with or without commercial objectives. Due to the lack of a unified definition, Mwasalwiba (2010) defines 5 key terms that scholars associate EE with: 'influencing individuals' attitudes, behavior, values or intentions towards entrepreneurship', 'acquisition of personal skills in entrepreneurship', 'new business formation', 'opportunity recognition' and 'managing of existing small firms'

Aspiring entrepreneurs, who combine the necessary skills and competencies, have the potential to become successful entrepreneurs (Kyndt & Baert, 2015), entrepreneurial education has been found to influence not only entrepreneurial intentions (Bae et al., 2014), but also to build competencies & skills to successfully engage in entrepreneurial activities (Wilson, 2008). Entrepreneurship education provides great benefits to students who have taken entrepreneurship courses as opposed to students who have not, whilst also directly contributing to the well-being of society (Mohamed & Ali, 2021). Martin et al. (2013) were, through a quantitative study approach, able to identify a positive relationship between EE and increased human capital and entrepreneurship outcomes. Grounded in Human Capital theory (Becker, 1964), this relationship means that individuals who have undergone EE possess greater levels of entrepreneurial knowledge, skills and other competencies. Directly influencing these individuals to achieve greater entrepreneurial outcomes. Therefore, EE can also contribute to economic development (Hall et al., 2010). EE allows individuals to gain experience, knowledge and skills for idea generation, opportunity recognition and

opportunity exploitation (Liñán et al., 2010). Multiple studies have examined the effect of EE on entrepreneurial intention of students and have revealed that there was a significant difference in entrepreneurial intention before and after having attended EE classes (Ebewo et al., 2017; Kalyoncuoglu et al., 2017). Findings that directly support the link proposed by Ball and Olmedo (2013); that EE leads to more businesses and intentions to develop these businesses.

A notable 13% of the subjects taught in EE programs are based on opportunity recognition (Mwasalwiba, 2010), since this is a critical component and a necessary skill for an entrepreneur in order to identify and evaluate new possibilities (Shane & Venkataraman, 2000). EE plays a major role in enhancing opportunity recognition competencies of individuals. Through EE focused on opportunity recognition, the accurate identification of a business opportunities' viability is positively affected, with the learning process being enhanced by entrepreneurial passion (Costa et al., 2017). Additionally, Zulkieflimansyah et al. (2021) reported that EE increases opportunity recognition, which in turn directly affects a student's intention to become an entrepreneur. Hou et al. (2022) underscore these findings further, noting that EE increases the entrepreneurial intention through opportunity recognition with direct influence of entrepreneurial learning, emphasizing the importance of education in the entrepreneurial process and the shaping of mindsets and competencies. Research by Wei et al. (2019) further supports these observations by demonstrating how EE, through a focus on opportunity recognition, not only enhances the identification and evaluation of business opportunities, but also significantly contributes to the innovative process and entrepreneurial success.

EE has been a researched field since the nineties, evolving over time, given different contexts and objectives. Going through different definitions of the field and still being researched and defined to this day, EE transitioned from a focus on developing business plan writing skills to fostering an entrepreneurial mindset and its inherent qualities (Mwasalwiba, 2010; Mohamed & Ali, 2021). In the early stages, EE focussed on teaching the mechanics of starting a business, such as financing, marketing and organizational planning (Mwasalwiba, 2010), founded in the notion that entrepreneurship is based on business knowledge and technical skills. In the last decade, EE is moving more towards the cultivation of an entrepreneurial mindset, to deal with the challenges of starting a venture. Broadening the scope of education to include the development of soft skills, including creativity, opportunity recognition, adaptability and flexibility (Chioda et al., 2021). Furthermore, EE has shifted focus from

theoretical learning to a more hands-on approach, emphasizing experiential learning and engaging in real-world entrepreneurial projects (Bell & Bell, 2020). The evolution of EE reflects the changes of the global economy, but also the increasing acknowledgement of the importance of sustainable development and the role that entrepreneurship can play therein (Rosário & Raimundo, 2024). Traditional EE is moving toward a curriculum that includes a focus on sustainability, circularity, ethical decision making and social responsibility (Shepherd & Patzelt, 2011). Allowing aspiring entrepreneurs to create ventures that are not only economically viable, but also take the United Nations Sustainable Development Goals into account (United Nations, 2023).

2.3 Sustainable entrepreneurship education

Sustainable entrepreneurship education (SEE) presents the next opportunity for preparing entrepreneurs to solve current global challenges (Rosário & Raimundo, 2024), by combining the entrepreneurial mindset with a commitment to sustainability and social responsibility (Patzelt & Shepherd, 2011). SEE distinguishes itself from traditional EE by incorporating sustainability principles into entrepreneurial learning and practice. With SEE aiming to identify competence frameworks that enable education of future sustainable entrepreneurs, focussing on innovative market solutions that have ecological, social and economic value (Diepolder, Weitzel, & Huwer, 2024). Adding to that, teachings in sustainable entrepreneurship focus on preserving nature, life support, and community while pursuing opportunities for economic and non-economic gains to individuals, the economy, and society (Patzelt & Shepherd, 2011). It extends upon traditional EE by not solely focusing on economic viability. Instead, it also addresses sustainable development issues (Terán-Yépez et al., 2020), development of individual competencies required for innovative sustainability driven enterprises (Mindt & Rieckmann, 2017) and the promotion of ethical leadership and corporate social responsibility within the framework of entrepreneurship (Schaltegger & Wagner, 2011). SEE encourages entrepreneurs to take into account the wider impact of their decisions, often emphasizing a balance between economic and ethical considerations (Gibbs, 2006). Interdisciplinary learning is also something that is promoted by SEE, as opposed to a more isolated focus by traditional EE, allowing learning by integrating across multiple disciplines and thus encouraging more impactful opportunity recognition for students (Carey et al., 2020). SEE fosters experiential learning, a shift from the more theoretical focus of traditional programs, connecting students with practice, project-based learnings and work

experience (Domask, 2007). SEE lays its foundation in many theoretical frameworks that make it possible to support the integration of sustainability.

SEE is designed to include economic, environmental and social pillars of sustainability, also known as the triple bottom line framework. This framework is a concept that expands upon a company's traditional focus on the financial bottom line and includes social and environmental considerations (Elkington, 1994). The framework encourages businesses to take three performance indicators into account: economic, social and environmental. Often referred to as the 3 P's: people, planet and profit (Fauzi et al., 2010). Here, the economic indicator assesses a company's financial health and economic impact. The social indicator evaluates how a company addresses communities, labor practices and human rights. Lastly, the direct impact that the company has on the planet is measured, for example in terms of waste management, carbon footprint and resource conservation. By integrating the three dimensions of this framework in SEE, it provides a more holistic overview of the current business environment. Including sustainability and corporate responsibility as important pillars of a company's long term success (Ashrafi et al., 2020).

The triple bottom line framework sets the stage for the addition of Stakeholder theory within SEE, further focussing on corporate responsibility (Zhang, 2011). It is a concept emphasizing the importance of all stakeholders in decision making, not just monetary gain of shareholders (Freeman, 1984). It argues that businesses should take the interests of all parties involved into account, including communities and environment, stating that addressing the needs of all stakeholders is essential for long term viability and ethical practices (Jones et al., 2007). Just like the triple bottom line framework, stakeholder theory challenges the focus of traditional business focus on maximizing shareholder value, suggesting that the common interests promote mutual benefits and sustainability (Freudenreich et al., 2019). By fostering a learning approach that includes multiple stakeholders in setting up ventures, including the environment, allows for the creation of businesses that contribute to sustainability and societal wellbeing, thereby increasing their long term viability and success (Brulhart et al., 2017).

Another concept central to the SEE curriculum is the focus on circular economies. This redefines models by prioritizing waste reduction, resource efficiency and regenerative practice and directly aligns with economic growth in European countries (Hysa et al., 2020).

In SEE, students are educated in developing business models that have a sustainability focus, prioritizing products and operations that minimize environmental impact and maximize social

wellbeing. This way of teaching equips students to lead innovative and sustainable ventures (Desai, 2012), but also ensures that future or existing business practices align with global sustainability goals (Amatucci, 2019). SEE plays a central role in circular entrepreneurship ecosystems by developing a sustainability mindset as a transformative learning process. El Awad et al. (2024) introduces a conceptual framework that theoretically demonstrates the impact of SEE in circular entrepreneurship ecosystems. Specifically, the role SEE can play in acting as a catalyst for nurturing a sustainable mindset. It theorizes that through teaching the what, the why and the how within SEE it impacts graduates on the individual, venture and system levels, allowing for more sustainable opportunity exploitation. Explicitly stating the importance of institutions and universities in the shaping of sustainable mindset and thus the ability to recognize opportunities.

A subject also touched upon by SEE is corporate social responsibility (CSR), where social and environmental concerns are integrated into the core of a company's business model (Garriga & Mêlé, 2012). Through incorporating CSR principles in the SEE curriculum, entrepreneurs who are committed to creating sustainable value and addressing global challenges, embedding sustainability into businesses ventures from their launch, can be educated (Chenavaz et al., 2023).

In conclusion, SEE not only prepares entrepreneurs to navigate the business world, but also to innovate in it to balance people, planet and profit. This shift from traditional EE is in response to the call for business solutions that contribute to sustainability, making it necessary for students to have the skills, mindset, and knowledge to drive sustainable development (Muñoz & Cohen, 2017). In the quickly evolving business landscape, there is a need for companies to become sustainable. Not only to address environmental challenges, social inequalities and fulfilling the United Nations Sustainable Development Goals, but also to remain profitable and competitive in the business environment (Aggarwal et al., 2020). SEE aims to prepare students for a future where sustainable practices are central to business success. Preparing students to potentially provide solutions to future sustainability challenges and recognize opportunities, through teaching skills, mindset, and knowledge within this field (Zahrani, 2022).

EE influences the entrepreneurial mindset and entrepreneurial intention positively, especially if there has not been any previous exposure to the EP (Fayolle & Gailly, 2013). With EE also having a positive effect on the accurate identification of opportunities (Costa et al., 2017). With the outlined conceptual differences between EE and SEE, it is relevant to look at EE

and SEE separately. The means of education are different, consequently meaning that the effects must also be different. In line with this reasoning, opportunity recognition in entrepreneurship and opportunity recognition in sustainable entrepreneurship are also different. Especially when focussed on the effects that sustainable entrepreneurship education directly has on the recognition of sustainable opportunities. However, research in this realm is scarce (Hanohov & Baldacchino, 2018). SEE transforms entrepreneurial education and practice, educating a new generation of entrepreneurs committed to sustainable development and potentially educating them in recognizing sustainable opportunities.

2.4 Opportunity recognition in sustainable entrepreneurship

Entrepreneurship is increasingly set into relation with driving sustainable development. This intersection receives growing attention in the literature (Klewitz & Hansen, 2014; Parrish, 2010; Thompson et al., 2015). The emerging concept, sustainable entrepreneurship, is believed to play a vital role in balancing the needs of present and future generations (Hall et al., 2010; Belz & Binder, 2017; Hanohov & Baldacchino, 2018; Enthoven, 2023) through meeting present and future market needs environmentally, socially and economically sustainable (Elkington, 1998; Cohen et al., 2008).

Traditional entrepreneurship is primarily driven by commercial needs and adding economic value, without specific concerns regarding sustainability (Belz & Binder, 2017), sustainable entrepreneurs are primarily motivated to address needs related to sustainable development (Trivedi & Stokols, 2011). Supplying an innovative need-solution fit in turn offers the potential of substantial market success, societal change and changed market conditions (Schaltegger & Wagner, 2011). Within the scope of sustainable development, integrating social, environmental and economic challenges (United Nations, 2023), environmental problems are the main source of profitable business opportunities for sustainable entrepreneurs (Dean & McMullen, 2007). Notably, there is no clear divide between profit and sustainability driven entrepreneurs. Numerous entrepreneurs are profit driven and simultaneously create environmental and social impacts (Blok, 2018). The distinction between the orientation of entrepreneurial activity just locates the entrepreneur within the span ranging from purely sustainable to a purely profit-driven orientation (Austin et al., 2006).

Sustainable entrepreneurship research draws from its alignment with social, green, ecological, and environmental entrepreneurship (Ali, 2020; Rosário & Raimundo, 2024), and

findings from the interlinked fields enhance the understanding of sustainable entrepreneurship as a concept, process and phenomenon. The different embodiments of entrepreneurship touched upon all are based on developing alternative business models that expand value creation to include ecological and social value (Brehemer et al., 2018; Geissdoerfer et al., 2018; Bocken et al. 2014). The main differences are that besides extracting business opportunities from distinct main sources, the related domains primarily focus on one specific ideological aspect altering the business models. What sets sustainable entrepreneurs apart is that they are "expected to be better able to balance economic (profit), social-cultural (people) and environmental (planet) interests by entrepreneurial action" (Blok, 2018, p. 204). In conclusion, sustainable entrepreneurship can be located as a distinct category within the domain of entrepreneurship (Majid et al. 2017).

Prior (traditional) entrepreneurship has been defined as a process of subsequent activities carried out by actors with compulsory intents and skills. The conceptual differences between traditional and sustainable entrepreneurship have been outlined above. Consequently, the question arises whether sustainable entrepreneurship unfolds differently as a process.

While the EP in the context of traditional entrepreneurship is a well established research field, studies that address the sustainable entrepreneurial process (SEP) are rare (Matzembacher et al., 2019). Recent publications underline the importance of investigating the SEP distinctively, due to the significant differences of sustainable entrepreneurship and traditional entrepreneurship practices (Hanohov & Baldacchino, 2018; Ceptureanu et al., 2017; Belz & Binder, 2017; Fors & Lennerfors, 2019; Enthoven, 2023).

Patzelt and Shepherd (2011) proposed that recognizing opportunities for sustainable development cannot be explained through the traditional entrepreneurial opportunity recognition sequences. In this context they define sustainable entrepreneurship as the process of "discovery, creation, and exploitation of opportunities to create future goods and services that sustain the natural and/or communal environment and provide development gain for others" (p. 632).

Belz and Binder (2015) pioneered in researching how this process fully unfolds. Defining the SEP, they developed a six-stage model which includes recognizing a social or ecological problem, recognizing a social or ecological opportunity, developing a double bottom line solution, developing a triple bottom line solution, funding and forming a sustainable enterprise, and creating or entering a sustainable market. The framework was empirically tested by Matzembacher et al. (2019). Their findings partially support, but also differ from

Belz and Binder's convergent sustainable entrepreneurial process, contradicting that all three dimensions of sustainability (economic, social, and environmental) are integrated at the same time and before venture launch. They found that the integration occurs not simultaneously but sequentially. Entrepreneurs initially focus mainly on one or two dimensions (Moggi et al., 2021; Carle & Rayna, 2023). In the emerging model Matzembacher et al. (2019) add impact measurement as the final step in the sustainable entrepreneurial process flow. Thereby they acknowledge that the inclusion of the triple bottom line might occur sequentially but it remains essential for sustainable entrepreneurship.

In conclusion, compared to the EP, the SEP aims at different objectives and includes distinct or adjusted sequences. On top of that, successful outcomes of sustainable entrepreneurial activities need to be evaluated not only through economic but also societal and environmental performance measures. These conceptual differences alter the processes within each of the subsequent elements of the SEP (Patzelt & Shepherd, 2011; Belz & Binder, 2017; Matzembacher et al., 2019).

In the SEP the key role of opportunity recognition for sustainable development is underlined in the literature (Shepherd & Patzelt, 2011; Muñoz et al., 2017). Mas-Tur et al. (2021) highlight that further research is required for the "examination of what generates the recognition of such opportunities" (p.31).

In their framework describing the process of recognizing opportunities for sustainable development, Patzelt and Shepherd (2011) integrate the knowledge of the natural/communal environment and perception of threats to this environment, in addition to motivation and entrepreneurial knowledge. Hence, they argue, that entrepreneurs who possess or acquire knowledge about their ecological environment are more likely to identify challenges and changes and thereby spot opportunity derived from environmentally relevant market imperfections. Furthermore, recognizing sustainable opportunities requires different levels of skills and knowledge compared to traditional opportunities (Hanohov & Baldacchino, 2018). The same dynamics can be applied for social development opportunities. Thus, expanding the individual or institutional focus from the business environment on the natural environment increases the entrepreneurs' ability to recognize sustainable opportunities. Muñoz and Dimov (2017) offered partial support to the model, focusing on the effect of prior knowledge and moral intensity on sustainable opportunity intention, suggesting that the relationship between prior knowledge and sustainable opportunity intention is moderated by moral intensity. Hanohov and Baldacchino (2018) largely support the framework with empirical findings

from the sustainable start-up scene in Berlin, noting that the general applicability might vary depending on the context. The findings indicate that entrepreneurial knowledge plays a significant role in the opportunity recognition process and suggest that prior jobs and projects are valuable sources for acquiring relevant entrepreneurial knowledge. Also, the study highlights the role of the personal environment and experiences to gain knowledge of the communal and natural environment in addition to the framework.

In their research Argade et al. (2018) outline the overlaps and differences of traditional and sustainable opportunity recognition. They propose a process model which draws from Shane et al.'s (2003) framework of (traditional) opportunity recognition. It is adjusted by integrating the knowledge of the natural/communal environment and the perception of threats to this environment, similar to Patzelt and Shepherd (2011) and expanded on the impact of the sustainable entrepreneur's individual and contextual level factors. Also, they contribute by shedding light on a non-western context, namely, India. The research finds that context substantially shapes the nature of sustainable entrepreneurship. Argade et al. (2018) raise the idea that knowledge of threat to society and environment "could be a stronger motivation to engage in sustainable entrepreneurship than entrepreneurial knowledge of individuals" (p. 3538). They complement the works by Patzelt and Shepherd (2011), Belz and Binder (2017) by providing empirical evidence that identification of opportunities by sustainable entrepreneurs is inherently linked to their efforts to address urgent social and environmental challenges.

Eller et al. (2020) part the process of sustainable opportunity recognition into the steps of transitioning from problem to solution identification and from solution to sustainable opportunity identification. To do so, they combine the model by Belz and Binder (2017) and Patzelt and Shepherd (2011). The findings confirm that individuals with high perception of threat are more likely to engage in the process of sustainable opportunity recognition. Strong entrepreneurial attitude is found to increase the likelihood of following along the process.

The diverse findings and frameworks presented by scholars such as Patzelt and Shepherd (2011), Argade et al. (2018), and Eller et al. (2020), underscore the complexity and contextual variability of sustainable opportunity recognition. Further investigation in how the process unfolds across different contexts is crucial to understand how sustainable opportunity recognition can be fostered as an essential enabler of sustainable entrepreneurship.

2.5 Sustainable opportunity recognition and sustainable entrepreneurship education

As a phenomenon and process, traditional entrepreneurial opportunity recognition and sustainable opportunity recognition overlap but also differ conceptually and empirically (Argade et al., 2018). Fundamental differentiator is the source of the opportunity, where a sustainable opportunity is primarily derived from environmentally relevant market imperfections (Patzelt & Shepherd, 2011). Empirically, the enabling intentions and motivations, and knowledge and skills to recognize an opportunity for environmentally sustainable development differ (Hanohov & Baldacchino, 2018).

Traditional EE and SEE mainly differ in the incorporation of sustainability principles into the curriculum. It emphasizes the importance of balancing the economic, social and ecological value within the SEP, focusing on the triple bottom line approach (Elkington, 1994; Belz & Binder, 2015). As opposed to the more traditional entrepreneurship education of focusing on a double or single bottom line approach (Terán-Yépez et al., 2020). SEE integrates stakeholder theory, focusing on all involved stakeholders, including the environment, instead of just shareholders (Freeman, 1984; Freudenreich et al., 2019). Also incorporated through SEE is the focus on circular business models, educating about resource efficiency and waste reduction (Hysa et al., 2020). Corporate social responsibility principles and interdisciplinary learning are also central to SEE, teaching entrepreneurship students how to incorporate social and environmental principles into their business models and integrate knowledge from multiple different fields (Garriga & Mêlé, 2012; Carey et al., 2020). SEE aims to prepare students for the business world and give them the knowledge and skills to achieve a balance between economic, social and ecological goals (Muñoz & Cohen, 2017).

EE influences the opportunity recognition process, through multiple moderating and mediating variables (Fayolle & Gailly, 2013; Costa et al., 2017). EE, although closely related to SEE, can not be seen as the same. SEE finds its basis in EE, but has multiple sustainability and other differentiating principles incorporated into its curriculum. This also holds true for opportunity recognition and sustainable opportunity recognition: they are closely related but necessarily different. Following this logic of reasoning, it would make sense that SEE influences sustainable opportunity recognition. It cannot with certainty be said that this connection is the same as for traditional EE, making it a promising path of exploration and the basis for the proposed research question.

3. Methodology

The following chapter provides the rationale for the use of certain research methods and the assumptions on which this research is based. Furthermore, it will outline the specific research design, research sampling and limitations of the study that follow from the method.

3.1 Epistemological and Ontological assumptions

A researcher's assumptions about knowledge and reality fundamentally influence the formulation of a research question and interpretation of findings, guiding the entire research process (Brinkmann & Kvale, 2015). This research is informed through the adoption of a pragmatic epistemological stance. Knowledge within the sustainable entrepreneurship education field emerges through a blend of practical applications of ideas and addressing real world problems. Dewey (1916) argues that "education is not an affair of 'telling' and 'being told', but an active and constructive process", a perspective that guides this research on how sustainable entrepreneurship education fosters the active construction of knowledge that improves sustainable opportunity recognition. Through taking this pragmatic stance, we prioritize the understanding of the practical effects of sustainable entrepreneurship education on the sustainable opportunity recognition process. This approach fosters in-depth insights as to 'how' sustainable entrepreneurship education influences the sustainable opportunity recognition process, and specifically through which mechanisms this unfolds.

Ontologically, this research is grounded in relativism. We consider how entrepreneurs' subjective reality shapes their understanding of opportunities. Allowing us to explore the individualized process through which entrepreneurs make sense of sustainable opportunities in their unique perception of reality. This relativistic foundation acknowledges the diversity and perspectives in the recognition of sustainable opportunities, allowing us to explore personal interpretations on the effects of sustainable entrepreneurship education.

To facilitate the understanding of the mechanisms through which sustainable entrepreneurship education influences sustainable opportunity recognition a qualitative research method is used. As supported by Patton (2002), employing a qualitative method enables us to delve into the nuanced ways entrepreneurs interpret and apply knowledge gained from SEE, offering the depth and flexibility necessary to understand complex topics such as sustainable opportunity recognition.

3.2 Research definitions

This thesis defines entrepreneurs as individuals who possess or can acquire certain intentions and competencies, which enable them to engage in the entrepreneurial process of recognizing and exploiting business opportunities for potential new venture creation. Integrating economic, social, and environmental goals to address market imperfections and achieve a positive impact on the triple bottom line throughout the entrepreneurial process, differentiates the concept of sustainable entrepreneurship from traditional entrepreneurship. Within the deriving sustainable entrepreneurial process, scholars broadly depict sustainable opportunity recognition as a key foundation for sustainable impact. This thesis therefore specifically focuses on sustainable opportunity recognition as an enabler of the positive impact of sustainable entrepreneurship on future business practices. Sustainable opportunity recognition is the process of identifying and evaluating business opportunities that are derived from and contribute to environmental sustainability. Notably, integrating all the three dimensions, (economic, social, and environmental) which is imperative over the course of the SEP for the creation of a sustainable venture, is not a defining characteristic for a sustainable opportunity. In line with the findings of Matzembacher et al. (2019), we acknowledge that the integration of the triple bottom line does not necessarily occur simultaneously but rather sequentially over the SEP. Consequently, in contrast to traditional and social entrepreneurial opportunities, sustainable opportunities must be based on environmental problems recognized as potential profitably exploitable market imperfection. This definition directly translates into the screening criteria for the research body.

The ability of entrepreneurs to recognize opportunities is found to be fostered by EE, through multiple moderating and mediating variables. SEE, the teaching of entrepreneurship designed to not only include economic but also the environmental, and social dimensions of sustainable business practices, must influence sustainable opportunity recognition, following the deduction of the literature described in previous sections.

This research uses an interpretative approach, in order to better understand the mechanisms through which SEE influences sustainable opportunity recognition. We firstly examined how previously identified influencing factors on sustainable opportunity recognition (Shepherd & Patzelt, 2011; Belz & Binder, 2017; Hanohov & Baldacchino, 2017) are influenced in the context of SEE.

We interpreted participants' answers to explore factors such as *knowledge of the environment* and *perception of threat to the natural environment*, focusing specifically on how SEE is perceived to influence these factors. Subjective experiences that participants attributed to sustainable opportunity recognition, following their education, were interpreted and directly provided context and insight for answering our research question.

Additionally, fundamental attributes of a sustainability mindset acquired through SEE were explored, consisting of a *holistic perspective*, *long-term orientation* and *social sensitivity* as conceptualized by El Awad et al. (2024). By interpreting participants' reflections and stories, we were able to derive mechanisms through which SEE influences sustainable opportunity recognition.

Furthermore, this research focused on eliciting novel and in-depth insights that the interviewed aspiring entrepreneurs had to offer on the influence of their education on their sustainable opportunity recognition abilities. Thus contributing to the understanding of the sustainable entrepreneurship field, by providing insight as to how SEE influences known and unknown variables of sustainable opportunity recognition.

3.3 Research design

In this qualitative research, an interpretative and exploratory approach were employed. Building on the theories and frameworks of Shepherd and Patzelt (2011), Belz and Binder (2017) and Hanohov and Baldacchino (2017) of sustainable opportunity recognition. The conceptual framework introduced by El Awad et al. (2024) will also be explored, highlighting the building blocks of the sustainable mindset developed by SEE. Deductions from these works have led to the identification of enabling conditions and variables for sustainable opportunity recognition. Such as the aforementioned *knowledge of the environment* and *perception of threat to the natural environment*, but also *altruism toward others* and *prior experience*. Other works have led to the identification of attributes that make up a sustainable mindset through SEE, namely a *holistic perspective*, *long-term orientation* and *social sensitivity*. Building on these theories and existing qualitative research in the sustainable entrepreneurship field (Sharma et al., 2020; Hanohov & Baldacchino, 2017), several interview questions were constructed in aid of answering the research question of this research (see Appendix A). Empirical contexts, such as this research, open up critical discussions of existing theories and frameworks, potentially leading to new research questions and future directions (Alvesson & Kärreman, 2007). It is important to note that this

study is employing an abductive approach. Our abductive approach involves a continuous iterative comparison between empirical data and established theoretical frameworks. We began with Patzelt and Shepherd's (2011) model as a guiding framework, using it to structure our initial data analysis. Throughout the study, we revisited and refined this model based on emerging empirical insights. This iterative process allowed us to identify gaps and validate new themes, leading to a more comprehensive understanding of how SEE factors to influence sustainable opportunity recognition.

3.4 Research instrument

This research employed a qualitative research method, based on multiple interpretative case studies. Where semi-structured interviews were employed to elicit insights regarding the factors influencing sustainable opportunity recognition. The initial sample consisted of 12 randomly selected students enrolled in the *Entrepreneurship and Innovation* program at Lund university. After screening, 10 students were selected to participate. These semi-structured interviews allowed for in-depth exploration of the participants' experiences, gaining a detailed understanding in the researched matter (Creswell & Poth, 2017). Semi-structured interviews suit well to the Gioia method of qualitative research as outlined by Gioia, Corley & Hamilton (2013). This method emphasizes the creation of a data structure through systematically categorizing data from interviews in first order concepts and second order themes. Which are both elements of identified themes used within the developed framework. Using the Gioia method allows for the development of a framework in a transparent and systematic manner, based on actual experiences of interviewees.

3.5 Research sample

The sample for this research consisted of students in the final phases of the master's degree *Entrepreneurship and Innovation* at Lund University, Sweden. Students were specifically selected from this program since this is a showcase of SEE. SEE is defined as an entrepreneurial program with sustainability principles integrated into it. Since there are no exact quantifiable criteria as to what qualifies a program as SEE, we propose that a program qualifies when it is targeted specifically towards students who seek education in balancing the social, economic and ecological aspects of a business. This is the case for the *Entrepreneurship and Innovation* program, where knowledge gained from the masters program is described as "demonstrating knowledge and understanding of economic, social

and environmental sustainability and its role in entrepreneurship and innovation" (Lund university, 2020). Participants were selected through an experimental setup, where a random selection of 14 students of the program *Entrepreneurship and Innovation* at Lund University took part in an ideation session ([Appendix B](#)). In this session, students were asked to write down their recognized opportunities after some introductory questions. After this experimental setup, potential participants for the research were able to be screened based on *identification of a sustainable opportunity* and *prior experience*. The participants for this research were reached through email or direct message.

Sampling students from this specific program ensured that the sample consisted of individuals that are actively engaged in sustainable entrepreneurship education, allowing for the exploration of its influence on sustainable opportunity recognition. However, this also introduces selection bias, as the sample may not be representative of other programs, limiting the generalizability of the findings.

Identification of a sustainable opportunity during the Masters
It could be argued that the effects of education might diminish over time. Suggesting that education will be replaced or trumped by industry and life experience, which are already proven influential factors in the recognition of opportunities (Baron, 2000). Yet, education plays a pivotal role in the shaping of certain mindsets and beliefs (Limeri et al., 2020), with entrepreneurship education positively influencing the fostering of an entrepreneurial mindset (Handayati et al., 2020). This entrepreneurial mindset, shaped by education, is essential in recognizing opportunities and of influence throughout an individual's life. Suggesting that the time between education and opportunity recognition is not as critical of a factor. However, to mediate for this argument we look at sustainable opportunities that are recognized during the program therefore being timely and causally related to receiving SEE.

For the sample selection, the individual answers from the ideation session were screened for recognized sustainable opportunities. For this study, a sustainable opportunity is defined as an opportunity that is derived from and contributing to environmental sustainability. This pillar of ecological sustainability is measured through the examination of the identified opportunity. The United Nation' SDGs focusing on environmental sustainability serve as the examination criteria; namely, 6. Clean Water and Sanitation, 7. Affordable and Clean Energy, 11. Sustainable Cities and Communities, 12. Responsible Consumption and Production, 13. Climate Action, 14. Life Below Water, and 15. Life on Land. If a participant had noted down

a sustainable opportunity during the ideation session that qualifies accordingly he or she qualified as interviewee.

Prior experience

To partially control for noise that could have affected this research, prior experience was used as a screening factor. Certain students may possess prior experience within the sustainability sector or have engaged in voluntary work, which could influence their ability to recognize sustainable opportunities in addition to the sustainable education they have received. As is proven by Hanohov & Baldacchino (2017), prior experience plays a partial role in the recognition of sustainable opportunities. This suggests that the ability to recognize opportunities cannot be exclusively attributed to SEE. To most accurately be able to describe the mechanisms through which SEE influences the sustainable opportunity recognition process, all participants with more than one year of experience in the sustainability sector have been excluded.

Following the screening, of the 12 students that participated in the experimental setup, one student had more than one year of experience in the sustainability sector and one student did not identify a sustainable opportunity. Meaning that 10 students were selected to participate in this research. A detailed overview of the selected individuals and recognized opportunities can be found in the table below.

Participant	Recognized sustainable opportunity
Participant A	Cork products, as replacement for plastic or wooden products. *Relating to SDG 12.2: sustainable management and use of natural resources.*
Participant B	Recycling system at home, to sort out the 60% of waste that does not belong in residual waste.

	Relating to SDG 12.5: substantially reduce waste generation through prevention, reduction, recycling, and reuse.
Participant C	Supply chain validation agency, promoting transparency for companies. *Relating to SDG 12.6: encourage companies, especially to adopt sustainable practices and to integrate sustainability information into their reporting cycle.*
Participant D	Vacuum sealed food storage containers, to preserve food for longer. *Relating to SDG 12.3: halving per capita global food waste at the retail and consumer levels.*
Participant E	Vintage interior shop, to reuse old furniture. *Relating to SDG 12.5: substantially reduce waste generation through prevention, reduction, recycling, and reuse.*
Participant F	Circular running shoe sole, to prevent throwing away good parts of shoes. *Relating to SDG 12.5: substantially reduce waste generation through prevention, reduction, recycling, and reuse.*
Participant G	Wireless charging for scooters and e-bikes, to avoid emissions caused by collecting the units

	Relating to SDG 11.6: Reduce the environmental impact of cities, by specifically paying special attention to air quality.
Participant H	Sustainable backpacking expeditions conducted locally to avoid emissions related to traveling *Relating to SDG 13.2: Integrate climate change measures into national policies, strategies, and planning. This initiative supports the reduction of greenhouse gas emissions and enhances resilience to climate-related hazards.*
Participant I	Upcycling coffee grounds to repurpose them into plates. *Relating to SDG 12.5: substantially reduce waste generation through prevention, reduction, recycling, and reuse.*
Participant J	Sustainable swimming wear made from hemp sourced locally. *Relating to SDG 12.2: sustainable management and use of natural resources.*

Table 1: Detailed overview of participants

3.6 Collection and analysis of data

Collection

Prior to the interviews, an interview guide consisting of predefined questions was created (see Appendix A). These interview questions are grounded in the model of Shepherd and Patzelt (2011), incorporating further refinements and additions to the model by Belz and Binder (2017) and Hanohov and Baldacchino (2017). The concept of the sustainability mindset as defined by El Awad et al. (2024) was also worked into the interview guideline to become subject to questioning. This was to better identify enabling conditions and variables for sustainable opportunity recognition reflected in SEE. This structure was followed for each interview to ensure that collected data from each interviewee could be compared. The collection of data involved semi-structured interviews that concentrated on specific themes, while allowing for open-ended conversation. A pilot interview was conducted to determine the effectiveness and understandability of the questions, after which questions were changed accordingly. The semi-structured interview method addresses the primary research objective, the influence of sustainable entrepreneurship education on predefined factors, but also welcomes unexpected insights (Adams, 2015). Potentially revealing how education might further affect the recognition of sustainable opportunities in ways not initially anticipated. The interview guide consisted of the following topics:

To start, some introductory questions were asked, to establish a good conversation climate for the interviews. The section included questions regarding background information on the interviewed individual, their motivation to study a Masters in Entrepreneurship & Innovation specifically in Lund and their current entrepreneurial project. Following this, questions investigating the influence of sustainable entrepreneurship education on sustainable opportunity recognition were put forward. Starting with asking the interviewee open questions regarding their perception of the effect of SEE on their knowledge on sustainability and evaluation of sustainable opportunities. This can be reflected in whether they have recognized any sustainable opportunities recently. Next, questions were asked to confirm the proposed factors that influence sustainable opportunity recognition as suggested by Shepherd & Patzelt (2011). Further, the questions focused on the influence that SEE has had on shaping a sustainable mindset, looking to validate the attributes of a sustainable mindset (El Awad et al., 2024). Lastly, participants were questioned on the effectiveness and role of SEE to foster sustainable opportunity recognition and what improvements can be made to current

curriculums. In total 10 interviews were conducted. All interviews were recorded with the interviewees consent and transcribed afterwards for further analysis.

Analysis

Gathered audio-recorded data from the interviews was transcribed using the AI tool 'TurboScribe' and validated manually afterwards. These transcriptions were analyzed on similarities and differences. Following the Gioia method, the data coding and categorization was done systematically.

Initially, *first-order concepts* were identified directly from the interviewees' statements and terms used in the interview. These first order concepts served as the raw data and empirical manifestations as described by interviewees. This process was guided by certain concepts in the Patzelt and Shepherd (2011) framework. For instance, we looked for direct mention of key elements such as '*knowledge of the natural/communal environment*' and '*perception of threat to the natural/communal environment*' in statements, which could directly inform further steps in the Gioia method. However, we also remained open to new concepts that were not yet covered by existing theory. Resulting in our first-order concepts.

Next, these first-order concepts were organized into *second-order themes*. The raw data examples were interpreted and grouped into broader categories, based on underlying patterns and similarities. Here we shifted from the interviewees perspective to our analytic point of view. While grouping the first-order concepts we cross referenced them with existing literature in the EE and SEE realm, to ensure that our findings are consistent and grounded in theoretical understandings. For example, we referenced a study on experiential learning and its impact on entrepreneurial mindset development (Bell & Bell, 2020) to inform our theme development and the interrelations within the themes.

Finally, the second-order themes were grouped into aggregate dimensions, which represents the overarching findings based on the raw data. This process facilitated the construction of a data structure that maps out a relationship between first-order concepts, second-order themes and aggregate dimensions. In turn helping us in creating a framework that helps in answering our posed research question. Figure 1 provides an overview of the developed data structure, based on the interviews.

Participants frequently discussed how educational content and learning modalities, such as practical examples and experiential learning, enhanced their ability to recognize sustainable opportunities. This insight led us to identify *knowledge and skill development* as a crucial

aggregate dimension. Aligning directly with and adding to the Patzelt and Shepherd (2011) framework, where '*knowledge of the natural/communal environment*' is of direct influence on sustainable opportunity recognition. Here we find that this is something that can be taught and has meaningful influence on the sustainable opportunity recognition process. Many interviewees also highlighted the importance of having a supportive entrepreneurial ecosystem, including mentoring, networking and resource access through which skills and knowledge could be amplified. The practical application of learned skills within a real-world context is what we termed *entrepreneurial ecosystem embeddedness*. Emerging from the patterns we expand upon the initial theoretical framework, illustrating a dynamic interaction between students and their environment. Confirming directly the importance of an ecosystem in order to sustain entrepreneurs (Isenberg, 2010). The interviews also revealed that SEE influenced students' attitudes and motivations towards sustainability through experiential learning or peer learning. Where many could notice a shift of perspective and growing commitment to sustainability, leading us to identify *mindset and motivation development* as the final aggregate theme. This theme aligns directly with and is based partially on El Awad et al. (2024), where we have found that SEE can indeed act as a catalyst for nurturing a sustainable mindset.
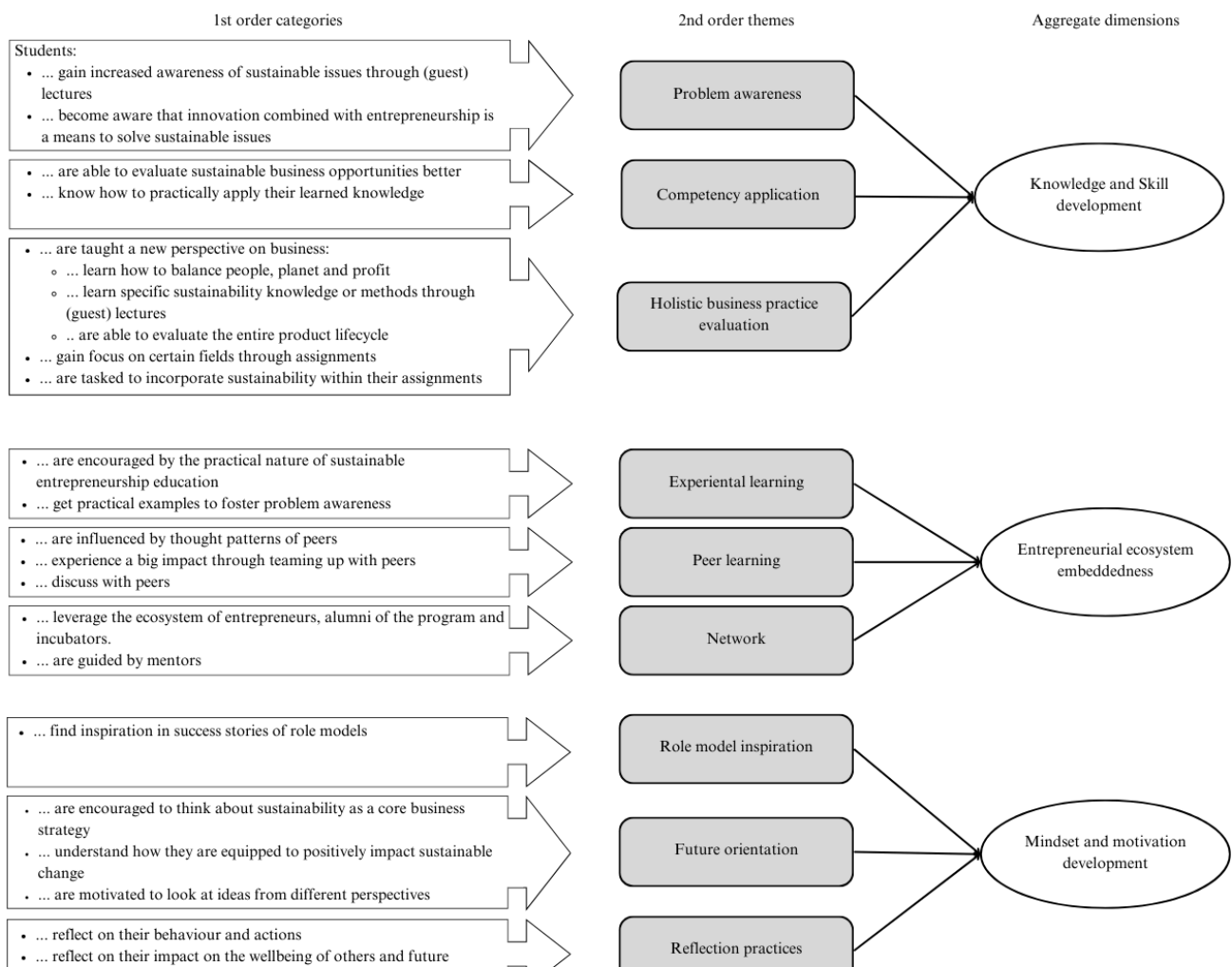
Figure 1: Data structure

3.7 Methodological limitations

Research design

The qualitative approach, while effective for identifying subjective meanings, actions and social contexts among participants, limits the ability to generalize findings across other contexts due to its focus on in-depth exploration instead of broad application (Fossey et al., 2002). The interpretative approach utilized in this research finds limitations in the subjectivity and bias of the researcher, especially in which methods are selected, how data is interpreted and how findings are applied. The researcher's beliefs and experiences can influence the choice of methods and outcomes. Potentially leading to a lack of thoroughness in the results, showing only what the researcher deems important (Morgan, 2014).

Case selection

Given the purposive nature of sampling for this research, outcomes of this research finds limitations in the generalizability of the research (Bell et al., 2022). The subjective nature of participant selection can introduce bias, as preconceptions or assumptions of the researcher might have an effect. The total selected sample originates from a single, screened program, which will give insight into the effects of this specific SEE program on sustainable opportunity recognition. These findings, however, might not apply to other programs. Additionally, while the program Entrepreneurship and Innovation at Lund University incorporates SEE and EE, through introducing the triple bottom line approach, it cannot be clearly quantified to what extent it does in practice.

Data collection

Within the qualitative framework the use of semi-structured interviews, though flexible and able to provide comparable results, might lead to varied data quality and depth. This variety might arise from the differing ability of interviewees to articulate their answers and the influence of the interviewer on the conversation, potentially leading to framed responses (Houtkoop-Steenstra, 1996). The language barrier also presented a limitation, as interviews conducted in a second language sometimes could not fully capture the interviewees thoughts.

Resulting in potential misinterpretations or missing nuances to understand exactly how SEE influences sustainable opportunity recognition (Marshall & While, 1994).

Data analysis

Subjectivity and interpretative bias are known limitations of the Gioia method. Researchers' perspectives, experiences and theoretical orientations can influence certain coding decisions and thus the eventual framework that is developed (Gioia, Corley & Hamilton, 2013). Additionally, the dynamic nature of the Gioia method, which relies on a specific context and unique dataset, can be challenging to replicate (Gehman et al., 2017).

3.8 Ethical considerations

Ethical considerations are a necessity when working in a qualitative matter, given the close interaction between interviewee and researcher and the often sensitive data that is collected (Creswell, 2013). Whilst conducting the research the main aspects taken into account were privacy, informed consent and responsible handling of the collected data. Ensuring the anonymity of our participants was essential in protecting their privacy and potential harm. Informed consent is another required ethical consideration for our research. We sent out consent forms (Appendix C) to all participants for their permission to record the conversation and to use their given answers in our research anonymously. Data is handled only by the two researchers and the AI tool used to transcribe the interview, for which written consent was also given. Data was only stored on personal computers of the researchers.

In order to ensure due ethical considerations, all respondents will be referred to as respondent A ranging to respondent J.

4. Findings

This research explored how sustainable entrepreneurship education influences sustainable opportunity recognition. Through conducting multiple semi-structured in-depth interviews, we found three main mechanisms that allow sustainable entrepreneurship education to influence sustainable opportunity recognition; *knowledge & skill development*, *ecosystem embeddedness* and *mindset & motivation development*. The following section will explore the means of sustainable entrepreneurship education that have been identified as impactful throughout the interviews. Based on aggregated data, we explain how these means defined the mechanisms through which sustainable entrepreneurial education influences the recognition of sustainable opportunities.

4.1 Knowledge and skill development

Engaging in sustainable entrepreneurial education enhanced competencies through knowledge and skill development, facilitating the recognition of sustainable opportunities. We define knowledge and skill development as the process of acquiring information, expertise and the abilities in order to recognize sustainable opportunities. This mechanism is important in the sustainable opportunity recognition process as it equips individuals with the understanding and competencies to recognize these opportunities.

One of the means through which SEE was found to enable this mechanism, is the curriculum of the program. Specifically (guest) lectures, workshops and assignments have had a direct educational effect, mainly through the increase of *problem awareness*, requiring *competency application*, and educating towards a *holistic perspective* on conducting business. These knowledge and skill dimensions reflect factors that are found to positively influence the ability to recognize sustainable opportunities, namely knowledge of the natural/communal environment and problem awareness.

Problem awareness
Our findings confirm the effectiveness of sustainable entrepreneurial education in increasing problem awareness towards sustainability challenges. In the context of this research, problem awareness refers to the recognition and understanding of sustainability-related issues and challenges that need to be addressed by innovative solutions.

Problem awareness is largely impacted by guest lectures. For the Masters program in Entrepreneurship & Innovation at Lund University, that translated into a key component of the curriculum, which is the inclusion of extracurricular activities and guest lectures taught by subject matter experts, including sustainable entrepreneurs, NGOs, and SDG experts. Students gain real-world insight and knowledge of sustainability challenges that the world or their community is facing. Reflecting on the guest lectures, participant G noted:

"I became more aware of it [sustainability issues] and had a more in-depth understanding of it, thanks to lectures, for example, from Elizabeth [Lagerstedt]. She was an expert" ~ Participant G

In the answer of participant C, we found how increased problem awareness is channeled by real-life examples through creating a tangible emotional connection to the matter:

"With the guest lectures I think it [sustainability in business] was very much more attainable for me to grasp it, because having that personal experience and emotional story connected to it is something entirely different than just hearing about the technical facts." ~ Participant C

Guest lectures by subject matter experts as part of sustainable entrepreneurial education were found to increase problem awareness. Students are exposed to specific knowledge impulses, and real-life problems which become attainable. This implies a transferability of knowledge, where enhanced sustainability problem awareness enables students to identify sustainability problems that require innovative solutions themselves, which often are the basis of sustainable opportunities.

The confrontation with existing ecological sustainability challenges had a pivotal influence on the students. Besides (guest) lectures, a field trip recurred in multiple interviews as an impactful experience, because it offered additional learning modalities. An instance of how a site visit to a recycling installation increased environmental awareness was highlighted by participant I:

"We visited a recycling plant in Malmö also that sort of created a lot of awareness that it's super important to ... environmental awareness is very, very important to contribute for a sustainable future" ~ Participant I

Competency application

The transfer of knowledge made available to the students catalyzed skill development through application of this knowledge. Here we define competency application as the practical use and implementation of acquired knowledge and skills in real-world settings where theoretical understanding can be put to use in practical situations.

Sustainability objectives were incorporated in curriculum assignments: An entrepreneurial challenge constrained to addressing the challenge of food waste or energy efficiency, a case study with Fitness24Seven, a Swedish fitness studio chain looking to sustainably innovate, or continuous institutional rewards for the integration of sustainability objectives into the entrepreneurial ventures that students are to start in their entrepreneurial projects. The students reported enhanced abilities to evaluate opportunities, analyze markets and integrate sustainability principles into business models.

Applying the developed specific knowledge and competencies became necessary to take part in the program as reflected upon by participant I, stating:

"We were sort of forced or asked to formulate our goals and parts of our business model always with a connection to the sustainable development goals: actively connecting sustainability to everything that you were doing." ~ Participant I

Combining increased problem awareness and competency application with the incorporation of specific themes in assignments laid the foundation to recognize opportunities in that field:

"One of the first assignments we had was to come up with an opportunity with food waste. That obviously kind of paved the way for afterwards that you want to reduce waste." ~ Participant A.

This strategy of continuously integrating and rewarding sustainability in all curriculum assignments fosters entrepreneurs that are more likely to integrate sustainability into future projects, and thus to recognize them as well.

Holistic perspective

Rewarding sustainability objectives throughout the curriculum's assignments was found to have another effect: Students developed a more holistic perspective on business practices. A holistic perspective in this research refers to the complete understanding and consideration of interconnecting factors in a business, such as: economic, social and environmental aspects.

This perspective emphasizes the importance of balancing profitability and ecological sustainability within a venture. Something that is mentioned by participant F:

"[The program taught me] Connecting things with each other in a smarter and more efficient way, rather than just creating more. And thinking more holistically, rather than focusing only on one small aspect." ~ Participant F

Beyond theoretical aspects, the applied practical implications supported students in understanding the challenges and benefits of starting up a sustainable business, developing a perspective in line with the triple bottom line principle.

"[SEE enables] seeing the bigger picture of entrepreneurship in general, talking about the process from the beginning to the end product, whether it's a product or a service, it kind of makes you see the bigger picture and all of the things that are behind [business processes]." ~ Participant B

As an additional factor, the repetition of knowledge impulses and institutional expectations and rewards focusing on the incorporation of ecological sustainability played a vital role in enhancing a holistic perspective.

"The priming of the program talking about sustainability ... learning about sustainability from the program got me thinking in those loops." ~ Participant B

SEE does more than just teaching business basics, it allows students to be able to evaluate and see business decisions through a wider lens that incorporates the triple bottom line as a more holistic approach to business.

4.2 Entrepreneurial ecosystem embeddedness

The second mechanism that we identified was entrepreneurial ecosystem embeddedness, which we define as students being integrated in the surrounding entrepreneurial network of their educational program. Being embedded in an entrepreneurial ecosystem appeared to be valuable, especially in the early stage of an entrepreneurial process, as it immersed students in a supportive environment full of insights, guidance and opportunities to apply their skills in real-world contexts.

Entrepreneurial ecosystem embeddedness captured the access to the surrounding *network* of the program, consisting of classmates and institutional support, incubators, mentors and

alumni networks granted to students. The *network* access, in turn, enabled *experiential learning* and *peer learning* experiences.

Experiential learning

The experiential learning environment that the sustainable entrepreneurship education placed students in, allowed for evaluating business opportunities beyond the academic context. In the context of this study, experiential learning is the process of learning through direct experience, where students engage in activities that allow them to use their knowledge and skills in real world scenarios. Students received feedback from business professionals, and tapped into the resources made available. We found that expert feedback fostered the students' ability to evaluate ideas, market inefficiencies or communal/environmental problems as potential business opportunities.

"It's a very fruitful environment to learn [about my business idea] it helped me to actually get new perspectives" - Participant I

While we did not observe that this ability was exclusively related to evaluating sustainable business opportunities, interviewees related their experience with mentors and incubators, who supported and critiqued them in experimenting with their ideas, directly to evaluating their recognized sustainable business opportunities.

Also, students were eligible and encouraged to apply for startup grants and spots at incubators. Ecological sustainability considerations were mandatory here, leading to an increase of sustainability focus:

"Like all the grants that we had to apply for, for example, they were connected to sustainability aspects." ~ Participant I

Being eligible for actual start-up grants provided an experiential learning setting aimed at raising funds by translating ideas into sustainable business opportunities by developing sustainable business models around them.

Peer learning

The collective of peers formed a part of the entrepreneurial ecosystem. Peer learning here is the process where students learn from classmates functioning as discussants, assignment partners or team members. Students exchanged, obsessed and amplified ideas and

perspectives which led to a collaborative learning experience. This environment created by the peer group can be described as a sustainability culture among students. With participant B reflecting on classmates:

"I would also say that people in our age from 20 to 25, that are currently pursuing academics are generally more inclined to think sustainably ... our class in entrepreneurship or the people around us are thinking in a very sustainable way." ~ Participant B

Facilitating peer interactions amplified the focus on sustainability, with students influencing and inspiring each other.

"[...] being part of this ecosystem [class] helps a lot because we can learn from each other and observe." ~ Participant G

The ecosystem embeddedness served as a bridge between theoretical and applied academic learning and applied learning in real-life contexts.

4.3 Mindset and motivation development

Sustainable entrepreneurship education affects the students' mindset and motivation development, which we identified as a third mechanism. We define mindset and motivation development as the process of shaping students' cognitive frameworks, attitudes and motivation towards integrating sustainability in present and future professional actions. This mechanism is essential for sustainable opportunity recognition as it fosters a long-term commitment to sustainability and motivates students to seek out sustainable opportunities.

We found that the mechanism unfolded through the *inspiration* that students got from *role models* and their success stories, demonstrating that sustainability focused ventures can be successful. The *future orientation* towards acting as a sustainable business practitioner was perceived amplified and supported through *reflection practices*. By developing a sustainably oriented mindset and motivation, students are more likely to recognize and pursue sustainable opportunities.

Role model inspiration

Certain guest lectures, mentor interactions and alumni stories were perceived as real-world success stories of sustainable business practices. We define role model inspiration as the

motivational impact that successful role models have on students through practical demonstrations of their achievements. Some students were motivated to pursue their entrepreneurial intentions by the demonstration of these practical applications. Participant G highlighted the exposure to role models as key motivational factor in the sustainable opportunity recognition process:

"Guest lecturers, role models & examples with actual major sustainable impact & relevant successful companies [motivated me]." ~ Participant G

The exposure to successful role models with measurable impact provided students with examples of what is achievable in sustainable entrepreneurship, from which they drew inspiration:

"I really enjoyed all the guest speakers and their entrepreneurial journey. I think that's something that really inspired me and showed me how it can be done, what they learned and what mistakes they made" ~ Participant H

Notably, we also received contrasting responses. Other students derived doubts from real-life examples about the scalability of sustainable business models, wishing for examples where success and impact is more prevalent. Although these responses indirectly confirmed the potential effect of positive role models, they implied that the characteristics of the example defined its effectiveness of providing inspiration.

"I feel like those examples [small scale sustainability examples] are rather keeping the people narrow minded and perceiving sustainability as something that is not worth investigating, because it doesn't appear to be scalable. And it's rather discouraging for people that want to start a big shift or want to tap into something big." ~ Participant F

Future orientation

The consistent tone and narrative throughout the course encouraged students to see themselves as changemakers, embodied in the program's mantra-like phrase to "do stuff". This phrase became a symbol of a proactive approach—learning by trying and impacting by doing. Future orientation here, is termed as the mindset and focus on long-term impacts and sustainable outcomes.

The program's emphasis on active engagement equipped students with the knowledge and competencies necessary to affect real-world sustainable changes. This practical approach is described by participant I, who reflected on the impact of this experience:

"[...] a shaping experience for me [... was ...] to work on something that changes something in real-life and not just talk about stuff theoretically." ~ Participant I

The cumulative effect of the program's atmosphere shaped a future-oriented mindset in students. Students reported an improved existing orientation:

"The program brought my focus even stronger on the sustainability aspect." ~ Participant F.

But also in creating a sustainability orientation entirely:

"My mindset was not so much sustainable and ecological before the program. And also, I would have never considered to work or try to find a business idea in the food sector or like in the sustainability sector" ~ Participant I

Reflection practices
The structured use of reflection diaries, updated every three weeks, served as a critical tool for students to consider their actions, reactions, and plans for the future. In the context of this research, reflection practices refers to the students evaluating their experiences, behaviors and learning processes.
These diaries were a compulsory element of the curriculum, prompting deeper personal insights to align their aspirations and orientations with their actions.

"The reflection diaries that we write in our course, they forced me to reflect some more, you know, look back also how I behaved, not only what I did, but how I did it, how I interacted with others." ~ Participant A

Reflection was not only encouraged, but required as a skill to successfully complete assignments within the program. This practice helped students critically evaluate their learning process.

Participant C illustrated how reflection helped reframe everyday challenges as opportunities, thus enhancing her ability to recognize and seize them effectively:

"[I am] looking at challenges in everyday life and framing them as opportunities to improve a given situation. [...] However, having and shifting your mindset in a way as to actually looking for an opportunity makes it easier to recognize that as well." ~ Participant C

By embedding reflection into the curriculum, the program effectively developed students' ability to think critically about their roles as sustainable entrepreneurs, aligning their motivations with actionable insights.

In this research we identified three main mechanisms through which SEE influences sustainable opportunity recognition: *knowledge and skill development, entrepreneurial ecosystem embeddedness,* and *mindset and motivation development*. The SEE curriculum, including guest lectures, workshops and practical assignments increased problem awareness and holistic business perspectives. Being embedded in an entrepreneurial ecosystem fostered experiential learning and feedback through practically applying sustainability principles. Role model inspiration and reflection practices helped in shaping students' sustainable mindsets and motivations. Through our findings we confirm that SEE influences sustainable opportunity recognition.

5. Discussion

Critical factors for sustainable opportunity recognition such as *knowledge of the environment, perception of threat to the natural environment*, and *altruism toward others* are reflected in the mechanisms through which sustainable entrepreneurship education positively influences sustainable opportunity recognition ability. Given the significance of sustainable opportunity recognition as the foundation for positive impact on people, planet, and profit in sustainable entrepreneurship, it is crucial to understand how enabling competencies can be institutionally fostered. While traditional opportunity recognition is well researched (e.g. Baron, 2006; Shane & Venkatamaran, 2000) and the positive effects of entrepreneurial education on opportunity recognition have been discussed (Bae et al., 2014; Wilson, 2008), very few studies have explored the notable differences in the process of recognizing sustainable business opportunities and the role of entrepreneurship education in enabling that process.

This study identifies three mechanisms through which SEE impacts students in advancing their competencies to better recognize sustainable business opportunities. Entrepreneurial learning processes are found to be dynamic, enhanced by the interaction of the mechanisms through which they unfold (Cope, 2005). We arrive at a framework which captures the effect of sustainable entrepreneurship education as a reinforcing continuous cycle between three mechanisms through which it enhances sustainable opportunity recognition (Figure 2).

The process of fostering sustainable opportunity recognition is a reinforcing continuous cycle. Each of the identified mechanisms is a standalone means through which SEE influences sustainable opportunity recognition, but given the continuous nature of this applied learning process, the interaction of the mechanisms plays a vital role in how the effect of each mechanism is reinforced by the other.

Our findings validate and expand upon Patzelt and Shepherd's (2011) model. For instance, we provide evidence supporting the model by demonstrating that their mechanism of *knowledge of the natural/communal environment* aligns closely with our identified mechanism of *knowledge and skill development*. Similarly, their *motivation mechanisms* are reflected in our mechanism of *mindset and motivation development*. Empirical data underscored the importance of entrepreneurial ecosystem embeddedness, a theme not fully anticipated by the original model. This empirical validation process helped us refine our theoretical framework, integrating both the original constructs, and new insights to better explain SEE's impact on sustainable opportunity recognition.
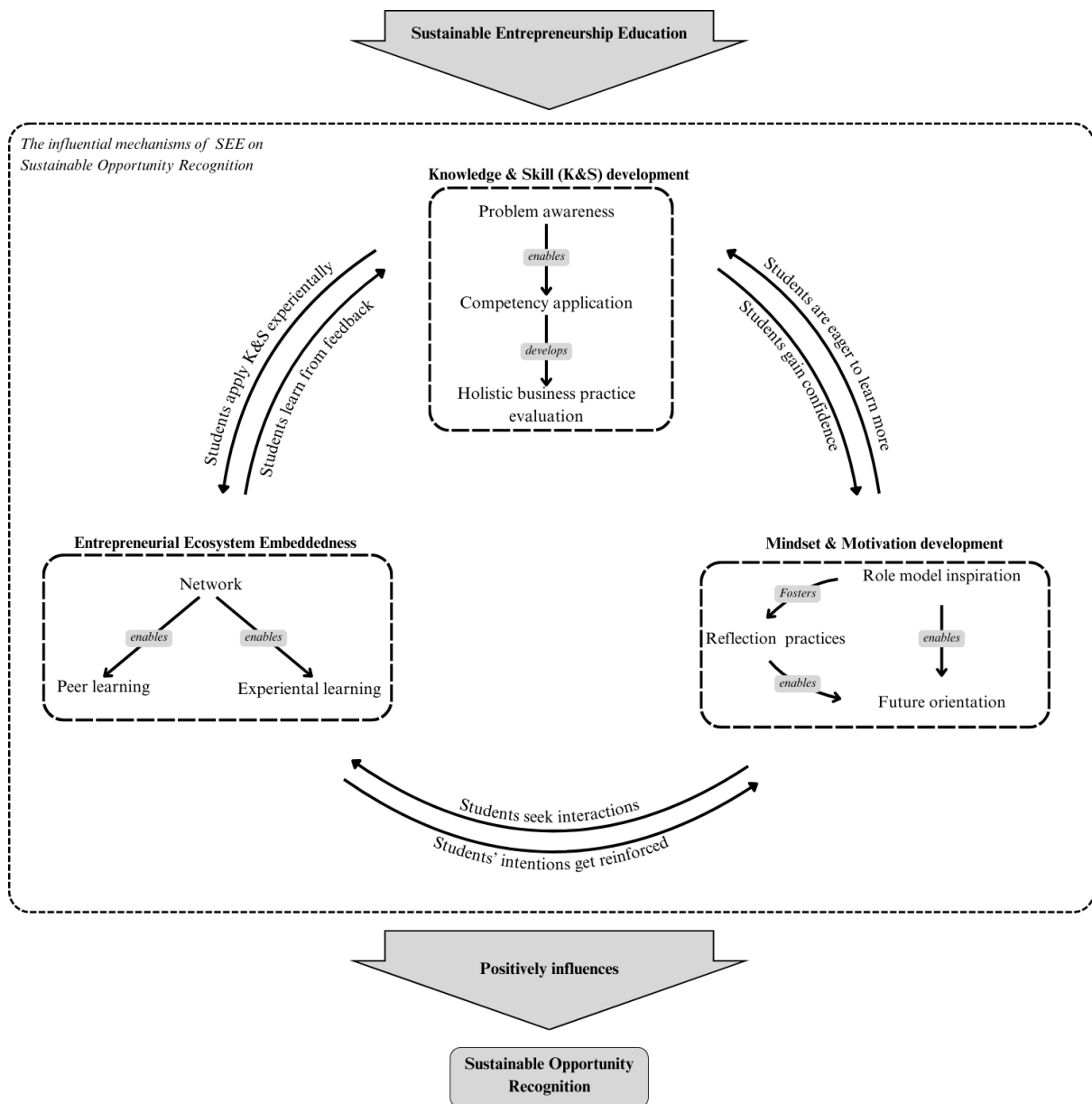
Figure 2: Framework

Mechanisms

The first mechanism identified is *knowledge and skill development*, through which students develop a toolset to better identify and act on potential sustainable opportunities. This parallels findings in traditional entrepreneurial education aligning with research that shows that knowledge and skills gained through education develop traits essential for recognizing opportunities (Henry et al., 2005). Curriculum components such as guest lectures and field trips provide students of the SEE program at Lund University with access to specific knowledge regarding the natural/communal environment. For instance, guest lectures from

sustainability experts increase problem awareness by exposing students to real-world challenges and solutions. This exposure is vital as it enhances sustainability problem awareness and enables students to identify sustainability problems that require innovative solutions themselves, often forming the basis of sustainable opportunities (Patzelt & Shepherd, 2011). Practical assignments which reward sustainability objectives enable the transfer of knowledge made available to the students, which catalyzes skill development through application of this knowledge. The strategy of continuously integrating and rewarding sustainability in all curriculum assignments fosters entrepreneurs that are more likely to integrate sustainability into future projects, and thus to recognize them as well (Zahrani, 2022). For instance practical assignments, like the entrepreneurial challenge on waste reduction or energy efficiency, rewarded for the most impactful ecological sustainability contribution, help students apply theoretical knowledge, but also positively condition a holistic perspective on business practices. The ability to holistically evaluate business practices, balancing the social, economic, and environmental aspects of business, is found an essential skill for recognizing and pursuing sustainable business opportunities (Terán-Yépez et al., 2020; Diepolder, Weitzel & Huwer, 2024).

The second mechanism, *entrepreneurial ecosystem embeddedness*, enables *experiential learning* processes through access to a network which provides feedback throughout the entrepreneurial process, extending the academic to a real-life setting. In line with the Social Network Framework, classmates, incubators, mentors and alumni networks are necessary for acquiring previously unattainable information and resources (Burt, 1992), as they provide feedback and support. Also, the access to the incubator network surrounding the SEE program at Lund University enables experiential learning by competing for funding with identified market imperfections as potential business opportunities recognized. Students engage with real-world entrepreneurial projects, aligning with the shift in SEE to a more hands-on approach (Bell & Bell, 2020). This shift towards experiential learning, bridging the gap between theoretical learning and application of that knowledge, fosters project-based experience (Domask, 2007), which in turn leads to a better ability to recognize sustainable opportunities (Hanohov & Baldacchino, 2018). Through the encouragement of participation in startup grants and positions at incubators, which incentivize the incorporation of sustainability within startup ideas as application criteria, recognizing and potentially pursuing sustainable business opportunities becomes more likely (Muñoz & Dimov, 2015). Thirdly, *Peer learning* plays an important role within the entrepreneurial ecosystem that SEE provides

through the collective exchange of ideas and perspectives among students. The focus on sustainable practices and thus sustainable opportunity recognition is amplified by the development of a collective, self-reinforcing mindset. In line with previous findings the students create a shared culture by engaging in peer learning that increases sustainability awareness and identity (Hilsdon, 2014).

Finally, the mechanism of individual *mindset and motivation development* leaves students with stronger sustainable intentions and attitudes, which plays an important role in initially engaging in recognizing sustainable business opportunities. The transformation of students' cognitive frameworks is influenced by the environment (Wang et al., 1990). The cognition transformative environment of the SEE program of Lund University is characterized by *role model inspiration,* found in the networks and guest lectures and *reflection practices* fostered through tailored exercises like the reflection diary. They enable students to understand themselves as changemakers that aim for long-term impacts with sustainable outcomes, defining a *future orientation* which favors sustainable business practices. Our interviews indicate that structured reflection diaries and exposure to successful sustainable entrepreneurs play critical roles in aligning students' motivations with sustainable practices, confirming that SEE influences sustainable mindsets (El Awad et al., 2024).

SEE is found to influence general and sustainable entrepreneurial intentions and attitudes, which parallels existing research on how EE impacts traditional entrepreneurial intentions and attitudes (Gieure et al., 2020; Galloway & Brown, 2002; Miller et al., 2009). Tailored education shapes specific intentions and attitudes (Sun et al., 2023), which aligns with our findings. Initial engagement in entrepreneurial activities is largely dependent on intentions and motivations (Fayolle & Degeorge, 2006; Thompson, 2009). Combined, this suggests that SEE influences students to be more likely to initially engage in recognizing sustainable business opportunities.

The reinforcing continuous cycle enabling sustainable opportunity recognition

The process of how SEE enables sustainable opportunity recognition is dynamic and continuous, influenced by three main mechanisms — *knowledge and skill development, entrepreneurial ecosystem embeddedness,* and *mindset and motivation development*. Each mechanism functions independently, but also interacts in order to shape the abilities of students to recognize sustainable opportunities.

Knowledge and skill development is an ongoing process inside and outside the classroom. Through activities like guest lectures and practical assignments, students engage with the entrepreneurial ecosystem more in-depth. This allows students to *experientally apply their knowledge* and also *receive feedback* on their ideas. This feedback, acquired through participating in startup grants and interaction with mentors allows for further development of their knowledge and skills. The entrepreneurial ecosystem enhances the learning process by providing new perspectives and support, encouraging students to continuously apply and refine their knowledge and skills. This creates a feedback loop, where each experience enhances a students' ability to identify sustainable opportunities.

Being embedded in this ecosystem does not only increase skills and knowledge through feedback, but it also *reinforces* a students' sustainable mindset and motivation. Getting in touch with role models, mentors and peers allows for students to reflect on their experiences and insights gained from both theoretical knowledge and practical experiences. With this increased sustainability mindset and motivation, students *actively seek out interactions* within this ecosystem, leading to even deeper embeddedness. The more feedback and inspiration students receive, the more motivated they become to interact further with the ecosystem and refine their mindset towards sustainability. A continuous cycle that motivates students to identify sustainable opportunities.

As students develop a more sustainable mindset and motivation, they become *eager to learn more*. They look to increase their knowledge and skills in sustainable subjects, understanding that these tools will help them to make a greater impact on the world. With these increased knowledge and skills, students also *gain confidence* to use these abilities. This, in turn, reinforces the sustainable mindset again, as students become more aware of the positive change they can bring to the world. Confidence will deepen students' connections to sustainability, creating a cycle where increased knowledge and skills lead to a stronger mindset and motivation and vice versa.

The dynamic interaction of these three identified mechanisms creates a continuous reinforcing cycle, where each element enhances or compliments the other. In SEE students engage with the entrepreneurial ecosystem, where they apply their knowledge and skills, but also receive feedback. Which in turn deepens their knowledge and skills. This ecosystem embeddedness also shapes a sustainable mindset and motivation, which leads to further interactions and learning possibilities within this ecosystem. As students' knowledge and skills increase, so does their confidence in their abilities to use these skills in a sustainable

manner. This confidence develops their sustainable mindset and motivation even further, allowing them to make a positive impact through being able to better recognize sustainable opportunities. This dynamic process of mechanism interactions in SEE supports students in becoming better equipped to recognize sustainable opportunities.

5.1 Theoretical implications

The exploration of the influence of sustainable entrepreneurship education on sustainable opportunity recognition offers several contributions to the entrepreneurship literature. Previous research has predominantly focused on the influence of general entrepreneurship education on traditional opportunity recognition (Fayolle & Gailly, 2013; Costa et al., 2017). Our research acknowledges recent findings that highlight the differences of traditional versus sustainable opportunity recognition, by questioning how tailored sustainable entrepreneurship education affects the process distinctively. Doing so, we take a first step to address the gap in current literature identified by Hanohov and Baldacchino (2018) concerning the effect of education on the sustainable entrepreneurial process.

We explored mechanisms through which SEE positively influences sustainable opportunity recognition, which unfold through the implementation of specific educational means. Guest lectures of successful sustainable entrepreneurs, for example, enhance the problem awareness of students and provide role model inspiration, which in turn fosters the knowledge and mindset necessary to engage in sustainable opportunity recognition. Our framework captures the effect of sustainable entrepreneurship education as a reinforcing continuous cycle between three mechanisms through which it enhances sustainable opportunity recognition. But it does not define the strength of the relationship, due to the qualitative nature of the findings. We are taking a first step towards assessing the outcome of the implementation of SEE, as called for by Sharma et al. (2020), but to measure the effectiveness of sustainable entrepreneurial education in enhancing sustainable entrepreneurial processes quantitative research is necessary.

Besides, this study provides support for the conceptual proposition of Patzelt and Shepherd (2011) on how the sustainable opportunity recognition process unfolds generally. We uncovered parallels between the mechanisms through which SEE enhances students' ability to recognize business opportunities and the mechanisms identified in their model. Still, the model has to be empirically validated throughout multiple contexts in future research. That would not only enhance the general understanding of sustainable opportunity

recognition but could also be applied to methodologically sharpen the investigation of SEE influencing sustainable opportunity recognition.

Finally, this study contributes to the scholarly domain of entrepreneurial education. It extends upon existing theories of entrepreneurship education by illustrating how sustainable entrepreneurship education, as a specialized form of EE, specifically influences the cognitive processes of students towards a more sustainable focus. In our findings this focus manifests through the mechanism of sustainable mindset and motivation development. Aligning with Self-Determination Theory, this allows for individuals to maintain long-term engagement and continue actions that they are intrinsically motivated for (Deci & Ryan, 2000). This suggests that the influence of SEE expands beyond opportunity recognition on the entire sustainable entrepreneurial process. Future research investigating the effect of SEE on the SEP is faced with the challenge to develop a clear method to conceptually and methodologically distinguish differences and similarities between the EP and SEP but also EE and SEE.

As outlined, our research contributes to the general understanding of opportunity recognition in a sustainable context, providing support for the conceptual proposition of Patzelt and Shepherd (2011) on how the sustainable opportunity recognition process unfolds. On top of that, it takes a first step towards uncovering how sustainable entrepreneurial education enables this process. Our study invites future research to validate the findings conceptually in different contexts, and empirically, but also to discover the effects of sustainable entrepreneurial education on the entire entrepreneurial process.

5.2 Practical implications

The findings of this study highlight multiple practical implications for educators and program designers that are looking to adjust current SEE offerings or transition from EE to SEE. We found that specific educational means, impulses and set-ups enable the uncovered mechanism through which SEE influences sustainable opportunity recognition.

The curriculum design of the sustainable entrepreneurial program at Lund University, which includes guest lectures, workshops, practical assignments and field trips, is largely responsible for the mechanism of knowledge and skill development. Curriculum components such as guest lectures and field trips provide students of the SEE program at Lund University with access to specific knowledge regarding the natural/communal environment. For instance, guest lectures from sustainability experts increase problem awareness by exposing

students to real-world challenges and solutions. These educational means increase problem awareness and allow students to gain a holistic perspective. To capitalize on the effect of positive role model inspiration, ensuring that guest lectures are given by successful sustainable entrepreneurs appears beneficial. Educators and program designers should therefore include lectures, practical assignments and field trips that demonstrate the achievable success through sustainable entrepreneurship.

Practical assignments, like the entrepreneurial challenge in the SEE program of Lund University, partially rewarded for the most impactful ecological sustainability contribution, includes experiential learning. Through this, students get to apply sustainability principles in different contexts. This helps students to use theoretical knowledge in order to develop a holistic perspective on business practices. Therefore, educators and program designers should include hands-on problem solving activities that mirror real-world sustainability challenges into SEE curriculums.

Access to incubators, alumni networks, mentors and peers enables the mechanism of entrepreneurial ecosystem embeddedness, which fosters experiential learning processes through access to a network which provides feedback throughout the entrepreneurial process, extending the academic to a real-life setting. At Lund University this ecosystem, although very diverse, is not completely focused on sustainability. To ensure that the positive effect of a sustainable network is captured effectively, educators could include a mentor network that consists primarily of successful sustainable entrepreneurs.

The SEE program at Lund University fosters a transformative environment through role model inspiration and structured reflection practices. This plays part in the third discovered mechanism: the development of a sustainable mindset and motivation. Facilitated through the curriculum and the ecosystem, reflection practices, such as reflection diaries, increase the development of a sustainable mindset and motivation through reflecting on role models and theoretical learnings. This helps students see themselves as changemakers that are focused on long-term sustainability, promoting a future orientation that gives sustainability priority. Educators and program designers should include regular reflection exercises in order to align one's mindset to prior learnings.

Implementing these strategies will allow sustainable entrepreneurship education programs to effectively prepare students to become innovators and leaders who understand the importance of sustainability and are equipped to implement these principles in their future careers.

5.3 Limitations and research outlook

Contextual Limitations

The study's primary limitation is its focus on a single educational program within Lund University. This narrow scope raises concerns regarding the generalizability of the findings. The specific pedagogical and institutional characteristics of the Lund University program may not be representative of other SEE programs across different geographic and cultural contexts. This limitation restricts the applicability of the theoretical and practical implications to other settings where educational structures, cultural influences, and environmental priorities might differ. Future research should extend the investigation to include diverse educational settings, enhancing the understanding of how various contextual factors alter the effects of SEE.

Data Collection Constraints

Another significant limitation is the reliance on self-reported data from participants collected retrospectively at a single point in time. This method is susceptible to biases such as social desirability bias and retrospective rationalization, where participants may portray their experiences and the impacts of their education in a more positive light (Podsakoff et al., 2003). To mitigate these issues, future studies could implement more objective measures, such as real-time assessments of competency development and the direct observation of opportunity recognition processes, collecting multiple data points over a period of time.

Differentiation Challenges

The study also faces challenges in differentiating between the general opportunity recognition abilities and those specifically enhanced to recognize ecological sustainability opportunities. While SEE aims to improve the recognition of sustainable opportunities, distinguishing the specific competencies from general entrepreneurial skills developed through traditional educational means remains problematic given that they overlap. This ambiguity complicates the interpretation of how SEE uniquely contributes to sustainable opportunity recognition, in comparison to general entrepreneurship education. Future research should focus on developing clear, measurable indicators that solely identify and evaluate

sustainability-specific competencies deriving practical implications to policy makers that allow to distinctively adjust SEE versus traditional EE.

Scope of Educational Impact

Critically, this research acknowledges the limitation in evaluating the full scope of the educational impact due to its concentration on students that were currently engaged in the program. There is an underlying challenge in ensuring that all potential educational means are explored and evaluated. Students might not be exposed to or able to identify all effective educational practices that could potentially enhance their opportunity recognition competencies. This limitation impacts the findings and restricts the practical implications of our research to policymakers, as educational strategies or policy adjustments cannot be reviewed comprehensively. The long-term effects of SEE on students' careers and their actual engagement with sustainable opportunities post-graduation are not captured. This temporal limitation prevents the study from assessing whether the recognized opportunities translate into real-world sustainable ventures. Furthermore, some students expressed skepticism about the overemphasis on sustainability, questioning its current relevance and practicality in the broader entrepreneurial landscape. This suggests that while SEE is designed to foster a sustainable mindset, there is a need to balance the curriculum to reflect the realistic application and demand for sustainability in the business world.

External Influences on sustainable opportunity recognition|

Another limitation is that various external factors beyond the educational program itself influence sustainable opportunity recognition. Many students enter the program with pre-existing sustainability knowledge and attitudes, shaped by their other educational backgrounds, upbringing or peer influence. Therefore, it is essential to recognize that SEE in this context interacts with these pre-existing factors, making the isolation of the direct impact that the program had a challenge. Future research could aim to further extend controlling for these external influences to better understand the specific contribution that SEE has on the sustainable opportunity recognition process.

Future Research Directions

Based on these limitations, this study not only calls for further empirical exploration to validate and extend its findings. On top of that need for innovative research methodologies to quantify the influence of SEE on sustainable opportunity recognition and the entire

sustainable entrepreneurial process. Investigating the long-term career outcomes of SEE alumni could provide valuable insights into the practical application of the skills and knowledge gained by such programs. Moreover, expanding the research to include multiple SEE programs worldwide would enhance the robustness and applicability of the findings, providing a more comprehensive understanding of how different educational settings influence sustainable opportunity recognition.

While this study advances the understanding of SEE's influence on sustainable opportunity recognition, its limitations highlight the need for broader, more diverse research efforts to fully comprehend the dynamics and implications of integrating sustainability into entrepreneurship education.

6. Conclusion

While sustainable entrepreneurship education has been receiving increased attention in entrepreneurship literature, specific research on its impact on sustainable entrepreneurship remains limited. This thesis explores how the integration of SEE affects students' abilities to recognize sustainable opportunities, revealing that SEE fosters intentions and competencies necessary for recognizing such opportunities. We derive a framework that captures these effects as a reinforcing continuous cycle consisting of three mechanisms: *knowledge and skill development, entrepreneurial ecosystem embeddedness,* and *mindset and motivation development*.

The *knowledge and skill development* mechanism, facilitated through curriculum components such as guest lectures and practical assignments, increases problem awareness and provides students with the skills and confidence needed to identify sustainable opportunities. The mechanism of *entrepreneurial ecosystem embeddedness* gives students access to a network of mentors, incubators and alumni, enabling experiential and peer learning. Through which students can apply their knowledge and skills in real-world contexts. The third identified mechanism, *mindset and motivation development*, is captured through role model inspiration and reflection practices. These elements help students reinforce their intentions and see themselves as changemakers committed to long-term sustainability.

The interaction of these three mechanisms creates a reinforcing continuous cycle where students in SEE programs deepen their developed knowledge and skills through engagement with the entrepreneurial ecosystem and receive feedback on applying these learnings, which enhances their confidence as changemakers and amplifies their sustainable mindset. This dynamic process of mechanism interactions supports students in becoming better equipped to recognize sustainable opportunities.

This research contributes theoretically to the overall comprehension of how business opportunities are recognized within sustainable contexts by providing support for the conceptual proposition of Patzelt and Shepherd (2011) on how the sustainable opportunity recognition process unfolds. Additionally, it marks an initial step towards understanding how sustainable entrepreneurship education enables this process. We encourage subsequent research to validate these findings in diverse contexts, both conceptually and empirically, and to explore the influence of sustainable entrepreneurship education on the entire entrepreneurial process.

Practically, our findings suggest that SEE programs which incorporate diverse learning modalities, such as guest lectures, field trips, and practical assignments, increase students' problem awareness and competency application abilities. Furthermore, embedding students in a supportive entrepreneurial ecosystem, enriched by peer interactions and mentorship, fosters experiential learning and collaborative innovation. The development of a sustainability-oriented mindset is further enhanced through reflective exercises and by role models who show scalable and impactful business practices.

However, despite the valuable insights gained, this study faces limitations. It focuses on a single educational program, which restricts the generalizability of the findings and thereby the generalizability of the theoretical and practical implications. The reliance on self-reported data introduces potential biases, and the overlap between general entrepreneurial and sustainability-specific skills complicates interpretation. Future research should include diverse educational settings, implementing objective data collection, and explore long-term influences of SEE on sustainable opportunity recognition.

In conclusion, this study advances the understanding of the influence of sustainable entrepreneurial education on sustainable opportunity recognition. Our findings imply that tailored sustainability education may play a substantial role to unlock the potential of sustainable entrepreneurship in balancing social, economic and ecological factors in future business practices. Extending future research by investigating the effects of SEE on the entire sustainable entrepreneurial process, could pave the way to understand the full potential of SEE as an enabler of sustainable entrepreneurship.

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Appendix A

Interview questions

Introductory questions:

(1) Can you give us a short introduction about yourself and what motivated you to pursue a degree in Entrepreneurship and Innovation, particularly at Lund University?

(2) Can you describe the entrepreneurial project you are currently working on in the Entrepreneurship and Innovation program?

(3) Which experiences shaped you as an (aspiring) entrepreneur in the last year?

- and how did these experiences (if education mentioned; how did the master) do that?
- What role did your masters education play in shaping you as an (aspiring) entrepreneur?

Knowledge and perspective:

(4) During the idea cafe, you came up with XYZ as a potential business opportunity. Do you remember what led you to recognize this opportunity?

- In what way did education in entrepreneurship & innovation help you recognize this opportunity?

(5) With your knowledge as an entrepreneur, how do business practices have to change to meet the challenges of the 21st century?

- Where does your knowledge of these challenges and your opinion on how to meet them come from?
- How do you want to incorporate sustainable business practices in your personal future?
- What was the role of the master program forming this opinion? (if mentioned) Please specifically focus on through which means the master program influenced you

(6) Since the idea café, have you recognized any other sustainable opportunities besides XYZ?

- If so, what issue do they solve?
- If it fits: how did the master help you recognize this opportunity?

(7) Do you feel like you're aware of environmental issues? If so, can you name a few that are pressing to you.

- In what way can entrepreneurship help to address these issues?
- Where does your awareness of these issues come from?
- How did the program in Entrepreneurship & innovation influence your awareness of environmental problems?

(8) Could you describe a moment, lecture, event, assignment, occurrence, etc. during the master that impacted your perception of sustainability in entrepreneurship?

(9) If you think about the future of the planet, how does that make you feel about your own future?

- Why do you feel that way?
- Where does this perspective come from?
- How has your perspective changed since you started the master program in Lund?

(10) We talked about how business practices need (or don't need) to change, the awareness of environmental issues and how troubled you feel about your future living on our planet. In what way do you feel personally responsible for creating a more sustainable future?

- In which way does that include the wellbeing of future generations?
- In which way does that include the wellbeing of others?
- How did this change after starting your education in entrepreneurship and innovation?

(11) What makes you feel capable of contributing to a more sustainable future?

- In what ways did the master equip you to contribute to a more sustainable future?

(12) What is your perspective on starting a sustainable business?

- What is important for a business to be sustainable?
- In what way did the master develop your perspective on starting sustainable businesses?
- How does an entrepreneur recognize an opportunity?
- How does an entrepreneur recognize a sustainable opportunity?

(13) In what way did your ability to recognize a sustainable opportunity evolve due to the master?

Environment and mindset:

(14) In what way are your peers in the program important to reflect on ideas, beliefs but also to learn from them?

- In what way did your peers influence your mindset to be more sustainable?
- Are there any other factors in the masters environment that influenced your mindset to be more sustainable?

(15) How did your masters education shape you to have a more sustainable mindset, if at all?

(16) How can education shape a sustainable mindset among entrepreneurs?

Improvements for the master:

(16) Reflecting on your experience, how could the master in entrepreneurship & innovation be improved to make future entrepreneurs recognize sustainable opportunities to start sustainable businesses?

Appendix B

Experiment setup

1. Identity (interests & background), skillset & contacts

(1) What are the three topics in your life you are most interested in?

(2) Briefly lay down your prev. experience combined with the fields of expertise you gained from those.

(3) Who are your five most important contacts? You define importance for yourself, it could be reach, business experience, success, fame, but also friendship, bond, interest).

2. Fostering Idea Brainstorming

(4) Which are the areas of life (& therefore business) that will be innovated most severely in the next 10 years // which areas need to be innovated? Try to think of 3 at least.

(5) Do you have any business ideas in mind (that you would like to share too)? Please note them down the following way:

Brief "headline" for business idea + area of business/society + need that it tackles

3. Knowledge

(6) Can you think of/Are you aware of any valuable knowledge, others are not aware of or tend to ignore in their consumer behavior?

(7) What do your friends/ families complain about in their jobs or everydays life?

Appendix C

Consent Form - Interview participation

Consent Form for Participation in Research

Title of Study (preliminary)**:** Exploring the role of sustainable entrepreneurship education for sustainable opportunity recognition.

Researcher: Martin Freihals and Casper van Wordragen; contact: martin.freihals@web.de

Introduction:
You are being invited to participate in a research study conducted by Martin Freihals and Casper van Wordragen from Lund University. Before you decide to participate, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully.

Purpose of the Study:
This study aims to explore the role of sustainable entrepreneurship education for sustainable opportunity recognition.. Your participation will involve one recorded interview either in person or online lasting approximately 30-60 minutes.

What Will Happen:
In the course of this study, you will be asked to engage in a recorded audio interview. The interview will be transcribed, and the information gathered will be analyzed to support the research objectives.

Voluntary Participation:
Your participation in this study is entirely voluntary. It is your choice whether to participate or not. You may choose not to participate, or, if you decide to participate, you may withdraw your consent and discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

Procedures for Protecting Confidentiality:
Your interview will be recorded and transcribed verbatim. To ensure confidentiality, all audio recordings and transcripts will be anonymized. Names and any identifying information will be replaced with pseudonyms in the transcripts. Recordings and original transcripts will be securely stored and only accessible to the research team.

Use of Data:
The anonymized data from this study may be used in our Master's thesis, presentations, and published papers. Quotes from the interview may be used in publications but will be completely anonymized.

Right to Withdraw Consent:
You have the right to withdraw from the study at any time, without affecting your relationship with Lund University.

Contacts for Questions or Problems:
For questions about the study or your rights as a participant, please contact us at martin.freihals@web.de or our supervisor at ziad.el-awad@fek.lu.se.

Thank you for your participation! Casper & Martin

Question 1:

Full name

Question 2:

By signing this form, I confirm that I have read and understood the information about this study. I have had the opportunity to ask questions, and all my questions have been answered to my satisfaction. I consent to participate in this study, knowing that I can withdraw at any time.

☐ I consent.
☐ I do not consent.