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Regenerative Approaches in Entrepreneurship Education: A New Paradigm Beyond Sustainability

DOCTORAL DISSERATION

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Abstract

The purpose of this dissertation is to propose a new paradigm for entrepreneurship education through an educational framework that integrates new approaches to curriculum content, teaching methods, educator roles, learning environments, and desired outcomes.
This shift is needed because current entrepreneurship education remains rooted in profit-centred paradigms and educational frameworks that prioritise individualism and economic gains while neglecting systemic interconnections and the broader social and ecological impacts of entrepreneurial practice.

The research aim is achieved through a three-stage research structure. First, a semi-systematic literature review (Research Paper 1) examines existing competency frameworks in social and sustainable entrepreneurship education. Second, a social-constructionist thematic analysis (Research Paper 2) analyses the European Union's two key competency frameworks in this field. Finally, a practice-oriented design science research process (Research 3) translates these insights into a new educational framework for regenerative approaches in entrepreneurship education.

The research shows that entrepreneurship education must transition from conventional sustainability frameworks to regenerative approaches that create net-positive ecological and social impact. It demonstrates that current educational frameworks are too limited and that a new paradigm is needed. One that reimagines entrepreneurship as a force for regeneration, and positions entrepreneurial practice as an active agent in generating net-positive impacts on ecological and social systems.
In response, this dissertation introduces a requirements model, termed the *Dandelion Collection*, which articulates key components related to content (What), teaching approaches (How), roles and learning environments (Who and Where), and intended outcomes (Why). Its illustrated application through a seven-day international summer school represents an initial educational framework toward translating this new paradigm into a tangible and lived reality within entrepreneurship education and practice.

This dissertation does not test or evaluate the proposed educational framework, nor does it compare it with alternative frameworks. Such empirical validation offers a clear avenue for future research.

The originality of this dissertation lies in its integration of systems thinking and transformative learning theory to conceptualise regenerative approaches in entrepreneurship education. It translates these theoretical insights into a practical blueprint for educators, proposing a new educational framework and paradigm that redefines the role of entrepreneurship education in society.

Key words: Sustainability, Regeneration, Entrepreneurship Education, Systems Thinking, Transformative Learning Theory, Regenerative Entrepreneurship Education, Competencies, Socio-Ecological Challenges

Acknowledgement

The dissertation was originally planned as a cumulative dissertation, structured around three interconnected research contributions. These contributions have been partly published or presented at conferences and build sequentially upon one another.

The first research paper, “Systems Thinking in Entrepreneurship Education: An Examination of Competencies and Pedagogical Approaches for Sustainable Transformation,” was presented at the 13th International Scientific Conference Region, Entrepreneurship, Development (RED), held online on 6–7 June 2024. This paper has been published in the conference proceedings, which are indexed by the Web of Science and accessible online via this link (Wilhelm and Planck, 2024).

The second research paper, “Greater than the Sum of Its Parts: Combining Entrepreneurial and Sustainable Competencies in Entrepreneurship Education,” was presented at the 3E Conference - ECSB Entrepreneurship Education Conference, held in Amsterdam from 15–17 May 2024. It has been published in the peer-reviewed journal Sustainability (MDPI), which is indexed by Web of Science and accessible online via this link (Planck et al., 2024).

The third research “A Requirement Model for Regenerative Approaches in Entrepreneurship Education,” was presented at the 3E Conference - ECSB Entrepreneurship Education Conference, held in Munich from 21-23 May 2025. As this research contributions has not yet been published, it is referred to in this dissertation as research rather than as a research paper, in contrast to the other two cases stated above.

Due to administrative constraints, and following consultation with senior academic staff, including Prof. Slavica Singer, Ph.D., Professor Emeritus and UNESCO Chair in Entrepreneurship Education at J. J. Strossmayer University in Osijek, the cumulative dissertation format was subsequently adapted into a monograph. This monograph preserves the coherence and holistic ambition of the original research design while meeting institutional requirements.

To support the writing process and address language-related challenges as a non-native English speaker, AI-based tools such as ChatGPT (www.chat.openai.com) and DeepL (www.deepl.com) were used for language refinement, reformulation, and improving overall clarity. These tools aided in enhancing understanding and expression but were used solely to support linguistic accuracy and not to generate original academic content. All other sources and references used throughout this dissertation are properly cited and acknowledged in accordance with academic standards.

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1 Reimaging Entrepreneurship Education

My intrinsic motivation for pursuing this PhD stems from a growing dissatisfaction with the dominant paradigms[1] in entrepreneurship education.
Much of current entrepreneurship education remains anchored in a conventional paradigm that, through its educational frameworks, narrowly defines value creation as profit maximisation. These approaches tend to emphasise values such as individualism and economic outcomes while overlooking the broader systemic connections and the significant social and ecological impacts of entrepreneurial practice.

Embarking on my PhD journey was therefore driven by a vision of a new paradigm, one that reimagines entrepreneurship as a force for regeneration, and positions entrepreneurial practice as an active agent in generating net-positive impacts on ecological and social systems.

Our world is facing a convergence of escalating socio-ecological challenges, ranging from climate change and biodiversity loss to water scarcity, environmental pollution, food insecurity and resource depletion (Das and Bocken, 2024; Edwards, 2021; Ellis, 2018). These crises are intensifying in scale and complexity, revealing not just environmental degradation but systemic vulnerabilities that threaten the stability of societies and economies alike (Guzman et al., 2021). Scholars conceptualised these interconnections through the lens of social-ecological systems, dynamic, co-evolving configurations in which human and natural domains are tightly coupled (Folke et al., 2010). Within these systems, reciprocal feedback looks mean that shifts in ecological conditions inevitable affect social and economic outcomes and vice versa (Folke et al., 2010). Conventional distinctions between business, society and environment are therefore rendered obsolete. Instead, they must be understood as interdependent systems that shape each other's long-term trajectories (Meadows, 1999), emphasising that we are not dealing with separate problems in separate domains (Folke et al., 2010).

[1] Paradigms are understood in this dissertation as distinct sets of concepts or thought patterns that include theories, research methods, underlying assumptions, and the standards that define what counts as legitimate knowledge or contribution within entrepreneurship education.

In this context, incremental improvements like reducing carbon emissions or boosting efficiency are no longer sufficient (Hahn and Tampe, 2021). Addressing today's challenges requires therefore also a fundamental rethinking of entrepreneurship's role in society, and environment and a reconsideration of the dominant economic paradigms that currently guide entrepreneurial practice (Ellis, 2018). It is important to recognise that entrepreneurship constitutes only one possible avenue to these complex challenges. While startups and established companies contribute meaningfully, they cannot, in isolation, resolve such systemic challenges[2].

This necessity for rethinking is underscored by the prevailing economic paradigms that shape entrepreneurship education and practice. Traditional economic paradigms in entrepreneurship education, such as neoclassical entrepreneurship, focus on resource optimisation and profit maximisation, and Schumpeterian entrepreneurship, where innovation drives growth and competitive advantage continue to shape the field (Mishra and Zachary, 2015). More recent models like the Lean Startup[3], emphasising rapid experimentation, and design thinking[4], with its human-centered, problem-first focus, represent attempts to broaden this view.
However, scholars argue that these more recent paradigms are still insufficient (Banerjee et al., 2021; Das and Bocken, 2024) calling for a transformation of the educational frameworks (including key elements such as curriculum content, teaching methods, educator roles, learning

[2] Throughout this dissertation, references to addressing socio-ecological challenges are intended to emphasise the meaningful contributions entrepreneurship can offer, while recognising that it is not the sole solution to these issues.

[3] Eric Ries introduced the concept of the 'Lean Startup' to entrepreneurship. He outlined this approach in his 2011 book "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses". The Lean Startup method focuses on using validated learning, rapid prototyping, and iterative development to build businesses more efficiently and with less risk (https://journals.sagepub.com/doi/full/10.1177/1042258719899415#bibr106-1042258719899415).

[4] Design Thinking is a human-centered, iterative problem-solving approach that fosters creativity, collaboration, and innovation introduced into entrepreneurship education primarily in the early 2000s and gained widespread adoption throughout the 2010s via David Kelley co-founded the Stanford d.school (Hasso Plattner Institute of Design at Stanford).

environments, and desired outcomes) and underlying assumptions that have traditionally shaped entrepreneurial practice (Banerjee et al., 2021; Das and Bocken, 2024; Guzman et al., 2021; Hahn and Tampe, 2021; Muñoz and Branzei, 2021).

In response, sustainability-oriented approaches have increasingly been incorporated into entrepreneurship education, including social and sustainable entrepreneurship education (Lans et al., 2014). However, many of these sustainability approaches remain grounded in outdated paradigms that overlook the systemic interconnectedness highlighted above (Birney et al., 2019; Gibbons, 2020; Hahn and Tampe, 2021). As Gibbons (2020) notes, such so called *conventional sustainability approaches* tend to emphasise harm reduction or the maintenance of existing systems. However, in the context of the Anthropocene, a concept describing a new geological epoch in which human impact on the planet is both profound and accelerating, such efforts are increasingly proving insufficient (Banerjee et al., 2021; Hahn and Tampe, 2021).
Consequently, scholars in entrepreneurship education are challenging such *conventional sustainability approaches* that prioritise linear growth, profit maximisation, and efficiency while neglecting broader social and environmental considerations (Edwards, 2021; Ellis, 2018; Lynch et al., 2021; Midgley and Lindhult, 2021).

Against this backdrop, systems thinking has emerged as a particularly promising avenue for reorienting entrepreneurship education.
By enabling learners to see and understand interconnections, feedback loops, and unintended consequences, systems thinking provides a conceptual and practical toolkit for addressing socio-ecological challenges with entrepreneurial means (Birney et al., 2019). Yet, while it is widely recognised as a critical competence (Lynch et al., 2021; Planck et al., 2024), its integration into entrepreneurship curricula remains fragmented. Wilhelm and Planck (2024) note that current efforts to embed systems thinking, particularly in sustainability contexts, have yet to realise their transformative potential.

Building on this critique, Hahn and Tampe (2021) argue that entrepreneurship must move beyond paradigms of harm reduction and linear thinking towards adopting a systems thinking perspective and regenerative approaches, those aimed at creating net-positive impacts by regenerating the very systems upon which life depends.

In line with this view, other scholars similarly call for entrepreneurial practices that actively align with the regeneration[5] of socio-ecological systems (Banerjee et al., 2021; Edwards, 2021; Guzmán et al., 2021; Manring, 2017).

This shift toward regeneration and systems thinking has far-reaching implications for how entrepreneurship is conceptualised and taught. Emerging literature highlights that regenerative approaches do more than mitigate or repair harm; they aim to enhance the capacity of systems to adapt, evolve, and renew themselves over time (Buckton et al., 2023; Das and Bocken, 2024; Duarte Dias, 2018; Muñoz and Branzei, 2021). Yet, despite this growing recognition, much of entrepreneurship education continues to be shaped by outdated educational frameworks that inadequately reflect these evolving demands (Lans et al., 2014; Wagner et al., 2021; Zahra et al., 2009).

Outdated frameworks in entrepreneurship education persist because entrenched paradigms continue to reproduce established values, while structural and cultural barriers further inhibit transformation (Ellis, 2018; Manring, 2017). Higher education institutions reinforce rigid disciplinary silos that limit the development of interdisciplinary and systems-oriented competencies essential for addressing complex socio-ecological challenges (Roobeek and de Ritter, 2016; Singer, 2020). Even where educational frameworks for sustainable or social entrepreneurship aim to address societal challenges through entrepreneurial means, their implementation often remains superficial and fragmented, lacking a systematic and holistic integration across education, research, operations, and outreach (Garcia-Feijoo et al., 2020; Kolb et al., 2017).

Overcoming these limitations requires a profound shift away from traditional economic paradigms in entrepreneurship education, including a reorientation of its underlying values and worldviews (Ellis, 2018; Manring, 2017). Raworth (2017) calls for a reconceptualisation of economic systems that supports ecological integrity and human flourishing, while Schneidewind (2019, 2023) adds that genuine transformation in society relies on a moral

[5] It is important to note that regeneration is distinct from restoration. Restoration is a remedial process that aims to repair damage caused by human activity. In contrast, regeneration involves replenishing and enhancing the capacity of systems to maintain ongoing vitality and renewal (Hahn and Tampe, 2021).

revolution and the embedding of long-term, value-driven practices, what he terms the “art of shaping the future” (Zukunftskunst).

Against this backdrop, the overarching objective of this dissertation is to propose a new paradigm for entrepreneurship education through an educational framework that integrates new approaches to curriculum content, teaching methods, educator roles, learning environments, and desired outcomes.

To investigate this, the dissertation comprises three main research contributions, each guided by a sub-research objective presented in chapters 4, 5 and 6.

The **first research paper** (chapter 4) employed a semi-systematic literature review within the domain of competency frameworks in social and sustainable entrepreneurship education guided by the following two research questions:

- ***What competency frameworks can be identified in the literature to promote sustainable transformation within entrepreneurship education?***
- ***How is systems thinking integrated into these competency frameworks to promote sustainable transformation within entrepreneurship education?***

Building on the findings of the first research paper, the **second research paper** (chapter 5) employed a social constructionist thematic analysis to examine the European Union’s two key competency frameworks in these fields: EntreComp and GreenComp. This analysis was guided by the following research question:

- ***How can entrepreneurship and sustainability competencies be effectively integrated?***

The **third and final research** (chapter 6) applied a practice-oriented design science research methodology to identify key elements such as content, teaching methods, roles, learning environments, and desired outcomes guided by the following research question:

- ***How could an educational framework for regenerative approaches in entrepreneurship education look like?***

Collectively, the interconnected research contributions of this dissertation provide a comprehensive pathway toward addressing the overarching research aim outlined above. The work begins with an examination of existing competency frameworks in the fields of social and sustainable entrepreneurship, with particular emphasis on the role of systems thinking (Research Paper I). It then moves into greater depth by comparing two of the European Union's leading competency frameworks, thereby identifying overlaps, gaps, and opportunities for integration (Research Paper II). Building on the insights generated in these first two papers, along with additional relevant resources, the third research develops a new educational framework designed to capture key elements such as curriculum content, teaching methods, educator roles, learning environments, and desired outcomes. These conceptual contributions culminate in the practical application in form of an international summer school, which demonstrates how the proposed key elements can be translated into a transformative learning experience based on the *Comprehensive Framework for Entrepreneurship Education* by Valliere et al. (2014) (Research III).

To ground the dissertation´s overall inquiry, transformative learning theory is adopted as one of its core theoretical foundations. Transformative learning emphasises deep, reflective, and often identity-shifting learning processes, which are crucial for challenging dominant assumptions and fostering new ways of thinking and acting in education (Freire, 1970). This is complemented by systems thinking, which provides theoretical context for understanding and navigating the complex, dynamic interdependencies that characterise socio-ecological challenges as stated above (Lynch et al., 2021). Together, these theoretical foundations are chosen to support a paradigm shift in entrepreneurship education, one that prepares learners to respond to social-ecological challenges and to actively regenerate the systems upon which life depends.

Building on these theoretical underpinnings, it is essential to clarify how this dissertation conceptualises certain terms.

Importantly, some key terms, such as sustainability, are elaborated and refined progressively throughout the dissertation. Therefore, the term is used in the earlier research chapters without the refined distinctions and conceptual depth that emerged later in the dissertation. While the final research contribution (chapter 6) comes closest to reflecting the dissertations fully developed theoretical position, the earlier research papers occasionally rely on more

conventional understandings of sustainability that do not yet fully capture the complexity of contemporary socio-ecological challenges or the regenerative approaches to entrepreneurship education (defined below) elaborated in the theoretical chapters.

Paradigms are understood in this dissertation as distinct sets of concepts or thought patterns that include theories, research methods, underlying assumptions, and the standards that define what counts as legitimate knowledge or contribution within entrepreneurship education.

A competency framework outlines the specific skills, knowledge, and behaviours expected of learners. In contrast, an educational framework covers a wider range of components, such as curriculum content, instructional strategies, educator responsibilities, learning environments, and the outcomes the programme aims to achieve.

The term societal transformation is used as an umbrella concept encompassing efforts that extend beyond basic carbon-neutral or net-zero ambitions. It refers to initiatives that seek to fundamentally redesign economies and societies to enable thriving ecological and social systems, following Raworth's (2017) framework. The term sustainable transformation/transition (used in research paper one and two) is equivalent to the term societal transformation.

The term regeneration serves as a guiding principle for reorienting entrepreneurial practice. Regenerative approaches in entrepreneurship education, as defined in this dissertation drawing on Ellis (2018) and Hahn and Tampe (2021), represent a paradigm shift in the role of entrepreneurship to actively creating net-positive effects on ecological and social systems. By integrating systems thinking and regenerative principles into curricula, these approaches equip entrepreneurs to use entrepreneurial means to restore, renew, and enhance the systems in which they operate. It moves beyond *conventional sustainability approaches*.

In general, this dissertation uses the term 'learners' rather than 'students' to capture the broader context of learning. However, when referring explicitly to enrolled students at my higher education institution, I use the term 'students'.

It is also important to clarify the scope and limitations of this study. This dissertation is primarily concerned with exploring the paradigmatic shift from *conventional sustainability approaches*

toward regenerative ones and with providing an education framework of it within the context of entrepreneurship education in higher education. It does not aim to offer a comprehensive or universal definition of regenerative entrepreneurship education, nor does it attempt to evaluate fully developed regenerative programmes. The study focuses on identifying theoretical foundations, curriculum content, teaching methods, educator roles, learning environments, and desired outcomes that support this shift. While international literature is referenced, the empirical findings are grounded in specific educational contexts and are not intended to be globally generalisable. Furthermore, the research does not engage with regenerative practices in corporate settings, early education, or environmental education more broadly. Rather, its scope is deliberately situated within higher education, and its aim is to contribute to the conceptual advancement of regenerative approaches within entrepreneurship education.

Following these introductory remarks, it is essential to recognise that the dissertation is organised into two complementary levels. Several integrative chapters are applied across all three studies at dissertation level. These include this overarching introduction (chapter 1); a comprehensive theoretical context and literature review (chapter 2); a detailed explanation of the methodological approach (chapter 3) adopted for the entire dissertation; an integrated discussion with directions for future research (chapter 7); and a concluding chapter (chapter 8). Within this structure, the three research chapters (chapter 4, 5 and 6) are presented sequentially, with each one building upon the previous one. Each research chapter has a consistent internal structure comprising an introduction, a methodology and research design section, a results and analysis section, and a discussion of implications section. This structure ensures coherence across the dissertation as a whole and clarity within each research chapter.

2 Theoretical Context and Literature Review

This theoretical chapter provides the overarching conceptual foundation for the entire dissertation and the three interlinked research chapters. Consequently, the individual research chapters do not include separate sections on theoretical context or literature review. Therefore, some content from this chapter also appears, in adapted form, in my published papers[6].

The role of theory in this dissertation is both foundational and generative. It provides the conceptual architecture that underpins the exploration of the overall research aim. Theory serves a dual purpose throughout this research: it informs and shapes the study's design, guiding the formulation of research questions and the selection of methodological approaches. Simultaneously, it acts as a dynamic site of contribution, wherein empirical insights enrich and extend existing theoretical understandings.

This chapter begins by outlining the philosophical orientations that ground the study, acknowledging the diversity and complexity inherent in the research context. Theoretical perspectives and concepts are deliberately selected to reflect and engage with the multifaceted nature of transformative learning theory and systems thinking theory related to entrepreneurship education. In addition, sustainability and regeneration are introduced as key theoretical concepts. In doing so, the dissertation not only employs theory as a lens for analysis but also participates in its evolution, bridging theoretical foundations with practical inquiry in a manner that is both reflective and generative.

Sustainability as a theoretical concept is first presented and discussed in its classical interpretations (section 2.1.1). Building on these foundational understandings, sustainability is subsequently brought into dialogue with transformative learning theory and systems thinking theory, allowing for a more integrative perspective that captures among others relationality, interdependence, and complexity. This conceptual development ultimately culminates in the introduction of regeneration as a theoretical concept (section 2.2.1).

In summary, while the integration of sustainability into entrepreneurship education is both timely and necessary, this chapter demonstrates that *conventional sustainability* approaches

[6] For further information please also see: Wilhelm and Planck (2024) and Planck et al. (2024).

often fall short of addressing the depth and complexity of contemporary socio-ecological challenges. Their emphasis on balance, efficiency, and incremental change does not fully align with the deeper personal and societal transformation articulated by transformative learning theory. To move beyond these limitations, the subsequent chapter introduces systems thinking theory and regeneration as theoretical concept in entrepreneurship education and practice. These approaches not only complement transformative learning theory but also offer a more holistic, dynamic, and forward-looking foundation for cultivating forms of entrepreneurship that are responsive to the urgent demands of our time.

2.1 Transformative Learning Theory

This subchapter explores transformative learning theory as a foundational lens for understanding how entrepreneurship education can foster meaningful change in learners' mindsets, values, and actions. It begins by outlining key theoretical perspectives on transformative learning and its relevance to entrepreneurship education. Building on this foundation, the chapter then turns to the integration of sustainability as a theoretical concept within entrepreneurship education and practice (section 2.1.1).

Transformative learning theory offers a theoretical framework for understanding how education can lead to significant changes in learners' mindsets, values, and actions. As developed by Paulo Freire (1970), the fundamental nature of transformative learning can be defined as a process whereby individuals critically reflect on their experiences, challenge existing assumptions, and ultimately transform their perspectives and behaviours.
Freire's approach (1970) is grounded in several interrelated principles:

- Dialogical learning: The construction of knowledge is a reciprocal process, occurring through open dialogue between educators and learners, rather than being imposed unidirectionally.
- Problem-posing education: Learners are encouraged to engage actively with real-world challenges, rather than passively receiving content, thereby developing critical problem-solving skills.
- Praxis: The iterative cycle of reflection and action enables learners to apply insights in practice and drive transformative outcomes.

- Empowerment: Learners are supported in developing agency to challenge existing norms, envision alternatives, and innovate within their own contexts.

The integration of these principles constitutes a robust educational approach that fosters personal transformation, ethical engagement, and social responsibility (Freire, 1970). These qualities are highly relevant to entrepreneurship education in the contemporary context.

Consequently, scholars are increasingly emphasising the necessity for transformative learning approaches within entrepreneurship education. Sterling (2004) posits that learning aimed at addressing socio-ecological challenges must be characterised by holistic and integrative approaches, eschewing the adoption of fragmented and instrumental methodologies. In a similar vein, Neergaard et al. (2020) delineate transformative learning in entrepreneurship education as a process that fundamentally alters a learner's frames of reference, values, and assumptions.

According to the aforementioned authors, this study's approach avoids merely acquiring new skills. Instead, it encourages learners to critically reflect on their existing worldviews and participate in profound personal and cognitive transformation processes. The facilitation of this process is often achieved through experiential learning, critical self-reflection, and dialogue. These elements are integral to the cultivation of responsible, ethical, and regenerative forms of entrepreneurship (Neergaard et al., 2020).

This approach marks a departure from traditional economic paradigms in entrepreneurship education. In classical economic theory, Joseph Schumpeter's Theory of Economic Development[7] conceptualises the entrepreneur as a figure who combines resources in novel ways to create new products, services, or ventures. This, in turn, results in the disruption of existing markets and the driving of economic evolution. Mishra and Zachary's (2015) seminal work provided a foundational framework for understanding the concept of entrepreneurship. They defined entrepreneurship as "a process of value creation and appropriation led by entrepreneurs in an uncertain environment" (p. 251). This seminal definition has been widely cited and referenced in academic and business circles.

[7] Schumpeter, J., A., **1934**. The Theory of Economic Development. Cambridge: Harvard University Press.

It is evident that, as time has passed, the notion of entrepreneurship has evolved to encompass a broader spectrum of considerations, extending beyond purely economic concerns. The advent of social and sustainable entrepreneurship is indicative of a mounting interest in enterprises that pursue not solely innovation and profitability, but also social justice, environmental stewardship, and long-term systemic change (Birney et al., 2019). This shift has important implications for how entrepreneurship is taught and learned, and it has prompted a re-evaluation of educational goals, teaching, and theoretical underpinnings as highlighted earlier (Lans, Blok and Wesselink, 2014; Wagner et al., 2021; Zahra et al., 2009).

As a result, there are now varied understandings of what constitutes entrepreneurial learning and how it should be delivered according to Chaker and Jarraya (2021) and Baggen et al. (2021). *Teaching about* entrepreneurship refers to theoretical engagement with entrepreneurship, drawing on foundational ideas such as Schumpeter's theory, which sees innovation as a driving force of economic development. This approach emphasises learning about entrepreneurial theories and the structural aspects of business and economic systems. In contrast, *teaching for entrepreneurship* focuses on preparing learners to start their own ventures, with business creation positioned as the primary learning objective. *Teaching through entrepreneurship*, on the other hand, is a well-established approach in entrepreneurship education research adopting an experiential perspective, using entrepreneurial tasks, processes, and methods not primarily to encourage venture creation, but to develop broader, transversal competencies such as creativity, initiative, and problem-solving.

The latter approach, which involves the utilisation of entrepreneurship as a medium for instruction, finds close alignment with the tenets of transformative learning theory. Rather than focusing solely on business outcomes, this approach seeks to cultivate an entrepreneurial mindset characterised by competencies such as critical thinking, innovative action, and navigating complexity (Fayolle and Gailly, 2015).

As Weinert (2001) observes, competencies are not static outcomes, but rather, they emerge through learners' active engagement in real-world experiences and reflective practice.
Diepolder et al. (2021) highlight, that the core aim of sustainable entrepreneurship is to empower learners with the skills, mindsets, and attitudes required to identify and develop business opportunities that are aligned with societal and environmental needs. In this context, sustainable entrepreneurship seeks to cultivate such competencies, which are often defined as

an integrated set of knowledge, skills, and attitudes (Bianchi et al., 2022). These competencies are used to address the socio-ecological challenges faced by modern societies (Barth et al., 2007; Diepolder et al., 2021). Similarly, Lans et al. (2014) view competencies as enablers that equip individuals to effectively confront and respond to real-world challenges.

In this context, key competences are defined as those that are transferable across domains and valuable for all learners (Lambrechts et al., 2013). In their 2014 publication, Hesselbarth and Schaltegger present the argument that, in contrast to conventional educational approaches, which prioritise the transmission of knowledge, competence-based education places greater emphasis on the outcomes of learning, namely the practical capabilities of learners and their cognitive and behavioural responses in authentic contexts.
Consequently, transformative learning in entrepreneurship education is increasingly recognised as a process that fosters identity shifts, critical awareness, and profound personal transformation (Klapper and Fayolle, 2023). This standpoint challenges the conventional, instrumental perspective of entrepreneurship education as merely teaching "how to start a business". Instead, it advocates a holistic, value-driven, and reflective approach that prepares learners to respond to complex socio-ecological challenges. Accordingly, a significant proportion of contemporary entrepreneurship education, particularly those oriented towards social and sustainable entrepreneurship, embody Freirean principles by encouraging learners to engage critically with societal challenges and actively contribute to positive societal transformation (Klapper and Fayolle, 2023; Lynch et al., 2021).

The dissertation draws on the work of Freire (1970) and Klapper and Fayolle (2023) to argue that entrepreneurship education should not aim merely to transfer knowledge, but rather to facilitate a deeper process of personal transformation, critical self-reflection, and experiential learning. The study employs this particular lens through which it investigates the manner in which entrepreneurial learning environments are able to support shifts in identity and challenge the assumptions of learners. The ultimate outcome of this is the fostering of more meaningful and durable educational outcomes that prepare learners to address socio-ecological challenges.

Building on this foundation, the integration of sustainability into entrepreneurship education and practice is not merely desirable, it is essential. As societies confront increasingly complex and interrelated socio-ecological challenges, entrepreneurship must be reoriented to meet these challenges in meaningful ways (Hahn and Tampe, 2021).

However, it is important to acknowledge that conventional understandings of sustainability, often focused on balancing economic, environmental, and social concerns, may fall short in addressing the depth and urgency of these challenges as highlighted in the introduction (Gibbons, 2020). More radical, regenerative, and critically informed approaches are needed to truly reshape the role of entrepreneurship in a time of planetary crisis (Ellis 2018; Hahn and Tampe, 2021).

The following subchapter will therefore examine sustainability as a theoretical concept within entrepreneurship education and practice, critically engaging with its traditional interpretations while laying the groundwork for more regenerative approaches.

2.1.1 Sustainability as a Theoretical Concept in Entrepreneurship Education and Practice

For a long time, the relationship between entrepreneurship and sustainability was rather perceived as being two opposite poles.

The concept of sustainability, which is central to addressing the socio-ecological challenges of a rapidly changing world, was first formally articulated in the Brundtland Report (1987). Introduced under the term sustainable development, it was defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987). This understanding of sustainability, balancing present needs with the responsibilities toward future generations, has increasingly shaped contemporary discourse in entrepreneurship.

Although entrepreneurship has often been seen as a major driver of unsustainable behaviour in the Anthropocene, both research and practice have, over the past decades, increasingly reoriented entrepreneurship toward sustainability (Terán-Yépez et al., 2020; Swanson and Zhang, 2014). As a result, sustainability and entrepreneurship are no longer viewed as separate domains, but as interconnected and mutually reinforcing.

The integration of sustainability into entrepreneurial practice has its roots in the emergence of social and sustainable entrepreneurship (hereafter referred to as sustainable entrepreneurship or SE). Research in sustainable entrepreneurship has grown significantly over the past three decades, with increased academic attention since the early 2000s[8] (Austin et al., 2006). Sustainable entrepreneurship is often viewed as a response to the limitations of traditional entrepreneurship (Anbarasan and Sushil, 2019). Definitions of sustainable entrepreneurship

[8] Rosário et al. (2022) conducted a comprehensive literature review on sustainable entrepreneurship (SE), identifying 329 scholarly publications on the topic up to 2022. Their analysis shows a noticeable rise in academic interest beginning in the early 2000s. Despite this growing body of work, Amatucci, Pizarro, and Friedlander (2013) still described sustainable entrepreneurship as a "relatively new" concept at the time, highlighting its emerging status within the field of entrepreneurship education.

vary along a spectrum: some scholars consider a business sustainable if it operates within the triple bottom line framework, balancing ecological, social, and economic goals (Shepherd and Patzelt, 2011).

The term "triple bottom line" describes the tension between economics, ecological and social impacts. As a concept, it was first introduced by John Elkington in 1994 and has since attracted attention in analysing sustainability at different levels. It is illustrating that companies can be profitable and at the same time bring positive social value to society and ecological value for the environment. As the name of the concept suggests, it encourages entrepreneurs to consider their full impact on people (social responsibility), the planet (environmental responsibility) and profit (economic viability), with the aim of achieving the 'sweet spot' at the intersection of these three areas (Elkington, 1997). This approach considers the long-term impact of business activities and decisions.

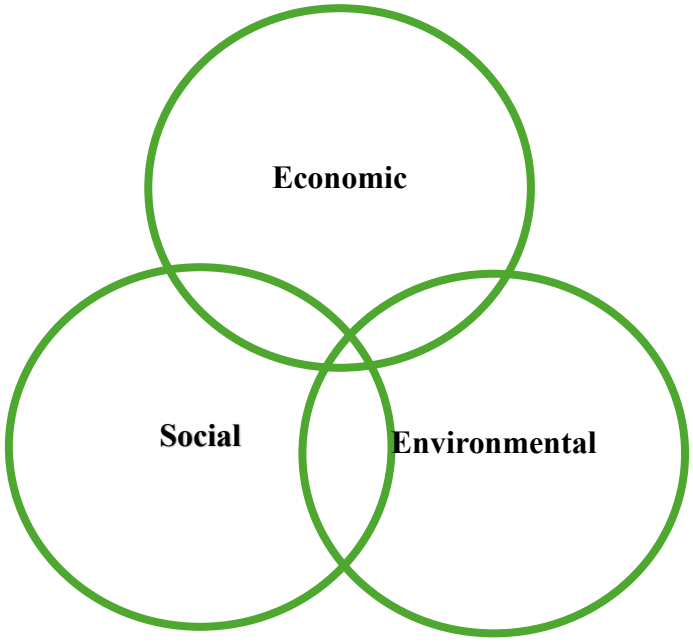

Figure 1 - Own visual representation of Triple Bottom Line established by John Elkington in 1994.

Others emphasise the need to integrate sustainability into an organisation's operational strategy (Atiq and Karatas-Özkan, 2013), or go further, arguing that sustainable entrepreneurship exists only when sustainability is embedded in the core business model (Bischoff and Volkmann, 2018). More critical perspectives even define sustainable entrepreneurship as inherently transformative, always aiming to challenge the status quo (Moberg and Holse, 2022).

Rather than emphasising distinctions between different forms of entrepreneurship, which risk deepening theoretical and practical divides, this research argues that integrating sustainability into entrepreneurship, and vice versa, is an essential imperative for the 21st century. While methodological and conceptual differences remain, adopting a holistic approach to entrepreneurship and its education can help dissolve these boundaries and foster more unified, impactful practices.

As previously stated, the incorporation of sustainability as a theoretical concept within entrepreneurship education has been significantly influenced by the emergence of social and sustainable entrepreneurship (Rosário et al., 2022), yet also by global frameworks such as the 17 Sustainable Development Goals (SDGs)[9] (Gibbons, 2020).

The 17 Sustainable Development Goals (SDGs) have been established as a concrete agenda for achieving sustainability in our society. The United Nations initiated this agenda in 2015 as part of the 2030 Agenda for Sustainable Development. The SDGs shown in the figure below "are an urgent call for action by all countries - developed and developing - in a global partnership" (UN, 2025). They aim to guide global efforts and collaborations towards achieving a sustainable and equitable future for all by the year 2030. As the deadline for the SDGs approaches, discussions around a post-2030 framework are already underway, with the aim of building on existing progress while addressing emerging global challenges (UN, 2025).
Looking ahead to 2050, experts emphasise long-term goals like carbon neutrality, ecosystem restoration, and resilient communities, striving to secure a sustainable future through deeper integration of social, economic, and environmental dimensions (UN, 2025).
While an agenda for future post-2030 SDGs is still being developed and no concrete reports or official documents are yet available (UN, 2025), this dissertation primarily engages with the current SDG ambitions. However, it is important to recognise that this evolving agenda promotes transformative and regenerative approaches that move beyond incremental change.

[9] https://sdgs.un.org/goals, last accessed on 23/06/2023.

Figure 2 - Visual representation of 17 Sustainable Development Goals (SDGs) established by the United Nations in 2015.

While the SDGs establish targets, objectives, and guidelines for advancing sustainability, they do not provide adequate support for the development of holistic, thriving living systems as highlighted by Gibbons (2020). He argues that the implementation of these measures has frequently proven challenging to integrate in a synergistic manner, resulting in trade-offs.

Although integrating sustainability into entrepreneurship education through frameworks such as the SDGs appears beneficial at first glance, critical reflection, building on the broader critiques as highlighted above (Gibbons, 2020), reveals specific tensions within educational contexts. Entrepreneurship education has been criticised for adopting the SDGs in a superficial or fragmented manner (Hahn and Tampe, 2021).

From a Freirean standpoint mentioned above, the SDGs may be adopted in a rather normative or prescriptive manner, potentially constricting the scope for authentic critical reflection, local contextualisation, and transformative praxis. Freire (1970) emphasised that transformation is derived from learners' own critical engagement with their immediate reality, rather than being a result of the top-down adoption of predetermined global goals. Consequently, entrepreneurship education that seeks to align with transformative learning principles, aimed at cultivating critical consciousness, must foster not only adherence to concepts such as the Sustainable Development Goals (SDGs), but also encourage critical examination of the underlying assumptions, power structures, and potential limitations of these goals. This

approach is predicated on the premise that entrepreneurial practice must remain anchored in the local needs and capacities of the communities in which it is situated. At the same time, it is recognised that these actions must contribute to global sustainability efforts.

Drawing upon these reflections, the SDG Wedding Cake[10] model, as developed by the Stockholm Resilience Centre, provides a more holistic perspective that encompasses transformative learning principles (2025).

It structures the SDGs in a hierarchy, with the biosphere as the foundation, supporting society and, ultimately, the economy. This challenges the traditional approach by emphasising that social and economic development must remain within planetary boundaries[11]. This layered model highlights the interdependence among the goals and sends a clear message: economic development is not sustainable without a healthy society, and a healthy society cannot exist without a healthy planet (Stockholm Resilience Centre, 2025). It accents that ecosystems and human societies are deeply interconnected, characterised by reciprocal feedback loops and mutual dependence according to Folke et al. (2010).

[10] https://www.stockholmresilience.org/research/research-news/2016-06-14-the-sdgs-wedding-cake.html, last accessed on 12/03/2025.

[11] The concept of planetary boundaries (PB), introduced in 2009, aims to define the environmental limits within which humanity can safely operate. For further information see Steffen et al. (2015).

Figure 3 – Visual representation of SDG Wedding Cake established by the Stockholm Resilience Centre in 2016.

The Inner Development Goals[12] (IDGs) have emerged as an additional, complementary framework by the Inner Development Goals Foundation in 2023. While the SDGs and the SDG Wedding Cake focus on external challenges like poverty and climate change, the IDGs focus on how individuals and societies can develop the inner capacities needed to effectively contribute to these global goals. These include e.g. self-awareness, critical thinking, empathy, and collaboration. The authors argue that without addressing internal development, progress on external goals is likely to fail or remain superficial.

[12] https://innerdevelopmentgoals.org/framework/, last accessed on 12/03/2025.

Figure 4 – Visual representation of Inner Development Goals established by the Inner Development Goals Foundation in 2023.

The concept of IDGs is more closely aligned with transformative learning principles. This is because they encourage individuals to become aware of their assumptions, biases and social realities, and to engage in reflective dialogue that can lead to personal and collective transformation.

The IDGs' focus on e.g. self-awareness, critical thinking, empathy and collaboration echoes Freire's call for learners to take an active role in their own development. He argued that, without reflecting critically on their internal world, their beliefs, values and emotions, individuals would remain passive recipients of knowledge, unable to challenge oppressive structures or contribute meaningfully to social change (Freire, 1970). Similarly, the IDGs suggest that developing one's inner capacities is a prerequisite for effectively addressing the external challenges represented by the SDGs.

In summary, while the integration of sustainability into entrepreneurship education is both timely and necessary, this chapter has shown that *conventional sustainability approaches* often fall short of addressing the depth and complexity of today's socio-ecological challenges. Their focus on balance and incremental change does not align with the deeper personal and societal transformation called for by transformative learning theory. To move beyond these limitations, the next chapter introduces systems thinking and regeneration as theoretical concept in entrepreneurship education and practice as more suitable and forward-looking approaches. These approaches not only complement transformative learning theory but also offer a more holistic and dynamic foundation for cultivating entrepreneurship that is responsive to the urgent demands of our time.

2.2 Systems Thinking

While transformative learning theory offers valuable insights into the internal shifts required for addressing socio-ecological challenges in entrepreneurship education, it must be complemented by approaches that address also the external complexity of the systems in which learners operate as highlighted above. In this regard, systems thinking emerges as a crucial theoretical counterpart. By fostering an understanding of interconnectedness, feedback loops, and dynamic change, systems thinking equips learners with the cognitive tools necessary to navigate and influence complex socio-ecological challenges (Lynch et al., 2021). The following section therefore explores systems thinking as a complementary theoretical framework.

This also builds the foundation for the section 2.2.1, which explores regeneration as a theoretical concept in entrepreneurship education and practice. Utilising systems thinking, the objective is to surpass the constraints of *conventional sustainability approaches*, as previously examined in the preceding section, and to transition towards regenerative approaches in entrepreneurship education.

The roots of systems thinking can be traced back to Aristotle in philosophy, when the Greek philosopher laid the foundations for this conceptual framework. Aristotle introduced the idea of holism as the basis for systems thinking, emphasising the interconnectedness of elements within a whole (Hossain et al., 2020). This holistic perspective, which considers the relationships and interdependencies between different components, sets the stage for the development of systems thinking over the centuries.

In 1968, Ludwig von Bertalanffy, considered the father of general systems theory, proposed a vision for an "universal language and laws that transcend multiple disciplines and are universally applicable" (Hossain et al., 2020, p.1). Bertalanffy's contribution established a theoretical framework that transcended disciplinary boundaries, emphasising the universality of systems principles. In this context, Waring and Liyanage (2022) describe systems thinking as rooted in various theoretical foundations, each with its own distinct ontological and epistemological assumptions, all centred on the core idea of systems. Meadows (1999) defines a system as "a set of elements or parts that is coherently organised and interconnected in a pattern or structure that produces a characteristic set of behaviours, often classified as its

'function' or 'purpose'". Building on these foundations, the concept of systems thinking has gained significant traction across multiple disciplines.

In consequence, systems thinking has evolved from the understanding that studying parts and processes in isolation is insufficient (Lynch et al., 2021). The literature on systems thinking outlines several principles that distinguish it from linear thinking. Accordingly, Lynch and colleagues summarise the following dichotomies: Disconnected vs. Interconnectedness, Linear vs. Circular, Silos vs. Emergence, Parts vs. Whole, Analysis vs. Synthesis, Isolation vs. Relationships (2021).

While sustainability science is highly compatible with systems thinking, as it often examines ecosystems from a broader perspective (Williams et al., 2017; Iacovidou et al., 2021; Meadows, 2008), entrepreneurship research has only recently begun applying systems thinking to micro-systems, such as entrepreneurial actors (Teece, 2018), and to entrepreneurial problems and ecosystems (Trivedi and Misra, 2015). As Lynch et al. (2021) explain, entrepreneurship "may be understood as a system or network of interconnected actors, intimately related to today's complex societal challenges like sustainability" (p.3).

By recognising the complex interconnections between economic, environmental and social dimensions (Gibbons, 2020; Stroh, 2015), systems thinking challenges reductionist and mechanistic worldviews emphasising the dynamic, interdependent, and evolving nature of systems (Reed, 2007). Rather than focusing on isolated components, this perspective highlights the significance of relationships, feedback loops, and emergent properties that characterise complex systems (Meadows, 1999), thereby fostering a more holistic approach to addressing socio-ecological challenges (Lynch et al., 2021; Stroh, 2015).

Peter Senge (1990) expanded on the concept of systems thinking in education, describing it as a conceptual framework and defining it as "a body of knowledge and tools developed over the past seventy years to make the full patterns clearer and to help us see how to change them effectively" (p. 7).

Based on this understanding, 40 educators, entrepreneurs and systems change experts met for a two-day summit on education for systems change[13]. In their post-summit report, they emphasised the importance of integrating a systems thinking perspective into entrepreneurship education. The report highlights those current disciplines, especially in entrepreneurship education within business and management, “still fail to widely address the systemic nature of the challenges we face” (Birney et al., 2019, p.7). The summit participants concluded that existing educational frameworks do not sufficiently prepare individuals to confront interconnected "wicked problems" or to "train people with the skills organisations will need to operate in an increasingly uncertain world" (Birney et al., 2019, p.7).

Further, Lynch et al., (2021) conducted an empirical study with 52 students working in small groups on an external challenge from a corporate partner integrating a systems view into innovation education. In their option, practice-oriented teaching combining perspectives of innovation education and systems thinking serves as a catalyst for local change in business models to create a more sustainable business system (Lynch et al., 2021). They further emphasise that the complexity of society requires moving beyond traditional linear thinking, as it may be insufficient and counterproductive (Lynch et al., 2021). Consequently, integrating a systems perspective into entrepreneurship education aims to reshape learners' mindsets towards a more holistic understanding of the role of entrepreneurship (Lynch et al., 2021).

Summing up, systems thinking and transformative learning have been shown to facilitate a shift in values towards a more holistic and critical understanding of complex, interconnected realities. Whilst transformative learning is predicated on the notion of internal change through critical reflection, perspective shifts and self-awareness (Freire, 1970), systems thinking provides cognitive tools with which to analyse the external complexity of dynamic systems, interdependencies and feedback loops (Lynch et al., 2021).

[13] As Birney et al. (2019) stated, “In September 2018, a group of 40 educators, entrepreneurs, and systems change experts gathered at Yale School of Management, to participate in a two-day summit focused on “Systems Change Education in the Innovation Context””. For further information please also see Birney et al. (2019).

2.2.1 Regeneration as Theoretical Concept in Entrepreneurship Education and Practice

As highlighted in the chapter before, systems thinking offers a vital lens through which to shift from a conventional understanding of sustainability (highlighted above in subsection 2.1.1) toward a more regenerative approach, both in sustainability itself and in the context of entrepreneurship and its education.

Hahn and Tampe (2021) emphasise that, although *conventional sustainability approaches* in entrepreneurship are often informed by systems thinking and concern themselves with issues of degradation and declining vitality, dominant business sustainability models frequently fail to adopt a genuine systems perspective as highlighted above. Instead, they tend to focus narrowly on the organisation itself, guided primarily by conventional business logic (Williams et al., 2017). This limitation has been recognised as inadequate for addressing socio-ecological challenges of our time (Ellis, 2018).

Accordingly, the concept of regenerative social-ecological systems is gaining momentum as a more dynamic and forward-looking alternative to *conventional sustainability approaches* such as the SDGs, mentioned earlier, enhancing ecological and social systems (Ahlström et al., 2020; Buckton et al., 2023; Ellis, 2018). Regenerative social-ecological systems refer to systems in which both ecological and social components are not only maintained but actively restored and enhanced over time (Das and Bocken, 2024). These systems are designed to regenerate and renew natural resources, improve social well-being, and create long-term resilience by fostering mutually beneficial relationships between human societies and the environment (Hahn and Tampe, 2021). It aligns closely with various ecological and holistic management approaches,

including living systems theory[14], gaia theory[15], eco-literacy[16], deep ecology, agroecology[17], permaculture[18], biodynamics[19], biophilia[20], biomimicry[21], and holistic management[22] (Buckton et al., 2023).

It is important to distinguish regeneration from restoration. Restoration is a remedial[23] process that aims to repair damage caused by human activity. In contrast, regeneration involves replenishing and enhancing the capacity of systems to maintain ongoing vitality and renewal (Hahn and Tampe, 2021).
For instance, ecological restoration may encompass activities such as the replanting of mangrove forests with a view to safeguarding coastal areas and supporting biodiversity, or the rehabilitation of coral reefs for the purpose of sustaining marine ecosystems (Nishi and

[14] For further information please also see Duncan, D., **1972**. James G. Miller's Living Systems Theory: Issues for Management Thought and Practice.

[15] For further information please also see Onori, L. and Visconti, G., **2012**. The GAIA theory: from Lovelock to Margulis. From a homeostatic to a cognitive autopoietic worldview.

[16] For further information also see McBride, B.B., Brewer, C.A., Berkowitz, A.R., Borrie, W.T., **2013**. Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here?

[17] For further information please also see Terán-Samaniego, K. et al., **2025**. Agroecology and Sustainable Agriculture: Conceptual Challenges and Opportunities - A Systematic Literature Review.

[18] For further information please also see Mollison and Slay (1997).

[19] For further information please also see Santoni, M. et al., **2022**. A review of scientific research on biodynamic agriculture.

[20] For further information please also see Joye, Y. and De Block, A., **2011**. 'Nature and I are Two': A Critical Examination of the Biophilia Hypothesis.

[21] For further information please also see Benyus, J.M., **2002**. Biomimicry: Innovation Inspired by Nature.

[22] For further information please also see Porvaznik, J., **2011**. The concept of the holistic management as a new approach in the theory of management.

[23] Remedial/Corrective measures are intended to address issues that have already manifested, whereas preventive measures are designed to avert the occurrence of such problems (Hahn and Tampe, 2021).

Subramanian, 2023). From an economic perspective, restorative practices may encompass the implementation of circular economy models[24], which are designed to minimise waste and preserve value over time. As Nishi and Subramanian (2023) demonstrate, social restoration efforts can range from participatory urban planning in underserved communities to post-conflict reconciliation initiatives. The latter, as the authors explain, are aimed at rebuilding trust and cohesion.

While restoration is an essential step, it is not sufficient on its own. As Hahn and Tampe (2021) argue, addressing the socio-ecological challenges of the Anthropocene, such as planetary health and social equity, requires a deeper, systemic transformation rooted in regeneration. This kind of transformation calls for a critical interrogation and redesign of the foundational structures, assumptions, and values that govern human interactions with the planet.

In entrepreneurship research, regenerative enterprises are therefore, increasingly seen as key drivers for addressing socio-ecological challenges of our time (Hahn and Tampe, 2021; Muñoz and Branzei, 2021). Unlike conventional businesses that primarily extract value from nature, regenerative enterprises create economic value while simultaneously regenerate life-supporting ecosystems (Muñoz and Hernandez, 2024). They represent a shift from *conventional sustainability strategies* that focus solely on efficiency and resource optimisation to regenerative business models that promote regeneration and co-evolution with natural systems (Hahn and Tampe, 2021). Muñoz and Branzei introduced the notion of regenerative organizing in this context, as "the process of sensing and embracing surrounding living ecosystems, aligning organizational knowledge, decision-making, and actions to these systems'structures and dynamics and acting in conjunction, in a way that allows for ecosystems to regenerate, build resilience and sustain life" (2021).

Accordingly, regenerative enterprises contribute to ecosystem regeneration both for businesses and for the environments in which they operate (Muñoz and Hernandez, 2024). This growing field of study has positioned regeneration as not only a new paradigm for entrepreneurship education (Hahn and Tampe, 2021) but also an emerging discipline that redefines the role of entrepreneurship (Konietzko et al., 2023).

[24] https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview, last accessed on 24/04/2025.

The figure below further deepens the theoretical concept of regenerative enterprises and highlights the differences between conventional and regenerative approaches. It was developed on the basis of Hahn and Tampe (2021) and illustrates a continuum of business approaches in relation to their impact on ecosystems, underlying rationale, and strategic practices, ranging from conventional, exploitative models on the left to regenerative enterprises on the right. It contrasts the environmentally detrimental strategies typically driven by short-term shareholder value with those that aim to actively regenerate ecosystems and support long-term socio-ecological well-being.

	conventional	**„green“**	**sustainable**	**restore**	**regenerative**
Impact on Ecosystem	Impact as an externality	Compensate negative impact	Avoid impact or net zero impact		Net positive impact
	does damage			gives back	
Underlying business rationale	Maximising shareholder value	Secure exploitation & maximise return from the ecosystem	Operating within environmental boundaries		Mutually reinforcing co-evolution of ecosystem & business
Business Strategy & Strategic Practice	Business as usual with minimum regulatory requirements	Disrupt business as usual with post-hoc repair, punctual & unilateral intervention	Adjustment of business operations through regular feedback & adaptation		Strategic integration through interactive & participatory experimentation

Figure 5 - Own visual representation of regenerative business strategies based on Hahn and Tampe (2021).

At the left end of the spectrum, businesses exploit ecosystems, treating environmental impact as an externality and focusing on maximising shareholder value. These firms typically follow a "business-as-usual" approach, meeting only minimal regulatory standards.

The next stage acknowledges environmental damage and seeks to compensate for it through isolated, reactive interventions. Although this still prioritises economic return, it begins to disrupt traditional models through limited post-hoc repairs.

Moving on, the third stage involves aligning business operations with environmental boundaries. Here, companies aim for net-zero impact and regularly adjust operations based on environmental feedback, reflecting a more proactive and adaptive mindset.
At the far right, regenerative enterprises go beyond harm avoidance to produce a net positive impact on ecosystems. These businesses are driven by a logic of mutual co-evolution, where business and nature are seen as interdependent. Strategically, they emphasise interactive, participatory experimentation and the deep integration of regeneration approaches into core operations.
The diagonal line in the figure divides the continuum into two overarching modes: "does damage" (shaded in orange) and "gives back" (shaded in green). This boundary marks a critical paradigm shift from extractive to regenerative thinking in entrepreneurship, I perceive it as a movement from minimising harm to actively contributing to ecological and societal renewal.

Following these, regenerative enterprises are often based on alternative business concepts to traditional linear models of production and consumption (Das and Bocken, 2024). According to Das and Bocken (2024) they aim to address environmental and resource-related challenges by closing, narrowing and slowing resource loops through strategies such as recycling, resource efficiency and product longevity. Thus, the underlying concepts guiding regenerative enterprises are rooted in systems thinking and holistic economic models that aim to regenerate and sustain both ecological systems and social well-being (Hahn and Tampe, 2021).

A commonly known alternative business model is *circular economy* established by the Ellen MacArthur Foundation[25]. Corresponding to the authors, *circular economy* is perceived as a "system where materials never become waste and nature is regenerated" (MacArthur Foundation, 2025). In a *circular economy*, "products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting" as shown in the figure below (MacArthur Foundation, 2025). This approach addresses socio-ecological challenges by separating economic growth from the depletion of finite resources. However, as mentioned earlier, it is generally considered to be a restorative measure, designed to minimise waste and preserve value over time.

[25] https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview, last accessed on 24/04/2025.

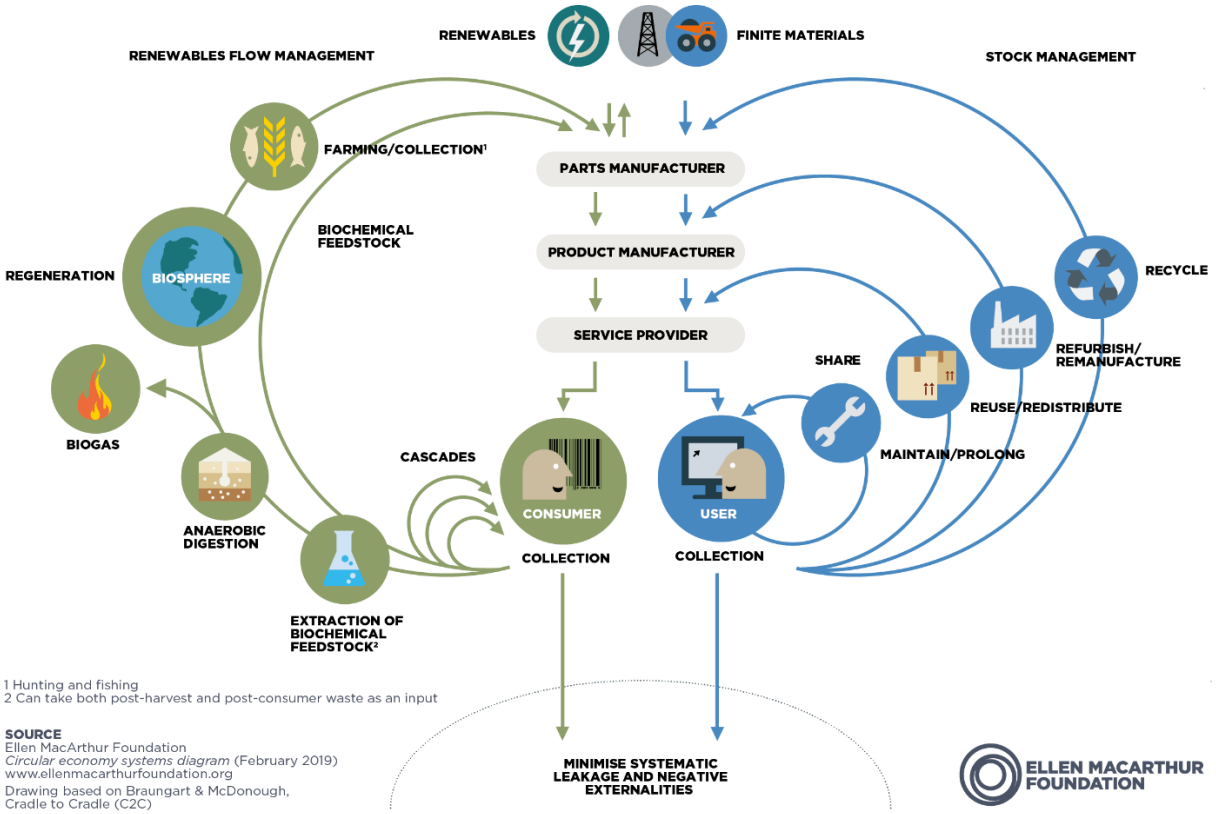

Figure 6 - Circular economy systems diagram by the Ellen MacArthur Foundation, 2019).

Raworth's (2017) *doughnut economy* model offers another alternative model following a broader socio-ecological framework that envisions a safe and just space for humanity. It balances essential human needs, such as health, education, and equity, with the planet's ecological boundaries, such as climate stability, biodiversity, and land use.

While the model of *circular economy* focuses on transforming production and consumption systems, the *doughnut economy* model emphasises the need to operate within both social and planetary foundations closely connected to the SDG Wedding Cake mentioned earlier. Both models are increasingly encouraging companies to adopt the paradigm of circularity and regeneration (Raworth, 2017).

Figure 7 - Doughnut Economics by Kate Raworth, 2017.

A particularly relevant and emerging model in this context in Germany is *Verantwortungseigentum*[26] (*steward-ownership or responsibility ownership*). This approach represents a radical shift in corporate ownership and governance. Rather than focusing on shareholder profit maximisation, *companies in stewardship ownership* are designed so that control remains with people closely connected to the company's purpose. Profits are reinvested or used to support the mission, rather than being extracted. This model ensures that businesses remain true to their values over generations, preventing takeovers and speculation, and reinforcing long-term commitment to employees, communities, and the environment.

Furthermore, *permaculture*, originally conceived as a design system for sustainable agriculture, has evolved into a broader framework that informs organisational culture and business design. It promotes integrated systems thinking, regenerative practices, and long-term resilience (Mollison and Slay, 1997). Developed by Australians Bill Mollison and Reny Mia Slay, *permaculture*, short for "permanent agriculture", is the intentional design and stewardship of productive ecosystems that mirror the "diversity, stability, and resilience of natural environments" (Mollison and Slay, 1997). At its core, *permaculture* represents the harmonious integration of people and landscape to meet human needs for food, energy, shelter, and more, both material and non-material (Mollison and Slay, 1997).

[26] https://purpose-economy.org/, last accessed on 24/04/2025.

Building on the foundations of regenerative business models, recent empirical research by Das and Bocken (2024) provides a comprehensive overview of how regenerative approaches are being applied in practice. Through purposive sampling, their study reviewed 84 regenerative business cases across 15 sectors, culminating in the development of the Regenerative Business Case Database. From this analysis, they derived "a typology of six archetypal regenerative business strategies […]: (1) regenerative leadership, (2) nature regeneration, (3) social regeneration, (4) responsible sourcing, (5) human health and wellbeing focus, and (6) employee-level focus" (Das and Bocken, 2024). Notably, regenerative innovations were most prevalent in the food, consumer goods, and fashion sectors (Das and Bocken, 2024). Many enterprises employed multiple strategies simultaneously, often in collaboration with local organisations (Das and Bocken, 2024). Contrary to the perception that regenerative models may struggle in competitive markets, the study highlights several long-standing businesses, some dating back to the 1870s, that have successfully embedded regenerative approaches (Das and Bocken, 2024). The research not only offers a valuable database of effective regenerative strategies but also serves as a foundation for future work on how such business models emerge and what institutional or regulatory environments are needed to support them.
Following these insights, the field of regenerative enterprises is highly diverse, encompassing a wide range of organisational forms and sectors, from agriculture and food production to technology, cosmetics, and even media and construction. While agriculture and food remain central to the regenerative movement due to their direct connection with ecosystems and soil health, many companies across other industries are also embracing regenerative approaches.

In contrast, regenerative entrepreneurship education, as a distinct and well-established field, does not yet truly exist. While there are emerging practices and initiatives aligned with regenerative approaches, such as alternative business models (Raworth, 2017), steward-ownership or responsibility ownership, community-centred value creation, these remain largely fragmented and practice-based rather than grounded in a cohesive, scientifically framed educational paradigm. Although the concept of regenerative entrepreneurship is gaining traction, particularly in relation to sustainability and systems thinking (Hahn and Tampe, 2021; Das and Bocken, 2024), formalised curricula, teaching models, and standardised competencies for teaching regenerative approaches in entrepreneurship are still in their infancy. Most existing educational approaches remain rooted in traditional entrepreneurial or sustainability education frameworks, which often lack the depth of systemic and ecological integration that regenerative

paradigms require (Wiek et al., 2011). As such, the development of a reimagined paradigm in entrepreneurship education is needed. One that reimagines entrepreneurship as a force for regeneration, and positions entrepreneurial practice as an active agent in generating net-positive impacts on ecological and social systems.

2.3 Review of the Literature: Competence Development at the Intersection of Sustainability and Entrepreneurship Education

Building on the understanding that transformative learning and systems thinking are critical foundations, it becomes essential to review the existing literature on the intersection of sustainability and entrepreneurship education.

Accordingly, many scholars emphasise the importance of equipping learners with the competencies to generate innovative ideas that address socio-ecological challenges (Zahra et al., 2009; Schaltegger and Wagner, 2011; Lans et al., 2014; Foucrier and Wiek, 2019).
As mentioned earlier, this trend has been driven by the growing fields of sustainable and social entrepreneurship education and the broader social innovation movement (Birney et al., 2018).

A foundational competency framework for sustainable entrepreneurship is presented by Lans et al. (2014). Lans et al. (2014) developed an integrated competency framework for sustainable entrepreneurship in higher education based on the assumption that the two worlds (sustainability and entrepreneurship) can be mutually reinforced.
Drawing on two focus group discussions with eight educators, which analysed literature-based lists of competencies for sustainable development and entrepreneurship, seven core competencies were identified: “1) Systems-thinking competence; 2) Embracing diversity and interdisciplinarity; 3) Foresighted thinking; 4) Normative competence; 5) Action competence; 6) Interpersonal competence; 7) Strategic management” (Lans et al., 2014).

Before combining those two worlds (sustainability and entrepreneurship), they established a theoretical framework for entrepreneurship and entrepreneurial competencies based on the existing literature. While stating that the “exact demarcation of entrepreneurial competence remains problematic due to mutual dependency and context specificity”, they explain that five competencies can be considered the “backbone of entrepreneurial competence” (Lans et al., 2014, p.39). These are: “opportunity competence, social competence, business competence, industry-specific competence and entrepreneurial self-efficacy” (Lans et al., 2014).

Regarding sustainability competencies, Lans et al. (2014) refer to Dentoni et al. (2012), who identified seven different competencies: “systems-thinking competence, foresight-thinking

competence, normative competence, embracing diversity and interdisciplinarity, interpersonal competence, action competence and strategic management".

As their main research outcomes, they (Lans et al., 2014) stated that there are clear overlaps (problems as central point, novelty and creativity, self-involvement, initiating new things, realising and improving projects and businesses and engaging with others) between the entrepreneurship and sustainable development lists from the group discussions they performed after their literature review.
As for significant differences, they mention "a stronger focus on individual accomplishments (as in 'drive', and 'self-efficacy') in the entrepreneurial competence list versus a more collective/societal aspiration in the sustainable development competence list" (Lans et al., 2014, p.43).

Furthermore, they highlight as a deficit that the systems approach, normative competence and the inclusion of diversity and interdisciplinarity are not central with regard to entrepreneurial competencies. With respect to the student questionnaire that provided the results for a list of competencies relevant to sustainable entrepreneurship, Lans et al. (2014) showed that normative competence did not correlate with overall entrepreneurial self-efficacy.
Moreover, their study showed that strategic management competence and action competence coincided in the students' questionnaire.

The framework for sustainable entrepreneurship by Lans et al. (2014) has served as a cornerstone for subsequent research in the field (Hesselbarth and Schaltegger, 2014; Ploum et al., 2018; Filser et al., 2019; Foucrier and Wiek, 2019; Hermann and Bossle, 2020; Diepolder et al., 2021).

Another noteworthy framework, distinct in its methodological approach and therefore particularly relevant in comparison with that of Lans et al. (2014), was developed by Foucrier et al. (2019).
Their model is grounded in both empirical insights from real-world entrepreneurial processes and a thorough engagement with existing literature, offering valuable perspective on how a framework should be designed in alignment with the dynamics of entrepreneurial practice.

Their aim was to create a framework that could serve as a practical guide for education and learning in the context of sustainable entrepreneurship. The authors noted that there are valuable competency frameworks, but in their view, they neglect to link the competencies to the actual process of entrepreneurship.

Compared to Lans et al. (2014), they began their research with a qualitative literature review on tasks, followed by a qualitative literature review on competencies, and the final synthesis of their framework.
As competencies for entrepreneurship, Fourcrier et al. (2019) mention recognising opportunities for creative destruction, identifying and acquiring resources, coping with uncertainty, overcoming obstacles, starting new ventures, and creating and maintaining strong networks.

In comparison to Lans et al. (2014) there is a very strong focus on the purely economic characteristics of entrepreneurship and the entrepreneur as a single actor. Lans et al. (2014) also mention "social competence" in their literature review and offer more of a cross-boundary understanding of entrepreneurial competencies.
Foucrier et al. (2019) themselves mention this shortcoming by referring to sustainability education and the competencies targeted, describing them as systems thinking, future thinking, values thinking, strategic thinking, and interpersonal/professional skills to successfully contribute to sustainability transformation. It can be seen here that there is a great deal of overlap between the two works, but Lans et al. (2014) include "normative competence," which does not occur in Foucrier et al. (2019).

In contrast to Lans et al., (2014), Foucrier et al. (2019) continue with their literature review by also reviewing existing literature on social entrepreneurship (including competencies such as creative thinking, negotiation, leadership, innovation, market the organisation, create significant social impact, and communicate with stakeholders) and on sustainability entrepreneurship (including competencies such as stakeholder communication and interpersonal competence, ability to market the organisation and strategic competence).

Foucrier et al. (2019) divided their research findings into three distinct parts: 1) tasks that sustainability entrepreneurs (ideally) perform, 2) the corresponding competencies required to perform these tasks, and finally 3) the presentation of the competency framework that maps the

identified tasks and competencies to an ideal entrepreneurial process. As for the first part, the authors present the tasks in four different clusters (entrepreneurial task, sustainability task, social entrepreneurship task and sustainable entrepreneurship task).

Based on that, Foucrier et al. (2019) also compiled the competencies corresponding to the tasks. As a result, they highlight that "many of the identified competencies across all clusters are similar, for example, systems-thinking competence or teamworking skills (even if terminologies vary) (Foucrier et al., 2019, p. 5) indicating a convergence across streams of literature.

Finally, they present a process-oriented competency framework for sustainability entrepreneurs consisting of five phases of entrepreneurial activity (exploration, planning, establishment, development, and consolidation) (Foucrier et al., 2019). For each phase, key tasks and associated competencies were identified through the steps outlined above. Given their number and details, they are not listed here in full. Instead, a comparison is provided highlighting the main distinctions between this framework and that of Lans et al. (2014), emphasising how the approaches diverge in structure, emphasis, and alignment with entrepreneurial processes.

One could argue that Lans et al. (2014) have as one main shortcoming that the results reflect only one university and a limited number of teachers and students, which makes it difficult to draw general conclusions and might cause unintended bias. In addition, the authors only mention the lack of entrepreneurial skills compared to sustainability skills in their analysis. However, they fail to also mention the lack of sustainability skills compared to entrepreneurial skills. In this sense, they paint a narrative that sustainable competencies are the ideal that can simply not be exceeded. Therefore, one could argue that they are taking a very one-sided approach. Further investigations on the combination of the concepts (sustainability and entrepreneurship) are needed.

In comparison to the findings of Lans et al. (2014), the study by Foucier et al. (2019) presents results that appear notably richer, drawing on a broader body of literature and yielding an arguably more comprehensive set of insights. Nevertheless, when considering their applicability within educational activities, it may be questioned whether these results should be explicitly linked to the entrepreneurial process in order to optimise the acquisition of sustainable entrepreneurial competencies. It is also conceivable that such a process orientation does not, in

itself, facilitate competency acquisition in the most effective manner. Moreover, given the theoretical foundations of transformative learning theory and systems thinking in entrepreneurship education, placing an exclusive emphasis on competencies may ultimately be insufficient to foster the desired depth and scope of entrepreneurial learning required to address socio-ecological challenges through entrepreneurial means.

3 Methodological Approach - Qualitative Research

The methodological approach of this dissertation is grounded in qualitative research, which is particularly well-suited for exploring complex social phenomena and gaining in-depth insights into human experiences. As Merriam (2009) emphasises, qualitative research is fundamentally concerned with understanding the meaning individuals construct about their lives and the world around them. Rather than seeking to quantify behaviour or test hypotheses, this approach focuses on how people interpret their experiences, how they construct reality, and how they attribute meaning to events and interactions in their everyday lives. By adopting this methodological approach, the dissertation aims to capture the richness, depth, and nuance of perspectives, allowing for a more holistic and contextualised understanding of the research topic.
Accordingly, the focus is on meaning, using an inductive approach, with me, the researcher, acting as an instrument for data collection and interpretation (Merriam, 2009).

Merriam (2009) further details in his research that qualitative research is grounded in two fundamental philosophical assumptions: ontology and epistemology. These foundational perspectives form the basis of my own research stance.

Ontologically, I align with the view that reality is not objective or fixed but rather socially constructed, inherently multiple, and shaped by the specific contexts in which individuals live and interact. This perspective acknowledges that human experiences and perceptions of reality vary across time, culture, and social environments.
Epistemologically, I adopt a constructivist stance, recognising knowledge as co-constructed through the dynamic interaction between the researcher and the participants. In this view, knowledge is not simply discovered or transferred; rather, it emerges through dialogue, reflection, and mutual engagement. Meaning is thus contextually and relationally produced, deeply embedded in cultural, historical, and interpersonal dimensions.

In addition, my own positionality significantly informs the interpretive framework. As a 30-year-old woman residing in Germany and shaped by the German education system and a broader Western academic tradition, I bring a particular set of experiences, values, and interpretive lenses to the research process. It is acknowledged that the socio-cultural

background of the researcher exerts a significant influence on the framing of research questions, the engagement with participants, the interpretation of data, and the construction of meaning.

In addition, a critical reflection on my role as an employee of the institution under scrutiny in this research is imperative. This dual role gives rise to what is often termed 'insider bias', the potential for personal involvement and identification with the institution to influence analysis in unconscious or overly sympathetic ways. While this positionality affords me with greater access, contextual understanding, and trust among participants, it also necessitates heightened reflexivity to avoid blind spots or uncritical assumptions. In order to mitigate this potential bias, I endeavour to adhere to the following: transparent methodological rigor, peer debriefing, and constant self-reflection. This reflexive awareness is integral to maintaining transparency and integrity in the research process and aligns with the broader goals of qualitative inquiry, which values subjectivity, context, and the multiplicity of truths (Merriam, 2009).

The qualitative research methods employed in this dissertation primarily consist of document and text analysis, as outlined by Neuman and Benz (1998). These methods were applied within the semi-systematic literature reviews, which involved a structured yet flexible examination of relevant documents and records to identify recurring themes, patterns, and conceptual developments. This approach enabled me to engage deeply with existing scholarship and trace the evolution of the research topic.

In addition to document analysis, empirical data was gathered through interactive workshops. These workshops incorporated open-ended conversations designed to elicit rich, detailed accounts of participants lived experiences and the meanings they attribute to those experiences. This conversational format allowed for a more dialogical and participatory form of data collection, encouraging participants to reflect openly and collaboratively on the issues under discussion.

A comprehensive description of the methodological procedures, including the rationale for the selected methods, the steps undertaken in data collection and analysis, and a critical reflection on their application, is provided in each of the individual research chapter. Each research chapter includes a dedicated part on methodology and research design, ensuring transparency and allowing readers to assess the rigor and appropriateness of the methodological choices in relation to the specific research questions addressed.

4 Research Paper I: Systems Thinking in Entrepreneurship Education: An Examination of Competencies and Teaching Approaches.

4.1 Introduction

Scholars in entrepreneurship education increasingly emphasise the importance of enabling learners to generate ideas that address pressing socio-ecological challenges (Lans et al., 2014; Schaltegger and Wagner, 2011; Zahra et al., 2009). At the same time, there is a growing consensus on the need for transformative educational approaches capable of responding to these complex challenges (Linnér and Wibeck, 2019). In this context, systems thinking has emerged as a key competency in entrepreneurship education, particularly at the intersection of sustainability and entrepreneurship, as discussed in section 2.3. Systems thinking encourages learners to move beyond linear and firm-centric perspectives and instead develop an understanding of the interconnections between environmental, economic, and social systems (Birney et al., 2019). Supporting this view, Lynch et al. (2021) call for a fundamental shift in educational perspectives, from a narrow focus on organisational value creation toward a more holistic and systemic understanding of value creation within interconnected socio-ecological systems.

Reflecting this growing interest, Diepolder et al. (2021) conducted a systematic literature review of competency frameworks for sustainable entrepreneurship and identified three particularly influential frameworks developed by Loué et al. (2017), Biberhofer et al. (2019), and Foucrier et al. (2019). While this review provides a thorough summary of the current research and emphasises the importance of more specific competency development, it is unclear to what extent these and other frameworks in this field explicitly adopt a holistic approach to environmental, social and economic systems, particularly from a systems thinking perspective. Moreover, there is ongoing debate regarding the prioritisation of specific competencies when designing educational interventions for sustainable entrepreneurship (Diepolder et al., 2021).

Against this backdrop, a clear need for further research emerges. This first research paper therefore undertakes a systematic examination of existing competency frameworks in entrepreneurship education to address the following research questions:

- *What competency frameworks can be identified in the literature to promote sustainable transformation within entrepreneurship education?*
- *How is systems thinking integrated into these competency frameworks to promote sustainable transformation within entrepreneurship education?*

To address these questions, the study employs a semi-systematic literature review methodology. This approach allows for a structured yet flexible examination of relevant academic sources, enabling the identification and critical analysis of competency frameworks that relate to sustainable transformation and entrepreneurship education.

The analysis conducted in this first research paper reveals that six key competency frameworks are particularly relevant for promoting sustainable transformation within entrepreneurship education. These frameworks are proposed by Lambrechts et al. (2013), Lans et al. (2014), Hesselbarth and Schaltegger (2014), Ploum et al. (2018), Foucrier and Wiek (2019), and Moon, Walmsley, and Apostolopoulos (2022). Given the recognised inclusion of systems thinking within these frameworks, the analysis provides compelling evidence for the integration of a systems thinking perspective across these fields.
The paper critically examines how these frameworks support sustainable transformation in entrepreneurship education, contributing to the scholarly discourse by offering insights into the essential skills, knowledge, and attitudes learners need to develop. The findings aim to inform educational practice, policy development, and curriculum design, offering practical guidance for aligning entrepreneurship education with the principles of systems thinking.

The findings and identified frameworks from this first research paper serve as a foundation for the second research paper, which conducts a detailed comparative analysis of two key competency frameworks.

This initial research paper has also been published as a separate academic paper, which I co-authored with a colleague[27]. This work was conducted as part of my doctoral research and constitutes a core component of the dissertation.

[27] Wilhelm, S., Planck, S., **2024**. Systems Thinking in Entrepreneurship Education: An Examination of Competencies and Pedagogical Approaches for Sustainable Transformation. 13th International Scientific Conference: Region, Entrepreneurship, Development, Osijek, June

4.2 Method and Research Design

Our research design used a semi-systematic literature review (Snyder, 2019) to gain insights into the research on competency frameworks in entrepreneurship education research to answer the research questions. The review process was guided by the PRISMA 2020 statement[28], which is appropriate for semi-systematic reviews in the field of education (Page et al., 2021, p.2). It allowed us to extract valuable insights from a wide range of studies in the literature, providing a comprehensive understanding of the competency frameworks and the integration of a systems thinking perspective within entrepreneurship education to facilitate sustainable change. It also allowed us to explore research gaps.

4.2.1 Eligibility Criteria and Restrictions

Our semi-systematic literature review adopted inclusive eligibility criteria and included a wide range of sources, including both traditional academic publications and grey literature. We searched SCOPUS and Google Scholar. To ensure a thorough examination of the current state of knowledge in the field, the review includes both empirical and non-empirical studies. The selected publication timeframe, from January 2013 to December 2023, ensures the inclusion of the most recent and relevant literature for a timely analysis. The PICOC (People, Intervention/Exposure, Comparison, Outcomes, and Context) framework proposed by Booth et al. (2022) was used to further guide the authors regarding the scope of the review. The 'people' category includes all sexes, ages and levels of knowledge mentioned in relevant studies. The 'intervention' aspect is not a mandatory eligibility criterion for our search, but if it is present, it focuses on subjects participating in an entrepreneurship education activity. Contrary to the typical use of the 'Comparison' and 'Outcomes' dimensions in the PICOC framework, in this

2024. ISSN 1848 - 9559. https://www.efos.unios.hr/wp-content/uploads/2023/06/Zbornik-2024.pdf.

[28] Page, M.J. et al. **2021**. 'The PRISMA 2020 statement: an updated guideline for reporting systematic reviews', Systematic Reviews, 10(1), p. 89. Available at: https://doi.org/10.1186/s13643-021-01626-4.

study non-empirical studies and documents are used, making these dimensions less applicable. The 'Context' dimension has a global scope.

The semi-systematic literature review applied strict exclusion criteria to ensure a focused and comprehensive analysis. Publications were excluded if they were not in line with the defined research interests in order to maintain relevance to the study objectives. The research interests include identifying and analysing entrepreneurship education competency frameworks tailored for sustainable transformation, evaluating their effectiveness in fostering competency development, and examining their scholarly contributions. In addition, the integration of systems thinking perspectives into these frameworks will be explored. In order to maintain a broad perspective, articles focusing solely on specific fields of education (e.g. nursing or engineering) were excluded. Furthermore, publications that did not adhere to the predefined concepts of sustainable transformation, specifically limited to the economic dimension, or transformation limited to the technological dimension, were excluded. By implementing these exclusion criteria, the systematic literature review aimed to streamline the selection process and increase the precision and applicability of the findings within the targeted research scope.

4.2.2 Information Sources

In January 2024, the data collection for this research relied on two primary sources of information, the bibliographic database Scopus[29] and the academic search engine Google Scholar[30], both recognised as two of the three major bibliometric databases according to Harzing and Alakangas (2016). These platforms were chosen to ensure a comprehensive retrieval of relevant literature for the systematic review. Notably, the third major bibliometric

[29] Scopus is a large, multidisciplinary bibliographic database developed by Elsevier. It is one of the most widely used research tools for finding scientific literature across a broad range of disciplines. For further information please also see www.scopus.com.

[30] Google Scholar is a freely accessible search engine that indexes scholarly articles, theses, books, and conference papers from a wide range of academic publishers and repositories. For further information please also see www.scholar.google.com.

database, Web of Science[31], was deliberately excluded from the information sources. This decision was based on a longitudinal and cross-disciplinary comparative study conducted by Harzing and Alakangas (2016), which showed analogous results for Scopus and Web of Science databases.

Using the research questions (*What competency frameworks can be identified in the literature to promote sustainable transformation within entrepreneurship education?; How is systems thinking integrated into these competency frameworks to promote sustainable transformation within entrepreneurship education?*) as the basis for the search strategy, the following terms were identified:

- competencies (knowledge, skills, attitudes)
- transformations (transitions, change)
- sustainable development (sustainability, SDGs)
- entrepreneurship education (entrepreneurship learning, entrepreneurship teaching)

The selection of terms and their associated synonyms for the literature search in Scopus and Google Scholar was based on established frameworks and scientific works. For the term 'competences', the synonyms 'knowledge, skills and attitudes' were used (following Bianchi et al., 2022; Bacigalupo et al., 2016). The choice of synonyms for 'transformation', namely 'transitions' and 'change', is based on the research of Redman and Wiek (2021), who explored the competencies for driving transformations towards sustainability. The decision not to use the terms 'sustainable transformation' or 'regenerative sustainability' (Gibbons, 2020) in this study is due to their early stage of adoption. Instead, the study chooses to use the well-established and globally recognised term 'sustainable development', which dates back to the Brundtland Report (1987) mentioned earlier. The exclusion of specific terms such as 'social', 'environmental' or 'economic development' is a strategic choice aimed at maintaining a holistic focus. By concentrating on sustainable development, the research aims to comprehensively address the

[31] Web of Science is a curated, multidisciplinary citation database maintained by Clarivate that offers access to high-quality research literature and robust citation tracking tools. For further information please also see www.webofscience.com.

interrelated aspects of social, environmental and economic considerations within the broader context of sustainability. This approach allows for a more comprehensive exploration of the issue and avoids an undue narrowing of the scope to individual dimensions. 'Entrepreneurship' is treated as a stand-alone term without synonyms that would be relevant for this study. According to the UNESCO thesaurus, 'education' includes the two synonyms 'learning' and 'teaching'[32] . A title and keyword search was carried out in Scopus and Google Scholar to identify literature relevant to the study.

4.2.3 Search Strategy and Selection Process

The following search string was used to search the academic bibliographic database Scopus:

- *TITLE-ABS-KEY("competency" OR "competence" OR "competencies" OR "competences" OR "attribute" OR "skills" OR "knowledge" OR "attributes" OR "capability" OR "capabilities" OR "learning outcome" OR "outcomes") AND TITLE-ABS-KEY("entrepreneurship education" OR "entrepreneurship learning" OR "entrepreneurship teaching") AND KEY("sustainable development" OR "sustainability" OR "SDGs" OR "transformation" OR "transition" OR "change") AND LANGUAGE(english) AND PUBYEAR AFT 2012.*

The search resulted in 110 documents, which were downloaded as a BibTeX file.

As for Google Scholar, Harzing's 'Publish or Perish'[33] software was used for the keyword search, as the bibliographic database itself cannot perform complex search strings such as Scopus or Web of Science (Harzing, 2020). The software searches and downloads up to 1,000 citations

[32] https://vocabularies.unesco.org/browser/thesaurus/en/index/E, last accessed on 04/01/2024.

[33]The keyword search was conducted using the search function of the harzing.com website, which provides access to the Publish or Perish software, a tool designed for retrieving and analysing academic citations from sources such as Google Scholar. For further information please also see https://harzing.com/resources/publish-or-perish, last accessed on 09/01/2024.

but has a character limit on searches. Therefore, the search string from Scopus (see above) was translated into the following keywords search:

- "Competencies, skills, knowledge, attributes, sustainable development, sustainability, transformation, entrepreneurship education".

The search included all publications published between 2013 and 2024, and the maximum number of hits was set at 200, as the search term was already very narrow. The 200 records were downloaded as a BibTex file.

The results from Scopus and Google Scholar (310 in total) were then imported into MAXQDA[34], a qualitative and mixed methods data analysis software, to apply the screening process. Before starting with the screening process, three duplicate records were removed. The remaining 307 records were screened for their titles regarding the eligibility and restriction criteria excluding 229 records. From the 78 remaining records, 32 records were excluded after reviewing their abstract. Based on this, the remaining 46 articles were screened for their full text and two (Diepolder, 2021 and Fourcier et al., 2019) additional records were identified. The following figure of a flowchart shows the identified, included and excluded records in each of the three phases of the PRISMA 2020 statements (identification, screening and inclusion).

[34] MAXQDA is a software programme used for qualitative and mixed methods data analysis. It helps researchers systematically organize, code, analyse, and visualize data such as interview transcripts, focus group discussions, surveys, literature, images, and more. It is widely used in the social sciences, education, psychology, and related fields to support rigorous, transparent, and efficient qualitative research processes. For further information please also see https://www.maxqda.com/, last accessed on 07/01/2024.

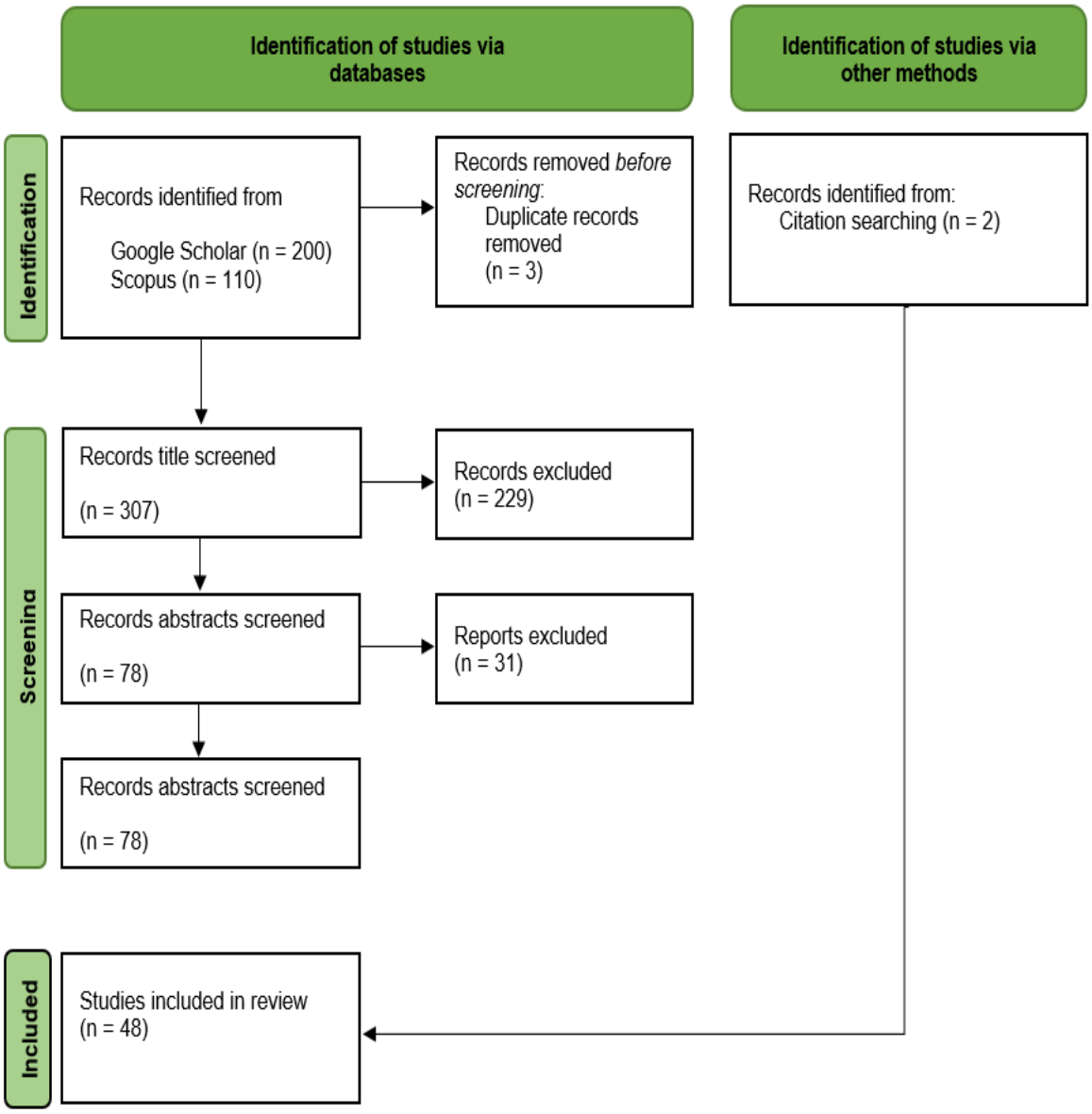

Figure 8 – Own visual representation of systemic literature review flow diagram according to The PRIMSA 2020 statement (Page et al., 2020).

As 11 of the 48 selected studies were not available as full papers, a total of 37 publications were analysed and evaluated in MAXQDA after the three phases, which are listed alphabetically in the appendix A. The results of the semi-systematic literature review are presented in the following section.

4.3 Results and Analysis

In order to address the two research questions, a table has been constructed that lists the six most relevant competence frameworks identified through the semi-systematic literature review and their integration of a systems thinking perspective. The table consists of three columns: the first column lists the author(s) and year; the second column provides information about the referenced or developed competence framework and the associated competences; and the third column provides information about the integration of a systems thinking perspective.

Author(s) and year	**Referenced or developed competency frameworks**	**Evidence of the integration of a systems thinking perspective**
Lambrechts et al. (2013, p.68-70)	Based on Roorda (2010): 1) Responsibility 2) Emotional intelligence 3) System orientation 4) Future orientation 5) Personal involvement 6) Action skills	● Systems orientation is highlighted as one of the six key competences. ● Systems orientation involves recognising non-linear processes, thinking across time scales, distinguishing between short-term and long-term approaches, assessing the consequences of decisions and adopting a future-oriented perspective. ● The authors prioritisation of 'systems thinking' stems from the inadequacy of existing competency frameworks to address interlinkages. ● The importance of understanding dynamic and non-linear processes is emphasised, in line with a wider recognition of the need for competences that consider the consequences of decisions over time.

		● In addition, 'future-orientation' is identified as crucial, missing in the competency frameworks, requiring awareness of the long-term consequences of decisions and in line with sustainability perspectives. A systems thinking perspective is explicitly included in the competency framework, addressing the importance of interconnected system elements. Although a systems theory approach is not explicitly mentioned, the emphasis on recognising non-linear processes, understanding interconnectedness and adopting a future-oriented perspective implies an implicit integration of systems thinking principles in the development process of the framework.
Lans et al. (2014, p. 40)	Based on two focus group discussions about two literature-based lists of competences for sustainable development and entrepreneurship involving eight educators: 1) Systems-thinking competence 2) Embracing diversity and interdisciplinarity 3) Foresighted thinking 4) Normative competence	● Systems thinking is prioritised as a key competence, recognising its critical role in addressing the inherent complexity of sustainability challenges. ● Emphasising the interconnectedness of human existence and natural systems and advocating a holistic approach that considers all relevant subsystems across different domains and disciplines. ● Emphasising that facilitating a nuanced understanding of cascading effects, inertia, feedback loops and

	5) Action competence 6) Interpersonal competence 7) Strategic management	accompanying cultures allows for a more comprehensive analysis of sustainable development issues. ● Within this framework, the application of systems thinking is visible in other competences: Normative competence: Involves assessing and improving the sustainability of social-ecological systems on the basis of values and principles. Action competence: Involves active participation in responsible action to improve sustainability. A systems thinking perspective is adopted from the outset, reflecting a commitment to integrating systems thinking into practical and normative aspects of sustainable development, and emphasising its relevance across different dimensions of decision-making and action. However, potential criticisms were acknowledged, such as the lack of a comprehensive systems thinking theory and the limited involvement of stakeholders in the development process.
Hesselbarth and Schaltegger (2014, p. 32)	Based on recent studies by Rieckmann, 2012 and Wiek et al., 2011: 1) Systemic thinking	● Recognise systems thinking as a critical competence within competency frameworks. ● Highlighting the emergence of numerous sustainability

	2) Anticipatory thinking 3) Strategic thinking 4) Critical thinking accompanied by 5) Normative competencies 6) Interpersonal competencies	management programmes, but noting the lack of empirical evidence on the requirements of the profession and effective methods for educating sustainability change agents. ● Emphasise the need for a broader understanding of the requirements and methodologies for sustainability education, particularly in entrepreneurship. ● Emphasise a holistic approach, suggesting a departure from traditional educational paradigms, in line with the evolving landscape of sustainability management programmes. A systems thinking perspective is included in the framework. However, despite the recognition of systems thinking within the competency framework, Hesselbarth and Schaltegger (2014) do not explicitly integrate this perspective into their theoretical considerations. The limited empirical evidence highlights the ongoing challenge of developing effective ways of educating sustainability change agents, and reflects a wider gap in understanding of professional requirements in this area.
Ploum et al.	Based on Hesselbarth and	● Highlighting the consistent inclusion

(2018, p. 114)	Schaltegger (2014), Lans et al. (2014), Osagie et al. (2016) and Wesselink et al. (2015): 1) Strategic management competence and action competence 2) Embracing diversity and interdisciplinary competence 3) Systems thinking competence 4) Normative competence 5) Foresighted thinking competence 6) Interpersonal competence	of 'systems thinking' competence in the four competency frameworks they reference. ● Emphasising the importance of considering the interconnectedness and interdependence of different elements within the field of sustainable development from a systems thinking perspective. ● Observe that descriptions of competences in the literature on education for sustainability are often divorced from specific contexts and designed for universal applicability across study programmes and different educational settings. ● It argues for a broader consideration of the systemic context, recognising the relevance of work environments for the meaningful application of sustainability challenges and tasks. A systems thinking perspective is consistently included in the competency frameworks highlighted by Ploum et al. (2018), emphasising the interconnectedness and interdependence inherent in sustainable development. They advocate for holistic competence descriptions that transcend program-specific boundaries, highlighting the systemic context for effectively addressing sustainability challenges in

		diverse work settings.
Foucrier and Wiek (2019, p.1-8)	Based on Wiek et al. 2016, Hesselbart and Schaltegger 2014, Lans et al. 2014, Osagie et al. 2016, Mindt and Reickmann 2017, Ploum et al. 2018, Biberhofer et al. 2018, Morris et al. 2013, Wiek et al. 2011a, Willard et al. 2010, Chell et al. 2007, Miller et al. 2012, Fantini et al. 2001, Salgado et al. 2018, Lans et al. 2011, Mitchelmore et al. 2010, Lambrechts et al. 2013, Wu 2009, Bernhardt et al. 2015, Afshar et al. 2017, Waldron 2016 and Moreau and Mertens 2013, the authors introduced a process-oriented competency framework tailored for sustainability entrepreneurs, comprising five distinct phases of entrepreneurial activity: As for the sustainability competencies related to the distinct phases: 1) exploration: System-thinking competence; Value-thinking competence; Future-thinking competence; Interpersonal competence 2) planning:	● Adopted a 'systems thinking' perspective from the outset, shaping their conceptualisation of sustainability entrepreneurship. ● Introducing the term "regeneration" to differentiate their framework, emphasising real-world entrepreneurial processes. ● Focus on transformational rather than incremental improvements, actively contributing to the improvement of interconnected social and environmental systems. ● Empowerment of the workforce and community signals a holistic view of the interrelated elements within the wider system. A systems perspective is an integral part of Foucrier et al.'s (2019) framework, guiding sustainability entrepreneurship towards holistic solutions that address interconnected social and environmental challenges while fostering community and workforce empowerment.

	System-thinking competence; Value-thinking competence; Future-thinking competence; Strategic competence; Interpersonal competence; Integration competence 3) establishment: Strategic competence; Interpersonal competence; Integration competence; Implementation competence 4) development: Future-thinking competence; Strategic competence; Interpersonal competence; Integration competence; Implementation competence 5) consolidation: System-thinking competence; Value-thinking competence; Future-thinking competence; Strategic competence; Interpersonal competence	
Moon, Walmsley and Apostolopoulos (2022)	Based on EntreComp and GreenComp: EntreComp competence area and competencies: 1) Ideas and opportunities: Spotting opportunities; Creativity; Vision; Valuing ideas; Ethical and sustainable thinking	● Mentioning "Systems Thinking" as a GreenComp competence. No further explanation or link to a systems thinking perspective.

	2) Resources: Self-Awareness and Self-Efficacy; Motivation and perseverance; Financial and economic literacy; Mobilising resources 3) Into Action: Taking the initiative; Planning and management; Coping with uncertainty ambiguity and risk; Working with others; Learning through experience GreenComp: 1) Embodying sustainability values: Valuing sustainability; Supporting fairness; Promoting nature 2) Embracing complexity in sustainability: Systems thinking; Critical thinking; Problem framing 3) Envisioning sustainable futures: Futures literacy; Adaptability; Exploratory thinking 4) Acting for sustainability: Political agency; Collective action; Individual initiative	

Figure 9 - Identified Competence Frameworks and Systems Thinking Perspective for Sustainable Development in SEE.

4.4 Implications and Discussion

The exploration of competency frameworks in entrepreneurship education for promoting sustainable transformation shows that systems thinking is prevalent in such competency frameworks. Authors like Lambrechts et al. (2013), Lans et al. (2014) and Foucrier et al. (2019) prioritise systems thinking as a foundational competence. Lambrechts et al. (2013) highlight its importance in recognising the interconnected elements within a system, fostering a holistic understanding that is essential for addressing the complexity of sustainable development. Lans et al. (2014) extend this perspective to sustainable entrepreneurship, highlighting the need for a comprehensive approach that actively contributes to the improvement and regeneration of interconnected social and ecological systems. Foucrier et al. (2019) echo these sentiments by incorporating a systems thinking approach to sustainability entrepreneurship, which envisages aligning business activities with critical sustainability thresholds.
In addition, Foucrier et al. (2019) explicitly engage with the concept of 'regeneration'. Their focus is on comprehensive or transformational approaches that envision going beyond minimising negative impacts to actively contributing to the improvement of interconnected social and ecological systems.

Despite this progress, challenges remain in the practical implementation of competency frameworks. Garcia-Feijoo, Eizaguirre, and Rica-Aspiunza (2020) call for a systematic and holistic approach in entrepreneurship schools to fully integrate sustainability into education, research, operations, and outreach. The need for a robust sustainable management agenda, as advocated by Kolb, Fröhlich, and Schmidpeter (2017), further reinforces the importance of a comprehensive strategy in entrepreneurship education for sustainable transformation.

Pedagogical approaches play a crucial role in cultivating competencies for sustainable transformation. Lambrechts et al. (2013) propose a multifaceted framework that combines interactive, action-oriented and research-based methods in line with a systems thinking perspective. Lans et al. (2014) highlight the importance of further research on the practical implementation of competency-based curricula, while Hesselbarth and Schaltegger (2014) advocate transdisciplinary approaches and the integration of soft skills. The gap in Foucrier et al.'s (2019) framework regarding pedagogical approaches emphasises the need for constructive alignment with effective learning and teaching environments.

In conclusion, the competency frameworks identified in the literature demonstrate a collective emphasis on systems thinking as a key element in promoting sustainable transformation in entrepreneurship education. The inclusion of this perspective is in line with the research question and illustrates its importance in promoting a holistic understanding of the interrelated elements within the wider system. However, a more systematic and comprehensive approach is needed in entrepreneurship education to fully integrate sustainability in all facets, as highlighted by Garcia-Feijoo, Eizaguirre and Rica-Aspiunza (2020) and Kolb, Fröhlich and Schmidpeter (2017).

The pedagogical approaches proposed by the different authors provide valuable insights, emphasising the importance of interactive, action-oriented and research-based methods. The identified gaps and recommendations for further research highlight the evolving nature of entrepreneurship education for sustainable transformation. Bridging these gaps will contribute to the development of responsible change agents capable of managing the economic, social and environmental impacts of their decisions. Going forward, a concerted effort is needed to align pedagogical approaches with effective learning environments and to ensure the seamless integration of systems thinking into competency frameworks to promote sustainable transformation in entrepreneurship education.

5 Research Paper II: Greater than the Sum of its Parts - Combining Entrepreneurial and Sustainable Competencies in Entrepreneurship Education.

5.1 Introduction

The findings of the first research paper reveal that higher education institutions (HEIs) are currently facing a convergence of multiple crises. Alongside demographic shifts, rapid digital transformation, and evolving societal, industrial, and political demands, the drive for sustainable transformation, and consequently, the resolution of socio-ecological challenges, has become a powerful catalyst for HEIs to adapt and rethink their practices (Etzkowitz and Leydesdorff, 1998; Cai, 2023). Despite this urgency, systematically embedding sustainability across all levels of HEIs remains both a significant challenge and an imperative (Geschwind et al., 2019; EC, 2018).

One of the key challenges in achieving sustainability is the persistent gap between knowledge and action. Although the realities of climate change and the need for deep, sustainable transitions have been recognised for over five decades (Meadows et al., 1972), attempts to bring our economies and societies within planetary boundaries have frequently been unsuccessful. This persistent gap between knowledge and action is also evident in the field of Education for Sustainable Development (ESD) (Chaplin and Wyton, 2014). A systematic review by O'Flaherty and Liddy (2018) found that while ESD positively influences cognitive competencies, its impact rarely extends into behavioural change. Learners may gain important theoretical insights into sustainability, but translating this into meaningful action remains a challenge. Accordingly, this second research paper explores how experiential entrepreneurship education (Piperopoulos et al., 2014) can bridge this gap by embedding sustainability within entrepreneurial practice.

While research on sustainability and entrepreneurial competencies in entrepreneurship education is steadily expanding as highlighted in section 2.3, a systematic analysis that integrates the European Union's two key competency frameworks, EntreComp (entrepreneurial) and GreenComp (sustainability), remains lacking. Existing studies on entrepreneurial and sustainability competencies have yet to fully engage with these frameworks in combination. Although EntreComp has garnered more scholarly attention (Joensuu-Salo et

al., 2022; Raţiu et al., 2023), GreenComp has only recently begun to receive academic interest (Sourgiadaki and Karkalakos, 2023). A comprehensive comparison of the two is still missing. Moon et al. (2022) attempt to explore the relationship between EntreComp and GreenComp but fall short due to the absence of a clear methodology and conclusive results. Similarly, while López-Núñez et al. (2022) suggest in their conclusion that the two frameworks could be integrated, they do not investigate their commonalities in depth. Although Moon et al. (2022) express an intention to explore the "real" relationship between the frameworks, their analysis lacks systematic rigor.

The overall aim of this second research chapter is therefore to investigate the intersections between entrepreneurial (EntreComp) and sustainability (GreenComp) competencies.
The central research question guiding this endeavour is:

- ***How can entrepreneurship and sustainability competencies be effectively integrated?***

To address this question, this study employs a social-constructionist thematic analysis. This approach allows to explore in detail the differences and similarities between the two frameworks.

The analysis yielded three key findings: (1) There is overlap between the two competency frameworks (2) GreenComp can be understood as a subset of EntreComp, rather than the reverse (3) Integrating both frameworks creates a comprehensive model that empowers learners to translate thinking into action and fosters applied competencies.
In addition, the research offers suggestions for educators on how to integrate three tools (IKIGAI, Team Canvas and Systems Mapping) that foster both sustainability and entrepreneurship competencies.

This second research paper has also been published as a separate academic paper, which I co-authored with colleagues[35]. This work was conducted as part of my doctoral research and constitutes a core component of the dissertation.

[35] Planck, S., Wilhelm, S., Kobilke, J., Sailer, K., **2024**. Greater than the Sum of Its Parts: Combining Entrepreneurial and Sustainable Competencies in Entrepreneurship Education. Sustainability 16, 3725. https://doi.org/10.3390/su16093725.

5.2 Method and Research Design

In this vein, we adopted a qualitative research approach, utilizing a social constructionist thematic analysis (TA) according to Braun and Clarke (Braun and Clarke, 2006; Braun and Clarke, 2012) was applied.

TA was deemed suitable for our research question and dataset, focusing on EntreComp[36] and GreenComp[37] publications by the European Union and its Joint Research Center, as it enables the systematic identification and organisation of patterns of meaning across the two competency frameworks (Braun and Clarke, 2012). Using TA allowed us to explore in detail the differences and similarities between the two frameworks, and to gain a deeper understanding of how they integrate entrepreneurship and sustainability. It supported a comprehensive analysis, generated insights and helped to interpret our data. By using TA, we were able to effectively facilitate a clear understanding of the congruence between entrepreneurship and sustainability in both frameworks. This method ensured a structured and rigorous comparison, making it well suited to our research question and data set.

With regard to the data set, EntreComp and GreenComp were utilised, as previously indicated.

In 2016, the European Commission identified entrepreneurship as one of eight key competences[38] for lifelong learning, thus establishing it as a fundamental skill set for individuals throughout their educational and professional journeys. Known under the term EntreComp, a

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[36] EntreComp was introduced by the European Commission in 2016 as a comprehensive and common understanding of entrepreneurial competencies (Bacigalupo et al., 2016).

[37] Six years later, GreenComp was introduced by the European Commission in 2022 as a comprehensive and common understanding of sustainability competencies.

[38]The Council has adopted a Recommendation on Key Competences for Lifelong Learning based on a Commission proposal. The Recommendation identifies eight key competences: Literacy, Multilingualism, Numerical, scientific and engineering skills, Digital and technology-based competences, Interpersonal skills, and the ability to adopt new competences, Active citizenship, Entrepreneurship and Cultural awareness and expression. For further information please also see https://education.ec.europa.eu/focus-topics/improving-quality/key-competences, last accessed on 21/06/2023.

comprehensive and common understanding of entrepreneurial competencies was introduced. The competency framework entails three main competence areas "Into Action", "Ideas and Opportunities" and "Resources", which each contain 15 competencies, 15 descriptors, 8 proficiency levels and 442 learning outcomes. EntreComp focuses on a broad understanding of entrepreneurship including the overall creation of cultural, social, and economic value, and in this sense encompasses different types of entrepreneurships (e.g., digital, social, or green entrepreneurship) (Bacigalupo et al., 2016). As a result, entrepreneurship is defined as a "transversal competence", enabling anyone "to transform ideas and opportunities into action by mobilising resources" (Bacigalupo et al., 2016).[39]

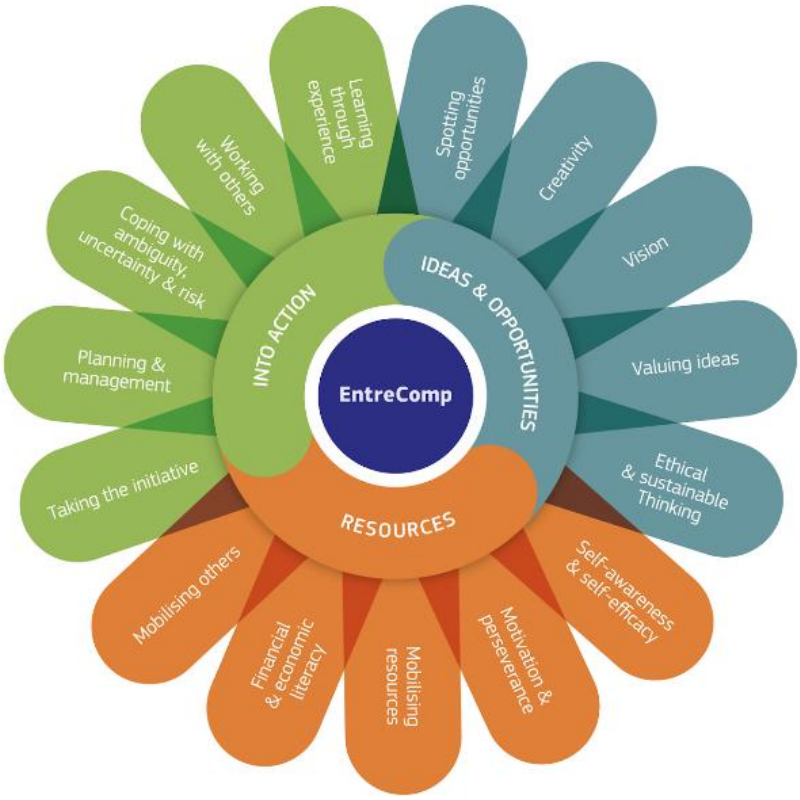


Figure 10 – Visual representation of EntreComp competence model (Bacigalupo et al., 2016).

Subsequent to this, in 2022, the European Commission introduced GreenComp as a comprehensive and common understanding of sustainability competencies. The framework consists of 12 different competencies. They are organised around the four main areas

[39] For a recent overview of the research on EntreComp, see Raţiu et al. (2023). Joensuu-Salo and colleagues (2022) validated EntreComp with start-up behaviour in seven countries.

represented through a metaphorical illustration: bees symbolise *acting for sustainability* as they carry pollen, representing *embracing complexity in sustainability*, from flowers, which stand for *envisioning sustainable futures*, back to their pod, symbolising *embodying sustainability values*. This imagery highlights the interdependence of all four areas. Under the term sustainability the authors of GreenComp understand "prioritising the needs of all life forms and of the planet by ensuring that human activity does not exceed planetary boundaries"[40] (Bianchi et al., 2022). Based on this, the GreenComp framework defines sustainability as a competence that enables learners "to embody sustainability values, and embrace complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures" (Bianchi et al., 2022).

Figure 11 - Visual representation of GreenComp competence model (Bianchi et al., 2022).

[40] The concept of planetary boundaries (PB), introduced in 2009, aims to define the environmental limits within which humanity can safely operate. For further information see Steffen et al. (2015).

In line with Braun and Clarke's proposal of six phases for thematic analysis (Braun and Clarke, 2006; Braun and Clarke, 2012) , 1. Familiarising yourself with the data, 2. Generating initial codes, 3. Searching for themes, 4. Reviewing potential themes, 5. Defining and naming themes, and 6. Producing the report, the analysis was conducted as outlined in the figure below.

Phase		Action
1	Familiarising yourself with the data	To gain a thorough understanding of the content of the EntreComp and GreenComp competency frameworks, we read them three times, focusing on 'areas,' 'competencies,' 'hints,' and 'descriptors'. This first phase helped us familiarise ourselves with the two different competency frameworks.
2	Generating initial codes	Subsequently, we conducted another thorough reading of both competency frameworks, guided by “theory-driven” (Braun and Clarke, 2006) codes specifically focusing on each point that referenced entrepreneurial or sustainable characteristics within the descriptors of each competence. This approach aimed to deepen our understanding through semantic-level coding.
3	Searching for themes	We reviewed the coded data to pinpoint similarities and overlaps among codes, as well as broader topics or issues around which codes were clustered into themes, with a particular emphasis on sustainability and entrepreneurial competencies. Our analysis revealed distinct patterns in the clustering of codes, and we also looked for patterns in the structural design to understand the relationships between the two frameworks and their respective links to sustainability and entrepreneurship competencies.
4	Reviewing potential themes	We assessed the coherence of our themes by comparing them to the compiled data extracts and evaluated how well each theme aligns with the data. We discussed the identified themes with our co-authors to discern patterns and review them in light of the entire dataset through a final comprehensive re-reading.

5	Defining and naming themes	We defined each theme taking into account the overlaps, components and combination of GreenComp and EntreComp competencies. We held discussions to highlight the distinctiveness and specificity of each theme, with the aim of capturing its essence. We worked with the co-authors to refine and finalise the definitions of the three themes identified by the analysis (see next section).
6	Producing the report	As part of the final stage, we completed the analysis by writing up the findings.

Figure 12 - Thematic Analysis Methodology; Research Steps according to Braun and Clarke Braun and Clarke (2006).

5.3 Results and Analysis

Based on our thematic analysis, we derived three results (themes): 1) there exists an overlap between the two competence frameworks, 2) GreenComp can be seen as part of EntreComp rather than the other way around, and 3) the combination of the two provides a comprehensive framework that enables students to translate sustainable thinking into action to achieve applied sustainability competencies. The figure below summarises these findings, which will be further explored in the following section.

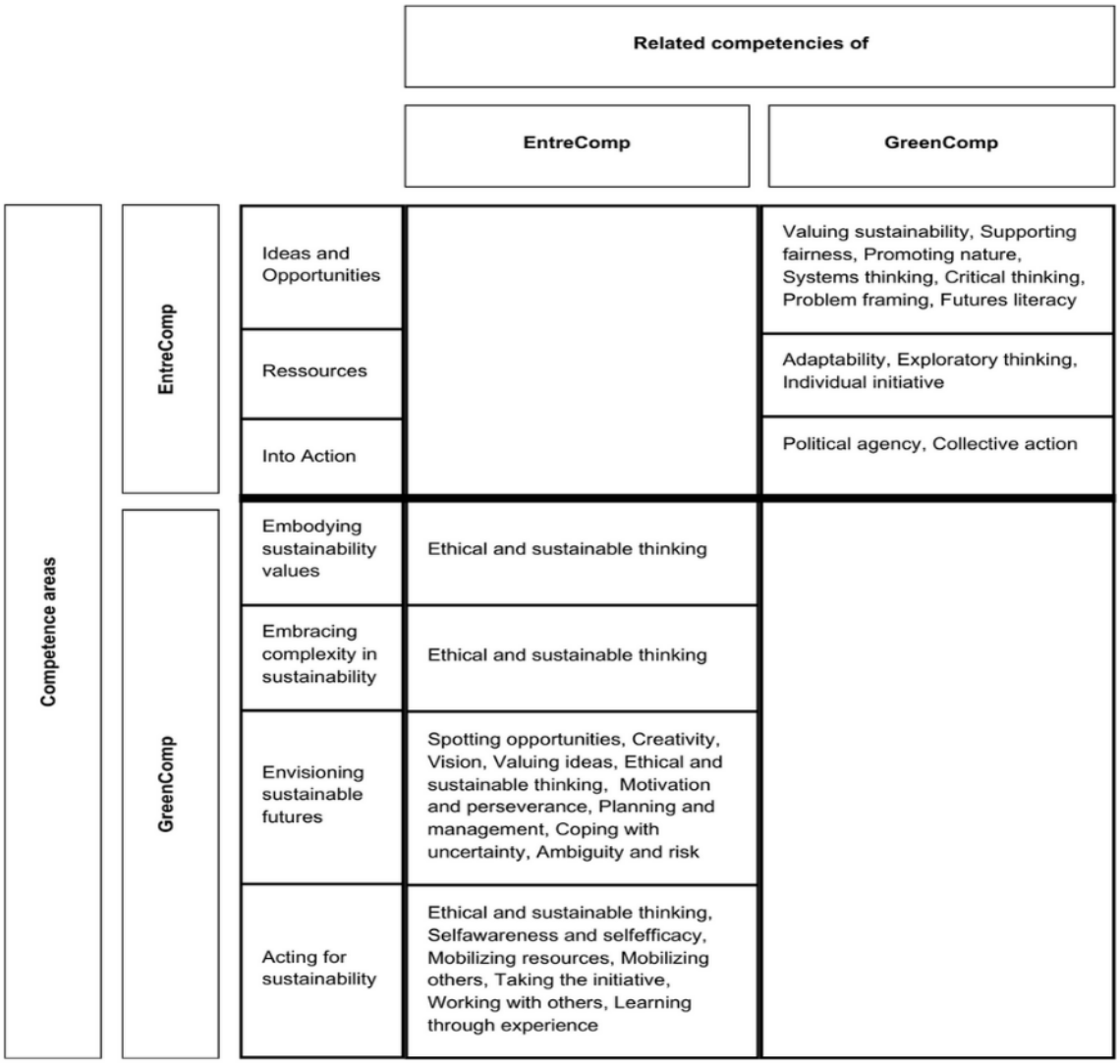


Figure 13 - Mapping of competencies according to competence areas of EntreComp and GreenComp (Created by the authors).

5.3.1 There exists an overlap between the two competence frameworks.

As shown above, the first EntreComp competence area “Ideas and opportunities” including the competencies “Spotting opportunities”, “Creativity”, “Vision”, “Valuing ideas”, “Ethical and sustainable thinking” almost all align with the GreenComp competence area “Envisioning sustainable futures”. With regard to the corresponding EntreComp competencies (“Self-Awareness and Self-Efficacy”, “Motivation and perseverance”, “Financial and economic literacy”, “Mobilising resources”) of its second competence area, a clear overlap with the GreenComp competence area “Acting for sustainability” and the associated competencies can be identified. In the last of the three EntreComp competence areas, “Taking action”, all the related competencies (“Taking the initiative”, “Planning and management”, “Coping with uncertainty, ambiguity and risk”, “Working with others”, “Learning through experience”) match the two GreenComp competence areas of “Envisioning sustainable futures” and “Acting for sustainability”.

In a second step, we semantically analysed the twelve different GreenComp competencies (divided into four different competency areas) in terms of their integration into the EntreComp competency framework. The analysis makes clear that the three competencies ("Valuing sustainability", "Supporting fairness", "Promoting nature") of the first competency area cannot be assigned to the entire EntreComp competency area "Ideas and Opportunities", but only to the specific competence "Ethical and sustainable thinking".
The same applies for the competencies (“Systems thinking”, “Critical thinking” and “Problem framing”) of the second competence area of GreenComp. As for the third GreenComp competence area “Envisioning sustainable futures” most of the related competences (“Futures literacy”, “Adaptability” and “Exploratory thinking”) fit into the EntreComp competence area “Resources”. The final area is “Acting for sustainability”, which includes the competencies “Political agency”, “Collective action” and “Individual initiative” and which are semantically related to the EntreComp competency area “Into Action”, although they focus more on political action.

5.3.2 GreenComp can be seen as part of EntreComp, while EntreComp is excluded from GreenComp.

One can discern the separation between entrepreneurship and sustainability already in the structural design of the competency frameworks. Moberg and Holse (2022) argue that this is intentional and that the differences between EntreComp and GreenComp mainly "provide a language and terminology that differs from the profit- and growth-oriented world of business". Yet on a closer examination, and as other authors have observed, “there are clear overlaps between the two” competency frameworks “including ethics and sustainability as a core competence for all entrepreneurs" (Moon et al., 2022). Our analysis provides a more nuanced understanding of the relationship between the two frameworks. Figure 13 shows that all GreenComp competencies can be related to the EntreComp competencies. Significantly, almost all GreenComp competencies could be related to one single competence of the EntreComp "Ethical and sustainable Thinking". This competence alone seems to bundle all four competence areas of GreenComp. It certainly is arguable that this competence touches upon almost all GreenComp competencies in terms of their semantic nature. In comparison, EntreComp competencies mainly cover two out of four GreenComp competency areas, namely “Envisioning sustainable futures” and “Acting for sustainability”. The competence "Financial and Economic Literacy" cannot be clearly integrated into the GreenComp framework. Furthermore, GreenComp does not mention the word entrepreneurship once, while EntreComp mentions the word sustainability.

5.3.3 The two frameworks together holistically combine cognitive and action-oriented competencies needed for sustainability driven entrepreneurship.

Combining both frameworks leads to a holistic set of cognitive and applied competencies for creating meaningful change. GreenComp heavily focuses on ‘thinking’ and enabling learners in the sense of creating a strong ‘mindset’ for sustainability competencies. In contrast, EntreComp has a clear focus on competencies related to a strong ‘toolset’ for entrepreneurship, while the intellectual and cognitive aspects of reflection only appear in the competence of “ethical and sustainable thinking” as well as “self-awareness”. Therefore, in order to understand how sustainability competencies play a role in and can be combined with entrepreneurship competencies, we distinguish along a ‘mindset’ and ‘doset’ for entrepreneurship. Whereas the

mindset for entrepreneurship includes a lot of competencies around ‘why’ to engage in entrepreneurial activities (i.e. embodying sustainability values, envisioning sustainable futures) the skill-set includes the ‘how’ to engage in entrepreneurial activities and ‘what’ is needed to succeed. However, whereas the analytical comparison of the competency frameworks above have shown links and interdependencies, they are not yet presented as a holistic set of competencies for future ready citizens. We argue sustainability competencies should support problem-solving skills for actual challenges (Wiek et al., 2011) and are therefore inherently linked to entrepreneurship competencies such as "Financial and Economic Literacy". Based on our analysis these frameworks are still seeing some parts of these competencies as mutually exclusive therefore limiting the potential of education towards an integrated understanding of actively shaping the world in a sustainable direction through entrepreneurial activities.
With the upcoming case study we introduce our way of bridging these frameworks through methodologies that equip students with both EntreComps and GreenComps simultaneously. Thereby it is our goal to educate active citizens with a holistic understanding of their potential to shape the future.

5.3.4 Combining Entrepreneurial and Sustainable Competencies in Entrepreneurship Education: A Case Study

In the following section we offer some suggestions for educators on how to integrate entrepreneurship tools that foster both sustainability and entrepreneurship competencies, based on the analysis above. We explore the three tools IKIGAI, Team Canvas and Systems Mapping that can help to develop both sustainability and entrepreneurship competencies. These tools are used in an interdisciplinary curricular format “Real Projects” (RP) that is being taught at the HM Munich University of Applied Sciences[41] and its entrepreneurship center Strascheg Center for Entrepreneurship[42]. The RPs were introduced more than 10 years ago. With more than 18.000 students and 14 faculties, the technically oriented university of applied sciences is one of the largest in Germany. Its entrepreneurship center was founded in 2002 and offers formats from inspiration, education to startup-creation. Since 2011, more than 5000 students have been taught in this format, with more than 50 professors involved. The format has been taught in all

[41] https://hm.edu, last accessed on 25/04/2025.

[42] https://www.sce.de/en/index.html, last accessed on 25/04/2025.

of the universities' 14 faculties. While different faculties integrate the format in different ways (mandatory, elective) and with varying ECTS-credits, each semester, around 400 students go through this format. During the RP the students follow an action-based learning journey of five phases from reflecting on their own values and motivations through forming a team, starting to understand a problem to developing a prototype solution with a final pitch presentation. During this journey, they are made aware of the following five categories that play an important role at every step of the innovation process: "The Entrepreneur", "Team and Collaboration", "Customers, Stakeholders and Ecosystem", "The Best Solution", and "Responsibility and Sustainability". With the help of different tools, methods and reflection, the student teams are supported by coaches that guide them through the process. The three upcoming methods have been selected for this paper since they have been integrated into the entrepreneurship curriculum to foster systems thinking and other sustainability competencies in students.

While they serve as best-practice examples of our theoretical discussion in this paper, we do not presume their universal applicability. Rather, we see them as one potential way of using entrepreneurial methods for establishing a sustainable mind- and toolset in students and vice versa. Figure 12 gives an overview of the three methods and the competences they can support to develop. To facilitate an easy understanding, these competencies have been differentiated in GreenComp and EntreComp according to the above elaborated frameworks. As these methods are part of the entrepreneurial learning experience that we created in order to bridge the gap between sustainability and entrepreneurship, we elaborate on our logic behind choosing them with regards to their potential in competency development.

However, it is beyond the scope of this paper to determine whether these exact competencies are an outcome of applying these methods. For quality assurance and future development we do use an evaluation framework that continues to show that the overall competency development especially with regards to EntreComp is positive for students that undertake a RP. Further research could include an exact determination of the competency development of each method.

Methods	IKIGAI	Team Canvas	Systems Mapping
Competencies developed			
GreenComp	Valuing Sustainability, Explorative Thinking, Individual Initiative	Valuing Sustainability, Collective Action, Individual Initiative, Critical Thinking	Adaptability, Explorative Thinking, Systems Thinking, Problem Framing, Critical Thinking, Political Agency
EntreComp	Spotting Opportunities, Vision, Self-awareness and Self-efficacy, Financial and Economic Literacy	Planning and Management, Working with others, Mobilising others, Self-awareness and -efficacy	Spotting Opportunities, Ethical and Sustainable Thinking, Financial and Economic Literacy, Coping with Uncertainty, Ambiguity and Risk

Figure 14 - Overview of methods in relation to competencies. (Created by the authors).

5.3.4.1 IKIGAI

As the discourse surrounding sustainability progresses, there is an increasing emphasis on investigating the role of individual circumstances in effecting change. In line with this, programmes and initiatives like the Inner Development Goals (IDG) initiative argue that sustainable development first of all requires personal development and the IKIGAI tool addresses some of these questions. IKIGAI is a Japanese term that can be translated as ‘a sense of life worth living’ and is therefore suitable as a starting point into an innovation journey. It has been chosen as a starting point for the course to enhance a systemic approach to personal development and the entrepreneurial self as an important part of the innovation process. Studies have shown that IKIGAI can serve as a meaningful tool to increase both academic performance as well as health and well-being (Schippers, 2017; Schippers and Ziegler, 2019). Another important aspect to support the use of IKIGAI as a starting point for this entrepreneurial class

is its potential to define personal goals antecedent to any innovative activities. While such self-endorsed goals are directly linked to personal well-being (Schippers and Ziegler, 2019) our students also develop a sense of purpose and motivation by being able to build their entrepreneurial project and team work on their holistic self-image. This is in line with what Hall et al. (2023) found in a study of a web-based future skills training based on ikigai that was successful in helping students discover personal strengths, core values and ultimately increasing self-leadership and -awareness.

The tool consists of four main areas: what do you love, what are you good at, what can you be paid for and what does the world need. At the intersection of these four aspects lies the personal IKIGAI. Filling out the canvas may lead students to reflect on their values and thereby start to "Value Sustainability," especially through asking themselves what it is the world needs and puts it "in relation to sustainability concerns" (Moberg and Holse, 2022). The educator may also intervene and mention the global challenges ahead to make the connection to sustainability during the usage of the IKIGAI canvas.

While some students tend to feel overwhelmed by the questions raised in the tool, many approach it with curiosity and end up being surprised by the results. Thinking about the personal answers to such a broad life concept inevitably asks for "Explorative Thinking" into often unknown territory. This has the potential to ultimately help them to tap into future visions for their own role within economic and societal development and to use their intuition and creativity for it. This turns into a much deeper understanding of the "Individual Initiative" they could take on to turn their values into meaningful actions by identifying their "own potential to sustainability and to actively improving prospects for the community and the planet" (Moberg and Holse, 2022). But it is not only these sustainability competencies the tool addresses. Becoming aware of their own purpose and potential for contribution to a more sustainable world increases students' self-efficacy and room for personal growth. This comes with a much broader sense of "Self-Awareness and Self-Efficacy" as part of EntreComp. By understanding that "what you get paid for" is also an important aspect of students' individual purpose, the IKIGAI addresses "Financial and Economic Literacy" on a personal level that makes sure individual actions need to be economically sustainable and backed by financial know-how as well. Through this process the students become better at "Spotting Opportunities", as the tool is integrated into the teaching process as a starting point for entrepreneurial activities. It may serve them as an overview of the opportunities for reaching their purpose while simultaneously contributing to the world in an innovative and valuable way. Finally, with this purpose-based approach the RP encourages individuals to start into their project with a clear "Vision" that

serves them as a compass for their actions both as an individual as well as within a team with a common vision of the future. As this elaboration has shown, the IKIGAI may be used to develop students' understanding that personal goals need to be aligned with economical, social and ecological sustainability to create a long lasting sense of a life worth living.

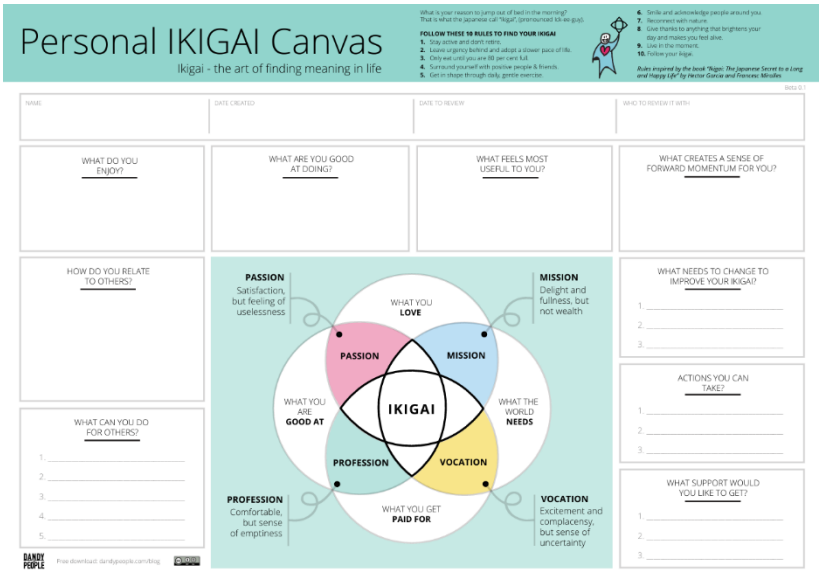


Figure 15 – Visual representation of IKIGAI[43].

5.3.4.2 Team Canvas

While one narrative of sustainable development has recently focused on the responsibility of the individual to create a sustainable future, impactful progress will not succeed without collaboration and collective action. There is a large body of research on team collaboration in general (Krawczyk-Bryłka et al., 2020) as well as explicitly in entrepreneurial teams and educational contexts (Patzelt et al., 2021). With regards to this, the need for team alignment, a shared vision and creating a common understanding is stated in different sources (Katzenbach and Smith, 2008; Lazar et al., 2020). However, the Team Canvas has not yet been discussed as a potential tool to support these needs. As we acknowledge the necessity to communicate and align well before collaborating on a project for turning beliefs and vision into action we use the Team Canvas as a method to start the team work as well as for realignment throughout the course if necessary to secure common understanding. Working with this tool both helps to ease teamwork and develops several entrepreneurship and sustainability competencies. The Team

[43] Free download: dandypeople.com/blog, last accessed on 25/04/2025.

Canvas was developed by Alex Ivanov and Mitya Voloshchuk in 2015 for agile project teams (The Team Canvas, 2024). With nine building blocks, the canvas is a dynamic tool that supports learners in reflecting, discussing, communicating and norming their team interactions. The nine categories are: People and Roles, Common Goals, Values, Rules and Activities, Personal Goals, Needs and Expectations, Strengths and Assets, Weaknesses and Risks, Purpose.

The Team Canvas invites students to follow up on their individual reflections on values and responsibilities in a world of radical climate change and social challenges and brings this together on a team level, thereby addressing the topic of "Valuing Sustainability" in the project work. Especially the canvas categories of Personal Goals, Values, Common Goals and Purpose may very well be connected to sustainability questions and competencies within a group or team as they "make learners realise that values are constructs and people can choose which values to prioritise in their lives" (Bianchi et al., 2022). At the same time the competence of "Critical Thinking" is needed as the tool manifests an important second step of reflection that connects the personal to other perspectives and values and requires discussion and synthesis. It also helps understanding how "personal, social and cultural backgrounds influence thinking and conclusions" (Bianchi et al., 2022). By reflecting and identifying these aspects together, both competencies "Individual Initiative" as well as "Collective Action" are at the center of using this tool, as it ultimately aims at a common agreement and a clear definition of a role for everyone (Bianchi et al., 2022). Although these sustainability competencies play an important role in the process, the tool equally addresses entrepreneurial competencies that are necessary for making a common project a reality. For filling out the categories Rules and Activities, People and Roles, Needs and Expectations as well as Strengths and Weaknesses a discussion about successful ways for "Planning and Management" as a team, identifying tasks and defining "priorities and action plans" as well as setting long-, medium- and short-term goals" for their project (Bacigalupo et al., 2016) and setting the framework for "Working with Others" in a way that uses the potential of all team members effectively but also helps to "solve conflicts [...] when necessary" (Bacigalupo et al., 2016), is encouraged. Furthermore, each student's "Self-Awareness and Self-Efficacy" is addressed and needed for this process as only through this the team will ultimately be able to achieve a greater common goal when being aware of "individual and group strengths and weaknesses" (Bacigalupo et al., 2016). Going from this individual awareness it is also crucial that everyone takes a role in "Mobilising Others" for this common mission and helps others to better understand their unique potential, which will leverage everyone's skills and promote effective teamwork and resource management for a common purpose (Bacigalupo et al., 2016).

Ultimately, the Team Canvas may support both the mindset development based on sustainability values and competencies as well as entrepreneurial competencies, especially in addressing operative and coordinative aspects of the process. With the goal of creating active contributors to a better world, navigating successful teamwork can be seen as the foundation for a larger process for change as it may help to develop many important competencies that form a baseline for this change to happen.

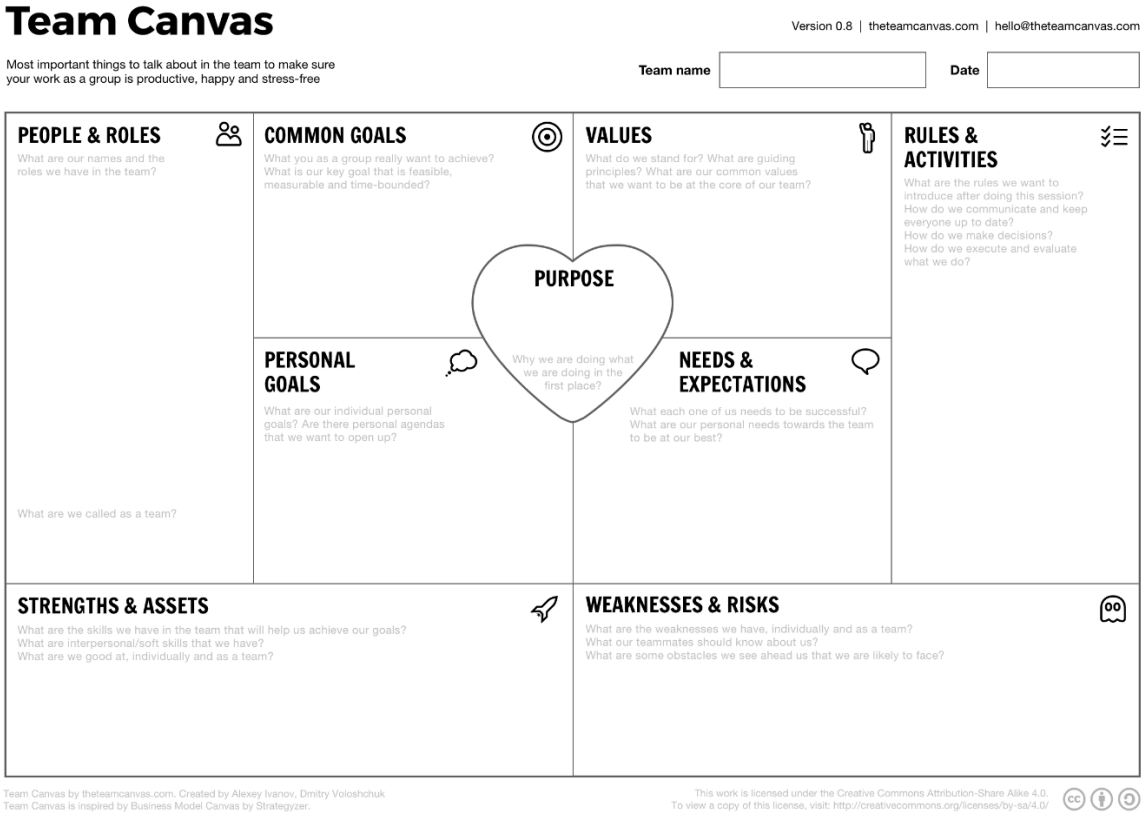


Figure 16 – Visual representation of Team Canvas developed by The Team Canvas (2024).

5.3.4.3 Systems Mapping

In light of wicked problems like climate change, and challenges that call for more complex solutions, one key competence that links entrepreneurship and sustainability is Systems Thinking (Trivedi and Misra, 2015). One way of developing the competence of Systems Thinking is through the method of Systems Mapping. Systems Mapping is used in systems innovation approaches to better understand the context of the challenge that is being addressed in a more holistic and comprehensive manner. As suggested by Wilkerson and Trellevik (2021), we introduce Systems Mapping as a method to improve problem understanding (Lynch et al.,

2021; Wilkerson and Trellevik, 2021). We follow their proposal to embed the method into a design thinking based course framework as this allows for the goal of including aspects of sustainability into entrepreneurial endeavours in a holistic way (Lynch et al., 2021; Wilkerson and Trellevik, 2021). Systems Thinking can be viewed as one of the key ways to link the two competency frameworks EntreComp and GreenComp to enable students to both work on their sustainability (cognitive) skills as well as understand ways in which active interference at the right leverage points within a system can actually achieve results for changing the world to the better from the very baseline of its underlying dynamics. Thereby "Systems Thinking," understood in GreenComp as "to approach a sustainability problem from all sides [...] in order to understand how elements interact within and between systems" (Bianchi et al., 2022) is the first of many competencies developed through systems mapping. The RPs encourage students to approach the complexity of problems with an elaborate systems map that integrates important stakeholders, stocks, as well as feedback loops. In order to make students tackle root causes and not mere symptoms of complex problems, this method is very useful for activating students' awareness of their interventions within these systems.

Besides "Systems Thinking", Systems Mapping also addresses the GreenComp competence of "Explorative Thinking" as learners are supported to understand problems as more than linear cause-and-effect relationships and simultaneously are challenged to engage in both creativity and curiosity fully engaged with a problem and its embeddedness in systems (Bianchi et al., 2022). By analysing relationships, components and especially dynamics at play within a system, the students' "Critical Thinking" can also be engaged, as it requires them to "assess information and arguments [and] identify assumptions" (Bianchi et al., 2022), which forms another important base for the generation of suitable ideas. Furthermore, a systems map improves "Problem Framing" as it asks students to frame "current or potential" challenges in a way that includes "people involved [and] time and geographical scope" (Bianchi et al., 2022). Since Systems Thinking and Systems Maps are fundamentally simply visualisations of complexity that are necessarily incomplete, learners are exposed to the need for "Adaptability", as they learn to integrate various perspectives and dynamic changes into their strategy of systems interaction and "make decisions related to the future in the face of uncertainty, ambiguity and risk" (Bianchi et al., 2022). Finally, by identifying political, social and economic factors, especially underlying power dynamics, policies and regulations contributing to the system, their "Political Agency" may be developed as well as their ability to navigate the system and drive impact through entrepreneurship. Whereas the sustainability competencies developed through Systems Mapping mainly address the "sustainable thinking" of students, the method also

encourages the translation of this understanding into action. This is represented in the entrepreneurial competence "Spotting Opportunities" as it will lead to a better picture of how to interact with stakeholders, dynamics and institutions within the system that is underlying a problem as an opportunity for entrepreneurship and for creating "value by exploring the social, cultural and economic landscape" (Atiq and Karatas-Özkan, 2013). Along the way, students tend to develop a more profound "Ethical and Sustainable Thinking" as they will need to account for the social, environmental and economic outcomes of their actions as they interact with a system and reflect on "how sustainable long-term social, cultural and economic goals are" (Bacigalupo et al., 2016). Finally, students usually engage their competence to "Cope with Uncertainty, Ambiguity and Risk", by learning that complexity and constant change is inherent in every system. It is their job as an entrepreneur to learn to navigate and react as they embrace uncertainty, deal with changing circumstances and learn to make decisions in the face of risk and ambiguity with sometimes partial or ambiguous information at hand.

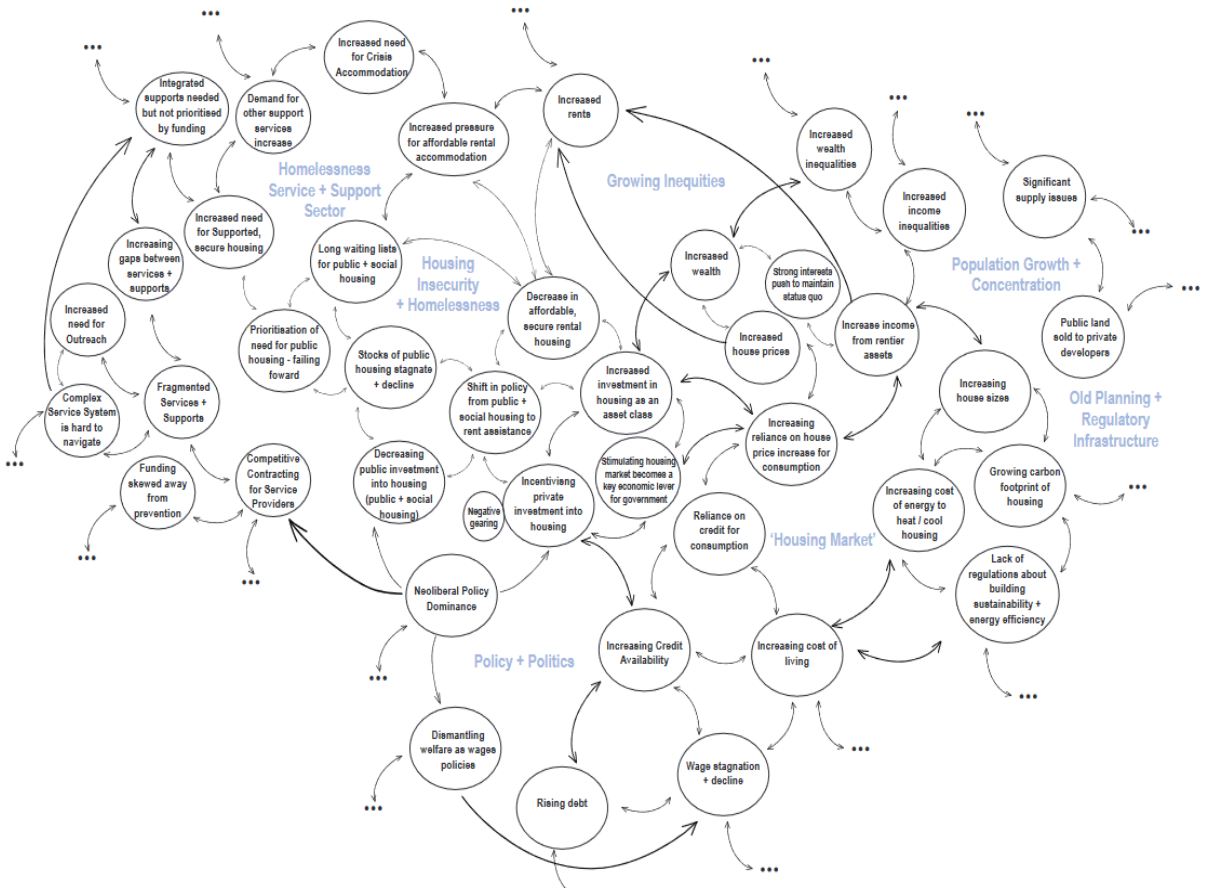


Figure 17 – Visual representation of example of systems mapping depicting perspectives of what contributes to homelessness in the Australian context from Burkett (2024, p.5).

5.4 Implications and Discussion

An analysis of EntreComp and GreenComp revealed that both competency frameworks can be combined, which paves the way for an alignment of the two concepts. We argued for a synthesis of sustainability and entrepreneurship competencies and showed how sustainability competencies may be developed through entrepreneurial tools and methods. Combining sustainability with entrepreneurial competencies is inevitable if we want to create responsible and entrepreneurially thinking and acting citizens. For HEI managers, educators and learners, our research provides guiding posts, if they are looking for ways on how to transform their HEI into a sustainable-entrepreneurial institution, if only by starting in their curricula. For policy-makers, our analysis might provide a foundation for a critical reflection on whether the separation of entrepreneurial and sustainable competencies is in line with approaches to design pathways that enable a sustainable future. Besides the structural similarities between entrepreneurship and sustainability that can serve as strategic foundations for institutional and curricular transdisciplinary development, we showed how three tools that are used in educational settings combine both competency frameworks. These tools are easy to implement in experiential, team and project-based settings and should provide educators with a low-threshold way of getting to action. Nevertheless, we want to stress that effective education relies heavily on educators that bring complementary expertise to the table and develop a systemic view just as they are teaching their students in order to succeed.

Within the limited scope of this article, we add to the discourse that argues for the synergies of two fields that are arguably miles apart and further the discussion on how to combine them.
Nevertheless, our approach includes some limitations: We assumed a qualitative approach to this research topic in order to initiate research on the compatibility of sustainability and entrepreneurship education in further investigations. Considering other competency frameworks for both sustainability and entrepreneurship might have contributed to a more holistic understanding of competency frameworks, but we intentionally focused on these two important European competency models, since they have not been researched in depth so far and are an important transnational guideline for European universities and curriculum development. Moreover, we did not aim for a quantitative measurement of how these competencies are developed by educational interventions. While there exists research on how to measure EntreComp, there is no research on the measurement of GreenComp up to date. From a methodological perspective, the TA is prone to subjective biases that we as sustainable

entrepreneurship educators bring to the analysis, for instance only analysing the commonalities of both frameworks, instead of its frictions. TAs are limited in its reproducibility, since it relies on subjective interpretations. Within the scope of this article, we only focused on three tools (IKIGAI, Team Canvas and Systems Map), while there are many being used in theory and practice that also contribute to sustainability and entrepreneurship competencies (STEEP Analysis, Non-human personas, Impact Gaps Canvas, Future Wheels, Impact Value Chain, Sustainable Business Model Canvas, etc.) Moreover, our study did not claim to investigate a measurement of the effects of the three tools on competency development, which means that we cannot make any statements on the effectiveness and correlation of these tools on the actual competency development of learners.

Being aware of the limitations of our conceptual article, we invite scholars to further dive into the concept of teaching sustainability through entrepreneurship by looking at different levels of interventions and analyse the effectiveness of the tools presented. A holistic teaching agenda for sustainable entrepreneurship needs to look at the systemic level of education in order to foster sustainability competencies in an impactful way. Further research is required to develop a concrete integration of these competencies in the framework of constructive alignment into curricula (Biggs et al., 2011). Here, attention should be concentrated on the context of the intervention (if entrepreneurial tools should be introduced in sustainability curricula or the other way around). In order to better understand the development of sustainability competencies in the framework of GreenComp, more research has to be executed to develop scales for evaluating GreenComp. By gathering more quantitative and qualitative data from students as well as educators on the effects of acquiring sustainability competencies through entrepreneurship, it would also be valuable to see possible counter effects between sustainability competencies and entrepreneurship competencies.

If entrepreneurship lives up to its proclamations to change the world for the better, sustainability and entrepreneurship need to grow even more together. In this article, we showed that there are tendencies of both realms (in terms of concepts as well as competencies) that are synergetic and that both can be adapted and brought together in order to create more impactful solutions in education and beyond.

6 Research III: A Requirement Model for Regenerative Approaches in Entrepreneurship Education.

6.1 Introduction

Building on the insights from the first two research papers, it becomes evident that transformative educational frameworks capable of truly addressing socio-ecological challenges are urgently needed. Addressing this gap requires moving beyond incremental improvements and *conventional sustainability approaches* in entrepreneurship education, toward a fundamental rethinking that embraces regenerative approaches grounded in a strong systems thinking perspective as highlighted in section 2.2.

In line with this view, scholars call for entrepreneurial practices that actively align with the regeneration of socio-ecological systems (Banerjee et al., 2021; Edwards, 2021; Guzmán et al., 2021; Manring, 2017).
Emerging literature highlights that regenerative approaches do more than mitigate or repair harm, they aim to enhance the capacity of systems to adapt, evolve, and renew themselves over time (Buckton et al., 2023; Das and Bocken, 2024; Duarte Dias, 2018; Muñoz and Branzei, 2021). This shift toward regeneration and systems thinking has far-reaching implications for how entrepreneurship is conceptualised and taught. Yet, despite this growing recognition, much of entrepreneurship education continues to be shaped by outdated frameworks that inadequately reflect these evolving demands (Lans et al., 2014; Wagner et al., 2021; Zahra et al., 2009).

In response, this final research chapter builds upon the findings of the previous two studies by explicitly incorporating regenerative approaches, which inherently include a strong systems thinking perspective. It aims to develop a transformative, research-based requirements model that can serve as a foundation for designing educational frameworks for regenerative approaches in entrepreneurship education.

The study is guided by the following research question:

- *How could an educational framework for regenerative approaches in entrepreneurship education look like?*

To address this question, this study employs a design science research methodology. This approach allows to identify key elements such as content, teaching methods, roles, learning environments, and desired outcomes. This process is further informed by the *Comprehensive Framework for Entrepreneurship Education* (Valliere et al., 2014), which provides a theoretical foundation for translating these elements into a concrete educational framework in form of a seven-day international summer school.

The research presents a comprehensive requirement model (named *Dandelion Collection for Regenerative Approaches in Entrepreneurship Education*) whose insights are organised around four key components (WHAT, HOW, WHO and WHERE, and WHY/FOR WHAT). The WHAT refers to the theoretical foundations and core content, forming the central core of the framework. The HOW represents the teaching approaches and teaching methodologies. The WHO and WHERE component address the roles, responsibilities, and learning environments that shape the educational experience. Finally, the WHY/FOR WHAT focuses on the intended learning outcomes, including the competencies and skills that learners develop.

To design the practical application of this model, the *Comprehensive Framework for Entrepreneurship Education* (Valliere et al., 2014) was used to provide a solid theoretical foundation that guided the curriculum development. This framework helped translate the elements of the *Dandelion Collection* into a structured educational framework. As a result, the study offers valuable guidance for educators by presenting a detailed seven-day international summer school curriculum that serves as a practical guide for creating transformative learning experiences focused on regenerative approaches in entrepreneurship education.

Regenerative approaches in entrepreneurship education, as defined in this dissertation, represent a paradigm shift in the role of entrepreneurship to actively creating net-positive effects on ecological and social systems. By integrating systems thinking and regenerative principles into curricula, these approaches equip entrepreneurs to use entrepreneurial means to restore, renew, and enhance the systems in which they operate. It moves beyond *conventional sustainability approaches*.

6.2 Method and Research Design

To address the final research question, this study adopts a Design Science Research (DSR) methodology as outlined by Hevner (2007) to guide the systematic development and evaluation of the requirement model. This methodological approach is complemented by the *Comprehensive Framework for Entrepreneurship Education* proposed by Valliere et al. (2014), which provides a strong theoretical foundation and is used to illustrate the application of the model through a concrete education framework in form of a seven-day international summer school in section 6.3.2. Together, DSR ensures methodological rigor in the design process, while the *Comprehensive Framework for Entrepreneurship Education* grounds the model theoretically and supports its translation into an educational framework.

This chapter focuses on the DSR process that culminates in the *Dandelion Collection*. Section 6.3.2 translates and applies the findings from this process, developing a concrete educational framework based on Valliere et al.'s (2014) *Comprehensive Framework for Entrepreneurship Education*.

Design Science Research (DSR) serves as an overarching methodological framework that extends beyond traditional research paradigms by not only analysing existing phenomena but also actively shaping and improving practice. Unlike conventional empirical methods that typically emphasise observation and theory-building, DSR is inherently interventionist, it seeks to design, implement, and evaluate innovative solutions within real-world contexts. This makes it particularly well-suited for complex educational environments, where both conceptual clarity and practical application are essential (Baran, 2020). DSR's strength lies in its dual commitment to scientific rigor and practical relevance. It systematically identifies gaps in current educational practices, designs artifacts or interventions to address these gaps, and iteratively refines these solutions through stakeholder feedback and real-time implementation cycles (Siedhoff, 2019; Akker et al., 2006). This iterative and context-sensitive approach ensures that the developed models remain adaptive to evolving educational needs, making it especially effective for transformative goals in teaching and learning.

Numerous studies have applied DSR within educational settings, reinforcing its relevance and diversity. For example, Derre and Baggen (2025) employed a DSR approach in their work

"Empowering the Next Generation of Entrepreneurial Change Agents", where they developed and implemented an educational framework aimed at fostering entrepreneurial competencies among students. Their research illustrates how DSR can be used to bridge the gap between educational theory and classroom practice through purposeful design and continuous stakeholder engagement.

Thus, by combining structured problem-solving, contextual adaptability, and demonstrable impact, DSR emerges as a robust and suitable methodology for guiding this research chapters' objectives.

Central to this approach is the notion of the artifact, a designed construct (such as a framework, tool, method, or model) intended to solve real-world problems through purposeful innovation (Derre and Baggen, 2022; Hevner, 2007). In educational research, where practical impact is as crucial as theoretical advancement, the artifact becomes both the outcome of and the vehicle for change.

In alignment with this orientation, the methodological process of this study followed a four-phase iterative approach: (1) Derivation of requirements, (2) Construction of the artefact, (3) Evaluation of the artefact, and (4) Refinement of the artefact based on the evaluation outcomes.

The figure below provides an overview of each phase, including information on the overall aim, type of data, data collection technique, data collection and data analysis.

	Phase 1			**Phase 2**	**Phase 3**	**Phase 4**
Aim	**Derivation of requirements**			**Construction of the artefact**	**Evaluation of artefact**	**Adjustment of artefact**
Type of Data	Qualitative					
Data collection technique	Semi-Systemic Literature Review (n=163)	Future-focused workshop using speculative design (n=24)	Future-focused workshop using speculative design (n=9)	Synthesis	Evaluation workshop (n=8)	Synthesis
Data source	Scopus and academic search	Participants (teachers, educators, and	Participants (teachers, educators,	Requirements deriving from: semi-	Participants (entrepren	Adjustments derived

	engine google scholar	attendees) of 3E conference in Amsterdam, May 2024.	students and attendees) of IEES conference in Stuttgart, Nov. 2024.	systemic literature review and workshops.	eurship researcher, educators, consultants and students) of evaluation workshop in Munich, Feb. 2025.	from evaluation workshop.
Data collection	Determining eligibility criteria and restrictions. Selecting data bases. Determining search strategy and string. Identifying studies. Screening selected records (title screen (n=163), abstract screen (n=49), full text screen (n=33)).	Developing and facilitating workshop format for participants with a brief welcome and introduction to the topic, followed by an interactive time travel exercise and group work activity (Postgrowth Ent 101 Curriculum exercise).	Developing and facilitating workshop format for participants with a presentation on regenerative business principles (Hahn and Tampe, 2021), guided time travel to regeneration and group work filling out flip charts with guiding question on how regenerative entrepreneurship education should look like.	Identifying and clustering requirements. Design of an artefact in the form of a framework.	Developing and facilitating a workshop format for participants with group work activities to discuss the effectiveness, relevance and applicability of the framework in regenerative entrepreneurship education.	Identifying and clustering adjustments.
Data analysis	Identifying and screening records based on eligibility criteria and restrictions. Reading and coding	Thorough screening and documenting input from group work.	Thorough screening and documenting input from group work.	Synthesising and clustering findings from phase 1 for alpha version.	Thorough screening and documenting findings from group work	Adjustment of alpha version towards the final beta version.

	relevant paragraphs according to 17 different codes.				for beta artefact version.	

Figure 18 – Design Science Research methodological process following a four-phase iterative approach. Own visualisation based on Hevner (2007).

6.2.1 Phase 1 – Derivation of Requirements

The first phase employed a mixed-methods approach, utilising two distinct data collection techniques to identify the core requirements: (i) a semi-systematic literature review (Snyder, 2019) and (ii) two future-focused workshops employing speculative design methodologies (Dunne and Raby, 2013). A detailed rationale for the choice of methodologies follows in the subsections.

6.2.1.1 Literature Review

The semi-systematic literature review (Snyder, 2019) followed the PRISMA 2020[44] guidelines (Page et al., 2021), ensuring a rigorous and transparent selection process. The review encompasses both empirical and non-empirical studies published between January 2014 and December 2024. Studies that did not align with the predefined research question were excluded. By applying these criteria, the semi-systematic review enhances the precision and applicability of findings within the study's intended scope. For data collection, two major bibliometric databases were utilised, as recommended by Harzing and Alakangas (2016): Scopus[45] and Google Scholar[46]. The Web of Science database was omitted due to its strong overlap with Scopus results (Harzing and Alakangas, 2016). The search strategy was developed based on the predefined research question and applied to Scopus using the following search string:

[44] Page, M.J. et al. (2021) 'The PRISMA 2020 statement: an updated guideline for reporting systematic reviews', Systematic Reviews, 10(1), p. 89. Available at: https://doi.org/10.1186/s13643-021-01626-4.

[45] www.scopus.com

[46] www.scholar.google.com

- TITLE-ABS-KEY("regeneration" OR "regenerative" OR "systemic thinking" OR “social-ecological systems”) AND TITLE-ABS-KEY("entrepreneurship education " OR "business education” OR "economic education" OR "entrepreneurship teaching" OR " entrepreneurship pedagogy" OR "business strategy" OR "economy strategy" OR "entrepreneurship learning") AND LANGUAGE(english) AND PUBYEAR AFT 2013.

The search yielded 63 documents, which were downloaded as a BibTeX file, imported into Zotero, and then exported to Excel for screening. An initial title-based screening led to the exclusion of 40 documents. The abstracts of the remaining 23 were then reviewed, resulting in the exclusion of 12 additional documents. The full texts of the remaining 11 articles (listed alphabetically in appendix B) were subsequently examined.
For Google Scholar, Harzing’s 'Publish or Perish' software (Harzing, 2020) was used to overcome the platform’s limitations in executing complex search strings. The search employed the following keyword set:

- "regeneration, regenerative, systemic thinking, social-ecological systems, entrepreneurship education, business education, economic education, entrepreneurship teaching, entrepreneurship pedagogy, business strategy, economy strategy, entrepreneurship learning”.

The search included publications from 2013 to 2024, with results capped at 100 entries to maintain relevance. The records were downloaded as a BibTeX file, imported into Zotero, and then screened using Excel. The title-based screening excluded 74 documents, leaving 26 for abstract review, of which 13 were further excluded. One additional document was removed due to unavailability in PDF format, leaving 12 documents (listed alphabetically in appendix C) for full-text review.

All selected documents from the Google Scholar search and Scopus search except one[47] were imported into MAXQDA for qualitative coding. The codes (to be found in appendix D) were

[47] Hofstra, N. (2015) ‘Entrepreneurship Inspired by Nature’, In: Zsolnai, L. (eds) The Spiritual Dimension of Business Ethics and Sustainability Management. Springer, Cham. https://doi.org/10.1007/978-3-319-11677-8_13.

developed inductively during the reading process in MAXQDA based on the overall research aim. It allowed for an emergent understanding and categorisation of data based on patterns observed throughout the analysis.
Each paragraph from the remaining documents relevant to a particular code was highlighted. Upon completion of document analysis, a coded dataset was exported into Excel for further synthesis and analysis, providing the foundation for the subsequent phases of the artefact construction and evaluation.

6.2.1.2 Future-focused Workshops

The two future-focused workshops employed a speculative design approach (Dunne and Raby, 2013).

In addressing socio-ecological challenges in education, particularly those related to fostering societal transformation, there is increasing recognition of the need for methodological approaches that extend beyond retrospective analysis or replication of past models. Traditional research methods often focus on understanding existing phenomena through observation and measurement, which, while valuable, may fall short when the goal is to create future-oriented, systemic innovation.

To meet this need, speculative design has emerged as a powerful methodological alternative. Originally articulated by Dunne and Raby (2013), speculative design encourages imaginative, visionary thinking rather than reliance on established frameworks. By exploring alternative futures, it enables researchers and practitioners to challenge entrenched assumptions, provoke critical reflection, and reimagine what is possible in education. Rather than fixing existing problems with incremental improvements, speculative design invites more radical, systemic questioning, leading to bold and transformative outcomes.

This approach was effectively used in *"The Future Within: Commitment, Hope, and Values in Entrepreneurship"* by Dimov, Johnsen, and Meier Sørensen (2025), where two future-focused workshops employed speculative design to rethink the goals and values underlying entrepreneurship education. The workshops did not aim to validate past successes or optimise existing models, but instead to cultivate forward-looking, regenerative mindsets. As the authors note, speculative design was chosen precisely because of its ability to inspire commitment,

hope, and value-driven action, qualities that are often absent from more mechanistic educational interventions.
By creating alternative scenarios, participants in these workshops could anticipate long-term consequences and break free from conventional constraints. This approach fosters bold, transformative ideas and ensures that solutions are innovative, forward-thinking, and system-changing rather than merely incremental (Gümüsay and Reinecke, 2022).

The workshops were conducted at two different locations. The first workshop took place on May 15, 2024, during the 3E Conference in Amsterdam, The Netherlands, with 24 participants. The 3E Conference 2024 in Amsterdam provided appropriate participants for the workshop, as it brought together experts, researchers, and educators in entrepreneurship education. Their deep knowledge and practical experience enriched the discussions and ensured a high level of engagement. The conference's explorative and forward-thinking nature aligned perfectly with the workshop's speculative approach, fostering critical reflection and creative exchange. Additionally, the international diversity of participants enabled a broader perspective on global challenges, making them a well-suited group for envisioning innovative education models.

The second workshop was held on November 29, 2024, during the IEES Conference in Stuttgart, Germany, with 9 participants. The IEES Conference in Stuttgart was chosen due to its diverse group of teachers, educators, conference attendees, and students. The participants brought a mix of practical experience and academic insight, ensuring rich and dynamic discussions. The interactive and collaborative environment of the IEES Conference was well suited to the workshop's goals, encouraging creative problem-solving and the exploration of innovative educational approaches. The variety of perspectives, ranging from students to seasoned educators, provided a well-rounded view of the challenges and opportunities in entrepreneurship education.

Both workshops followed a similar structure. They began with a brief welcome and introduction to the topic, followed by an interactive time travel exercise and group work activity designed to explore potential future scenarios for entrepreneurship education.

At the first workshop in Amsterdam, participants engaged in a group work activity aimed at collaboratively designing a *Post-Growth Entrepreneurship Curriculum* using a structured template (included in appendix E). The second workshop also featured a group work activity,

where participants used flip charts (included in appendix F) to address guiding questions on how regenerative approaches in entrepreneurship education should be shaped. Discussions focused on aspects such as content, applied teaching approach, roles and responsibilities, and suitable locations.

Both workshops concluded with a final reflection session, allowing participants to share their insights and discuss key takeaways, fostering a deeper understanding of regenerative and future-oriented approaches in entrepreneurship education.
The group work outcomes were documented through photographs and subsequently transcribed for further processing.

6.2.2 Phase 2 – Construction of the Artefact

The second phase focused on synthesising the collected data from Phase 1 to develop an initial version of the artefact. The design of the artefact was informed by insights derived from both the systematic literature review and the workshops. The data collection process involved identifying, clustering, and analysing the core requirements, which were then structured into a model. The synthesis of these findings resulted in the development of an alpha version of the artefact, presented in the form of a structured canvas.

The alpha version of the artefact, the *Dandelion Collection for Regenerative Approaches in Entrepreneurship Education (Dandelion Collection)*, is structured around four main components (WHAT, HOW, WHO & WHERE, and WHY), which emerged through the data collection and analysis process involving the identification, clustering, and examination of core requirements. These components were thus intentionally selected to facilitate a comprehensive gathering and integration of findings from the analysis.
It is important to emphasise that the *Dandelion Collection* functions as a broad compilation of findings from the analysis rather than a finalised educational model or framework.
The development of a concrete educational format or framework will require applying additional models, including those proposed by Fayolle and Gailly (2008), Gedeon (2014), or Vallière's *Comprehensive Framework for Entrepreneurship Education* (2014), as these provide a more clearly structured representation of the causal relationships among key constructs and dimensions. Therefore, the *Dandelion Collection* should be understood as a foundational

resource rather than a complete or prescriptive educational framework. As highlighted above, section 6.3.2 translates and applies the findings from the *Dandelion Collection*, developing a concrete educational framework based on Valliere et al.'s (2014) *Comprehensive Framework for Entrepreneurship Education*.

Metaphorically, these components are represented through the image of a dandelion (presented in section 6.3.1), which serves as the basis for the name *Dandelion Collection for Regenerative Approaches in Entrepreneurship Education* and symbolises regeneration, societal transformation, and the dissemination of ideas. Within this metaphor, each part of the dandelion corresponds to a distinct and essential element of the educational design.

WHAT	Curricular Components: This field focuses on the knowledge, skills, and competencies to be embedded in teaching activities. It addresses key topics, theories, principles, and mindsets that learners should develop.
HOW	Teaching Strategies/Approaches: This category outlines the teaching methods and approaches to be employed and considers the most effective ways to deliver content.
WHO	Roles and Responsibilities: This section identifies the educators responsible for delivering content, their required expertise and training, as well as the learners' prior knowledge and skills. Additionally, it highlights potential external contributors, such as guest speakers, community partners, and startups.
WHERE	Learning Environment and Contexts: This part defines the locations in which teaching activities should take place and explores opportunities for learners to apply their knowledge in real-world contexts.
WHY	Purpose: This component clarifies the core objectives of the teaching activity, ensuring alignment with the overarching goals of regenerative approaches in entrepreneurship education.

A detailed description and derivation of the four key components can be found in the 6.3. Results and Analysis section, under 6.3.1 Dandelion Collection for Regenerative Approaches in Entrepreneurship Education.

6.2.3 Phase 3 – Evaluation of the Artefact

The third phase focused on the systematic evaluation of the alpha version of the artefact to assess its relevance and applicability. The evaluation process was designed to gather feedback from key stakeholders, refine the framework, and ensure its alignment with educational needs and practices.

The evaluation was conducted through a workshop session with 8 participants taking place on 25, February 2025 at the Strascheg Center for Entrepreneurship / Social Entrepreneurship Akademie, University of Applied Sciences Munich in Munich, Germany. The participants of the workshop were chosen to include teachers, learners, and startup consultants, as this mix provided a balance of academic insight, innovative ideas, and practical expertise.

The workshop started with a short introduction round followed by the presentation of the artefact. After that, the participants were asked to discuss and assess individually the frameworks clarity, applicability, completeness, and usability guided through pregiven question (to be found in appendix G).

6.2.4 Phase 4 – Adjustment of the Artefact

The fourth and final phase focused on adjusting the artefact based on the insights gathered during the evaluation phase. The process involved identifying and clustering the insights from the evaluation. Based on that the artefact was refined leading to the development of a beta version of the *Dandelion Collection for Regenerative Approaches in Entrepreneurship Education*.

6.3 Results and Analysis

Based on the research activities of this paper, this chapter presents the *Dandelion Collection for Regenerative Approaches in Entrepreneurship Education* (*Dandelion Collection*) and its practical application in form of an educational framework.

6.3.1 Dandelion Collection for Regenerative Approaches in Entrepreneurship Education

The requirement model is designed to support entrepreneurship educators in integrating regenerative approaches into their teaching. Recognising that there is no “one-size-fits-all” concept to teaching, the model does not prescribe a fixed structure or rigid instructional model but instead provides a flexible reference point. As a conceptual map of key requirements, it provides guidance on essential content, teaching methodologies, roles and responsibilities, and the competencies and skills that learners should develop.

The model was developed through an iterative synthesis of data from a semi-systematic literature review and two speculative design workshops as highlighted above (section 6.2.1). Rather than simply listing concepts, the process involved inductive coding of the workshop data, identifying patterns and thematic overlaps with the literature. These insights were structured according to the four key components of the framework (WHAT, HOW, WHO and WHERE, WHY) - as outlined above as part of the Phase 2 Construction of the artefact of the research process.

Converging themes were distilled into key components, while tensions between sources were used to refine the model further. The dandelion metaphor helped integrate diverse inputs into a coherent structure. Each element of the four key components is clearly linked to its source, ensuring transparency and traceability.

Accordingly, the model consists of four key components as mentioned above, represented by the metaphor of a dandelion. The WHAT refers to the theoretical foundations and core content, forming the central core of the model. The HOW represents the teaching approaches and teaching methodologies, symbolised by the seeds, which guide how the content is delivered.

The WHO and WHERE component address the roles, responsibilities, and learning environments that shape the educational experience. Finally, the WHY/FOR WHAT focuses on the intended learning outcomes, including the competencies and skills that learners develop, represented by the new plants.

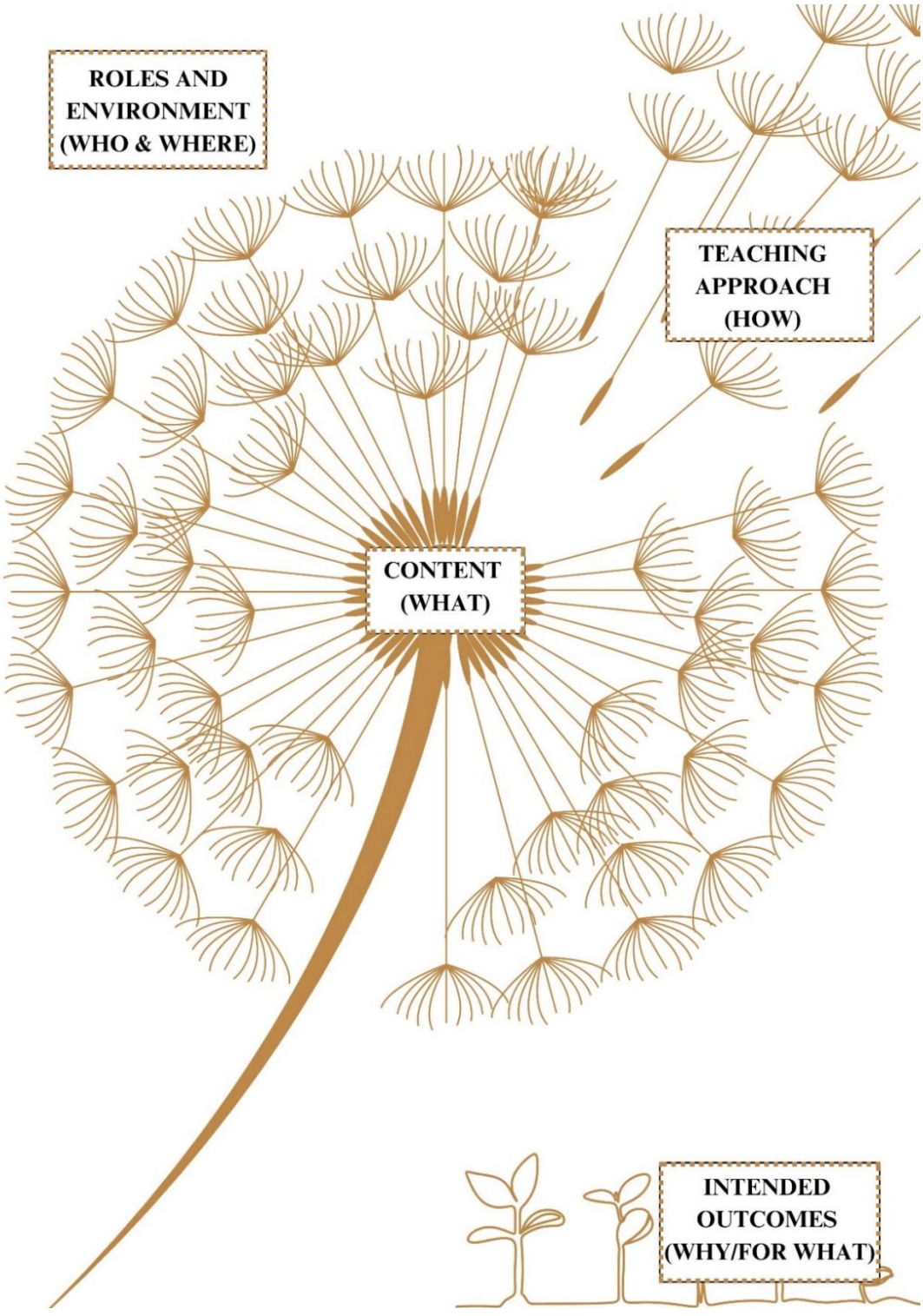


Figure 19 – The Dandelion Collection for Regenerative Approaches in Entrepreneurship Education, own illustration.

To enhance clarity and usability, each component of the model is accompanied by a structured table that summarises its key elements along with their respective sources. These elements were derived during Phase 1 - Derivation of Requirements of the research process. This initial phase followed a mixed-methods approach as highlighted above, combining two complementary data collection techniques to identify the core design requirements:

- A semi-systematic literature review (Snyder, 2019), which synthesised relevant academic and conceptual insights;
- Two future-focused workshops that applied speculative design methodologies (Dunne and Raby, 2013), enabling participants to envision and co-create potential futures for regenerative entrepreneurship education.

The resulting tables present a consolidated summary of the key elements identified through this process, serving as the empirical and conceptual foundation for each component of the model.

The core of the model (**WHAT**) builds the theoretical foundations and key concepts essential for regenerative approaches in entrepreneurship education. This includes foundational knowledge across multiple dimensions summarised in the table below:

Theoretical Foundations and Perspectives	
Systemic Dimension	**Social-Ecological Systems** (Ellis, 2018) (Manring, 2017); **Complex Adaptive Systems** (Ellis, 2018) (Guzmán et al., 2021) (3E Workshop Team 5) (Manring, 2017); **Critical phenomenology** (Macintyre, 2019); **Inter and Trans disciplinarity** (Guzmán et al., 2021) (Manring, 2017) (IEES Workshop Team 1); **Uncertainty** (Guzmán et al., 2021) (IEES Workshop Team 1)
Reflective Personal Dimension	**Reflexive Social Learning and Capabilities Theory** (Macintyre, 2019)
Ecological Dimension	**Organicism** (Ellis, 2018); **The Rights of Nature** (Guzmán et al., 2021); **Positive ecological reciprocity** (Ellis, 2018) **Natural resources** (3E Workshop Team 1); **Ecological Literacy** (Ellis, 2018) (IEES Workshop Team 1); **Global Sustainability Issues** (Ellis, 2018)

Societal Dimension	**Epistemological diversity and humility** (Guzmán et al., 2021); **New social movement, postcolonial and decolonisation theory** (Macintyre, 2019); **Cultural and cultural historical activity theory** (Macintyre, 2019); **Sociology** (IEES Workshop Team 1)
Economic Dimension	**Neoliberalism** (3E Workshop Team 2) (3E Workshop Team 3); **Anthropocene** (Ellis, 2018) (Guzmán et al., 2021) (IEES Workshop Team 1); **Degrowth** (Edwards, 2021) (3E Workshop Team 3)
Key concepts and models, principles, tools	
Systemic Dimension	**Root cause analysis** (Manring, 2017)
Reflective Personal Dimension	**Empathy** (Guzmán et al., 2021) (IEES Workshop Team 1) **Respect** (IEES Workshop Team 1)
Ecological Dimension	**Biomimetic design** (Ellis, 2018); **Industrial ecology** (Ellis, 2018); **Ecological footprint** (Guzmán et al., 2021); **Symbiosis** (Ellis, 2018); **Mutual aid** (Ellis, 2018)
Societal Dimension	**Regenerative Societies** (3E Workshop Team 3); **Power structures and systems** (3E Workshop Team 2); **Equity and Inequality** (Guzmán et al., 2021); **Accessibility** (Guzmán et al., 2021**); Social, Distributive, Intergenerational and Multispecies Justice** (Guzmán et al., 2021); **Co-Creation and Co-operation** (3E Workshop Team 1) (Ellis, 2018); **Generative ownership** (Ellis, 2018); **Racism and Oppression** (Guzmán et al., 2021); **Privilege** (Guzmán et al., 2021) **Cultural Humility** (Guzmán et al., 2021); **Intercultural living** (IEES Workshop Team 1)
Economic Dimension	**Circular Economy** (3E Workshop Team 1); **Regenerative business models** (3E Workshop Team 3); **Permaculture** (Ellis, 2018); **Planetary Boundaries** (Guzmán et al., 2021) (IEES Workshop Team 1); **Zero impact production** (Ellis, 2018) **History of economy** (3E Workshop Team 1)

Extending outward from the core, the seeds of the dandelion (**HOW**) symbolise teaching approaches that inform the delivery of regenerative approaches in entrepreneurship education.

These elements are flexible and not confined to a specific dimension, allowing them to be applied across all areas rather than following a pre-structured approach, as shown in the table above.

Teaching approaches and teaching methodologies
Learning through direct experience: Active learning (Ellis, 2018), problem-based learning, experimental study activities (3E Workshop Team 1)
Engaging with real-world contexts: Case studies (3E Workshop Team 3), simulations (IEES Workshop Team 2), observational learning from society and nature (IEES Workshop Team 2)
Playful and experimental formats: Purposeful reflective walking (3E Workshop Team 1), experimental escape rooms to "sense" scenarios (3E Workshop Team 3), organic learning formats that encourage active student involvement in complex real-world problems (Ellis, 2018)
Practice-oriented and applied learning: Action-research learning networks with stakeholders (Manring, 2017), cooperative entrepreneurship models such as "Genossenschaft" attached to universities (IEES Workshop Team 4)
Outcome-driven learning formats: Output-oriented course formats (IEES Workshop Team 4), educational games (IEES Workshop Team 4)
Learning for systemic change: Transgressive learning, which addresses structural barriers inhibiting meaningful societal transformations (Macintyre, 2019), transformative learning (Macintyre, 2019), emergence and multi-perspective approaches (Macintyre, 2019)
Collaborative knowledge creation: Co-creation with teams, internal and external stakeholders (3E Workshop Team 2; 3E Workshop Team 5), constructivist learning (Macintyre, 2019)
Community engagement and social innovation: Community-engaged scholarship that redesigns university functions to foster reciprocal faculty-student-community relationships (Ahmed et al., 2024); social innovation teaching and learning focused on grand challenges (Popowitz and Dorgelo, 2018); radical collaboration with communities (Kalema, 2019; Tamm and Luyet, 2004)
Reflection and critical thinking: Biographical reflection exercises, students analyse how past models have impacted their own lives, families, and communities (3E Workshop Team 3)

Exploratory and self-directed learning: Understanding by Design (Cloud, 2016), inquiry-based learning (Macintyre, 2019), project-based learning (Macintyre, 2019; IEES Workshop Team 4), professional learning communities (Macintyre, 2019)
Interactive and participatory formats: Flipped classroom (3E Workshop Team 1), learner-centred and assessment-driven instruction (Macintyre, 2019), interactive learning (IEES Workshop Team 2)
Foresight and scenario thinking: Future-casting (3E Workshop Team 2), virtual reality for immersive learning experiences (3E Workshop Team 3)
Peer learning and teamwork: Teamwork (IEES Workshop Team 2), cooperative peer-to-peer learning where students act as both knowledge consumers and producers (Ahmed et al., 2024)
Relational and in-person learning: Teaching in physical spaces to foster social interaction (3E Workshop Team 1; 3E Workshop Team 2)
Role models as facilitators: Learning from real-world examples and mentors (IEES Workshop Team 2)
Contextualised learning approaches: Selecting relevant local topics such as food, clothing, and sports (3E Workshop Team 1)
Reflective writing and discussion: Exploring fundamental questions through writing exercises, such as "What is food life?" or "What is a life worth living?" (3E Workshop Team 4)

Surrounding the seeds, the **WHO and WHERE** dimensions define the roles and responsibilities of educators, the learning environment and stakeholder involvement. Educators play a vital part in questioning prevailing assumptions, fostering reflexivity, and co-creating knowledge with learners and external partners. Key stakeholders such as community members, social scientists, behavioural experts, and permaculture practitioners contribute to a transdisciplinary learning ecosystem that bridges theory and practice.

Responsibilities of Educators		
Societal and Ethical Responsibility: Critically question dominant assumptions and integrate	**Reflexivity and Continuous Development:** Reflect on personal teaching practices and adapt	**Collaboration and New Forms of Leadership:**

alternative perspectives into teaching (Ellis, 2018). Promote ethical decision-making and sustainability-driven entrepreneurship (Ellis, 2018). Collaborate with diverse stakeholders to drive systemic change (Ellis, 2018).	methodologies accordingly (Ellis, 2018). Use reflexive inquiry to generate deeper insights for theory and practice (Ellis, 2018). Implement an upside-down approach to knowledge transfer, learning as a co-creative process rather than one-directional teaching (Ahmed et al., 2024).	Work in transdisciplinary teams to co-develop sustainable solutions (Ellis, 2018). Assume shared leadership roles and adopt decentralised decision-making models like Holacracy (IEES Workshop Team 3).
Key Stakeholders		
Experts from Social and Behavioural Sciences: Caregivers (children, elderly, special needs): Insights into inclusive and socially responsible entrepreneurship (IEES Workshop Team 3). Behavioural scientists and ethologists: Understanding human behaviour, motivation, and decision-making in sustainability contexts (IEES Workshop Team 3). Social scientists and anthropologists: Exploring cultural, societal, and economic dimensions of regeneration (IEES Workshop Team 3).	**Practitioners and Changemakers:** Permaculturalists: Applying ecological principles and regenerative design thinking to entrepreneurship education (IEES Workshop Team 3).	

At the base of the model, young plants emerging from the soil represent the competencies and skills **(WHY/FOR WHAT)** that learners develop through regenerative approaches in entrepreneurship education. They equip learners with the ability to address socio-ecological challenges.

Intended learning outcomes, including competencies and skills
Systems thinking: Understanding complex, interrelated systems and their dynamics (Ellis, 2018; 3E Workshop Team 5; Cloud, 2016). **Ecosystem thinking:** Recognising the interdependencies within socio-economic and ecological systems (Hodgson and Spours, 2016). **Future casting:** Developing foresight and the ability to anticipate and shape future scenarios (3E Workshop Team 2).
Critical reflexivity: Analysing one's own assumptions, biases, and actions to foster deeper learning (Ellis, 2018). **Critical thinking:** Evaluating information, questioning dominant narratives, and formulating independent judgments (3E Workshop Team 1). **Change of perspective:** Developing the ability to see issues from different cultural, economic, and ecological viewpoints (IEES Workshop Team 1).
Collaboration and cooperation: Working effectively with diverse teams and stakeholders (Ellis, 2018; 3E Workshop Team 2; 3E Workshop Team 5). **Non-violent communication:** Practicing conflict resolution through empathy, active listening, and respectful dialogue (3E Workshop Team 2). **Democratic and open/direct decision-making ability:** Engaging in participatory governance and inclusive leadership (3E Workshop Team 2). **Intercultural living:** Navigating and thriving in diverse cultural environments (IEES Workshop Team 1)
Empathy: Understanding and responding to the emotions and perspectives of others (Guzmán et al., 2021; IEES Workshop Team 1). **Respect:** Valuing different opinions, backgrounds, and approaches in entrepreneurship and education (IEES Workshop Team 1). **Agency and hope:** Cultivating a proactive mindset and belief in the potential for positive change (3E Workshop Team 4).
Creativity skills: Encouraging innovation and the ability to develop novel solutions (3E Workshop Team 1). **Peaceful problem-solving skills:** Addressing challenges through non-adversarial, constructive approaches (3E Workshop Team 2). **Soft skills:** Strengthening interpersonal, adaptability, and communication skills to navigate complex environments (IEES Workshop Team 1).

As highlighted above, the *Dandelion Collection* is a reference point, a collection of key elements when developing a teaching activity for regenerative approach in entrepreneurship education. It was developed through an iterative synthesis of insights from a semi-systematic literature review and two speculative design workshops. Rather than simply compiling isolated concepts, the workshop data were inductively coded, enabling the identification of recurring themes and overlaps with the academic literature. These findings were organised across four key components: WHAT, HOW, WHO and WHERE, and WHY/FOR WHAT.

The model is intended as a non-hierarchical reference tool, a flexible collection of key elements to support the design of teaching activities in regenerative approaches in entrepreneurship education. Its application is demonstrated in the next chapter, while a deeper reflection is provided in section 6.4 Implications and Discussion.

6.3.2 Seven-day International Summer School on Regenerative Approaches in Entrepreneurship

The following section demonstrates the application of the previously presented model through a concrete educational framework in the form of a seven-day international summer school.

The design of the entrepreneurship education programme was informed by the outcomes of the *Dandelion Collection*, which provided the key design elements for the international summer school. In addition, the programme design draws strongly on the *Comprehensive Framework for Entrepreneurship Education* developed by Valliere et al. (2014), as it offers "a more specific and delineated model of the causal relationships among the key constructs and aspects, enabling designers to better understand how design decisions in one area are reflected in the choices available in others" (p. 14). This framework builds on earlier contributions by Fayolle and Gailly (2008) and Gedeon (2014), which are grounded in the Theory of Planned Behaviour and emphasise the contextual influence of ontology and environment. Valliere et al. (2014) extend this foundation by incorporating a stakeholder theory perspective, which is particularly relevant for regenerative and ecosystem-oriented approaches to entrepreneurship education. The framework by Valliere et al. (2014) illustrated in the figure below depicts how broad ontological and environmental considerations inform programme design through decisions concerning the purpose (*why*), the target participants (*who*), and the pedagogical approach (*how*). These elements collectively shape the detailed design of *what* specific activities constitute programme

delivery. Finally, programme outcomes are assessed through appropriate measurement mechanisms, with the results feeding back into earlier stages of the framework to support ongoing evaluation and continuous improvement.

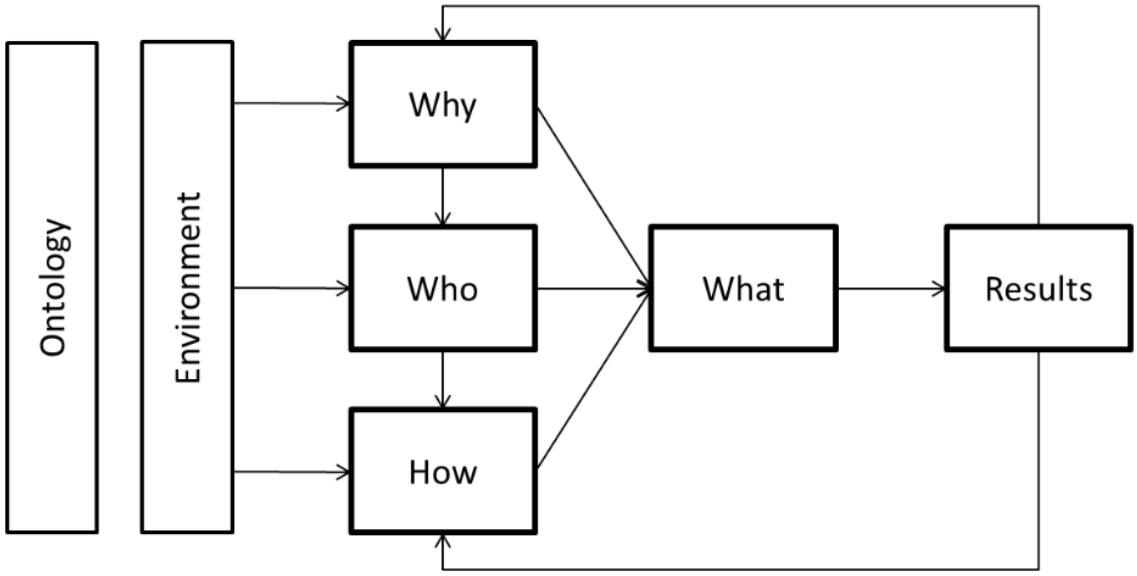


Figure 20 - Comprehensive Framework for Entrepreneurship Education by Valliere et al. 2014.

Valliere et al.´s (2014) framework incorporates ontological considerations about the nature and purpose of entrepreneurship, as well as the influence of environmental and contextual factors such as stakeholder dynamics and ecosystem interactions. This board, multi-level perspective aligns closely with principles of systems thinking and regeneration. Additionally, the framework's detailed model of causal relationships between learning objectives, teaching methods, and outcomes allows for careful design decisions that ensure coherence and depth throughout the curriculum. By integrating stakeholder theory and emphasising continuous feedback and adaptation, the framework supports the dynamic and transformative nature of regenerative entrepreneurship education, making it an ideal foundation for curriculum development in this emerging field.

The following table was created based on the research from Valliere et al. (2024). Using the results from the *Dandelion Collection* it presents the underlying and interrelated design decisions that were made to develop the Seven-Day International Summer School on Regenerative Approaches in Entrepreneurship.

	DESIGN FEATURES
ONTOLOGY	
Regenerative Entrepreneurship	Net positive value creation through the mutually reinforcing co-evolution of business and its surrounding ecosystem, grounded in systems thinking (Meadows, 1999) and regenerative principles (Hahn and Tampe, 2021).
Education	Experiential, student-centric learning grounded in transformative learning theory, evolving from objectivist teaching toward subjectivist and social constructivist learning, and enabling dialogical learning, problem-posing education, praxis and empowerment (Freire, 1970).
ENVIRONMENT	
Stakeholders	A broad spectrum of stakeholders from the three organisational entities, including the Strascheg Center for Entrepreneurship, the Social Entrepreneurship Akademie, and the University of Applied Sciences Munich, as well as their respective administrations, faculties, students, employers, guest speakers, and other ecosystem actors, actively participating in the curriculum. While this inclusive approach fosters collaboration, it also introduces complexity due to potential entrenched interests and politics. The involvement of external stakeholders and the incorporation of on-site or virtual visits to regenerative enterprises further add to the curriculum's design complexity. However, the three organisational entities provide access to a rich pool of suitable stakeholders.
Market/competition	Students increasingly seek a comprehensive entrepreneurship offering that goes beyond traditional business courses. They value opportunities to connect with both local and international peers, while also gaining firsthand insights into Munich's dynamic entrepreneurial ecosystem. At the same time, competing universities such as TUM and LMU are expanding their entrepreneurship programs, and new providers from outside the university sector are entering the market. Munich faces particularly

	strong competition among international summer schools, highlighting the importance of innovative, applied, and ecosystem-integrated approaches to distinguish the university's offerings in this vibrant landscape.
Resources	The limited budget makes it challenging to involve many external stakeholders, who generally need to participate on a voluntary basis. Additionally, providing accommodation, transportation, and meals for international students adds further complexity and cost. Therefore, the programme relies heavily on funding through grants, public funding sources, or the support of dedicated staff, such as employees of the above mentioned three interconnected institutions, to sustain and expand its offerings.
WHY	
Vision	Graduates who are motivated to purposefully think and act entrepreneurially across diverse contexts to create new or support existing regenerative enterprises and initiatives that generate net-positive ecological and social impacts.
Mission	The international summer school fosters an immersive educational environment through interactive workshops, experiential site visits, and guided mentorship, encouraging collaborative exploration and practical application of regenerative entrepreneurship. It motivates students to apply systems thinking and to adapt a philosophy of regeneration and wholeness, grounded in entrepreneurial thinking, passion, action orientation, and stewardship equipping them to create and support ventures that contribute to thriving ecological and social systems.
Goals	While the seven-day format can effectively motivate students and introduce system thinking and regenerative principles, it is limited in its ability to facilitate deep mindset shifts or fully develop regenerative ventures. The primary goal is to inspire and motivate students to pursue regenerative entrepreneurship beyond the program.
WHO	

Target audience	Designed for a diverse, international cohort of approximately 40 Master's level students from varied academic disciplines and personal backgrounds.
HOW	
Values	Collaboration, mutual respect, critical reflection, and a commitment to regeneration are core values guiding the learning experience, where students actively take initiative and ownership of their education, fostering a strong sense of personal responsibility.
Teaching	Two facilitators guide students through each day, with a strong emphasis on transformative learning theory (Freire, 1970). Each student team is paired with a dedicated coaching mentor who provides ongoing support and guidance throughout the program. These coaches act as role models, offering real-world insights and mentorship to enrich the learning experience.
WHAT	
Scope	The programme applies the SCE Dynamic Innovation Process[48], consisting of five key phases: Start, Discover and Explore, Transform, Create, and Implement. Content-wise, it draws from the *Dandelion Collection* selected to align with the overarching ontology of regenerative entrepreneurship and tailored to the specific context.
Methods	Strong emphasis on teamwork and workshops, with students organised into teams from the start to encourage collaboration. Workshops and practical tools focus on regenerative practices and systems thinking, offering both hands-on experience and theoretical foundations. In addition, guest speakers and field trips provide direct exposure to real-world regenerative initiatives, enriching students' practical understanding.

[48] The Strascheg Centre for Entrepreneurship (SCE) (mentioned earlier) is the innovation centre of the University of Applied Sciences Munich. For more information, see also: https://www.sce.de/en/inside-sce/innovation-approach.html, last accessed on 20/03/2025.

Sequencing	The international summer school is a compact, intensive seven-day programme that takes place once, designed to deliver a concentrated learning experience within a single session rather than spanning multiple years.
RESULTS	
Knowledge transfer	Due to the program's short, seven-day duration, it is not possible to fully measure the long-term results of knowledge transfer or to achieve deep, lasting learning within this timeframe.
Skills and competencies	The programme addresses a wide range of important skills and competencies, including collaboration, respect, foresight, agency, reflexivity, systems thinking, ecosystem thinking, empathy, perspective change, participatory governance, creativity, conflict resolution, critical thinking, and essential soft skills such as communication and adaptability. However, due to the program's short duration, as noted earlier, these competencies cannot be fully developed or measured within the seven-day timeframe and instead serve as foundational introductions to be further cultivated beyond the program.
Beliefs, attitudes, and intentions	Changes in beliefs, attitudes, and intentions toward regenerative and systems thinking require long-term measurement beyond the program's duration. While the programme does not aim to fully achieve these changes, it is designed to initiate and inspire the alignment of students' mindsets with regenerative principles and systemic perspectives.

The following figure and sections present a detailed description of a day-by-day curriculum, demonstrating how these design choices translate into a seven-day international summer school format, integrating key elements of the *Dandelion Collection*.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Dynamic Innovation Phase	**Phase 1 - Start**	**Phase 2 - Discover and Explore**	**Phase 2 - Discover and Explore**	**Phase 3 - Transform**	**Phase 3 - Transform**	**Phase 4 - Create**	**Phase 5 - Implement**
Topic	**Teambuilding**	**Possible Futures and Visioning**	**Systems Thinking and Stakeholder Dynamics**	**Exploring Impactful Pathways**	**Concept Creation and Testing**	**Business Modelling**	**Concept Presentation**
Intended learning outcomes, including competencies and skills	**Collaboration and cooperation** [Working effectively with diverse teams and stakeholders]; **Respect** [Valuing different opinions, backgrounds, and approaches]	**Future casting** [Developing foresight and the ability to anticipate and shape future scenarios]; **Agency and hope** [Cultivating a proactive mindset and belief in the potential for positive change]; **Critical reflexivity** [Analysing one's own assumptions, biases, and actions to foster deeper learning]	**Systems thinking** [Understanding complex, interrelated systems and their dynamics]; **Ecosystem thinking** [Recognising the interdependencies within socio-economic and ecological systems]; **Empathy** [Understanding and responding to the emotions and perspectives of others]	**Change of perspective** [Developing the ability to see issues from different cultural, economic, and ecological viewpoints]	**Democratic and open/direct decision-making ability** [Engaging in participatory governance and inclusive leadership], **Creativity skills** [Encouraging innovation and the ability to develop novel solutions]	**Peaceful problem-solving skills** [Addressing challenges through non-adversarial, constructive approaches]; **Critical thinking** [Evaluating information, questioning dominant narratives, and formulating independent judgments]	**Soft skills** [Strengthening interpersonal, adaptability, and communication skills to navigate complex environments]
Teaching approaches and teaching methodologies	Collaborative and Social Learning	Foresight and Scenario Thinking	Active and Experiential Learning	Transformative and Critical Learning, Practice-oriented and Applied Learning	Inquiry-Based Learning	Outcome-driven Learning	Outcome-driven and Active Learning
Theoretical foundations and core content	Inter- and Transdisciplinarity	Regenerative Societies, Planetary Boundaries, Uncertainty	Systems Thinking, Social-Ecological Systems	Permaculture, Zero Impact Production, Regenerative Business Models	Biomimetic design, Industrial ecology, Co-Creation and Co-operation, Symbiosis	Neoliberalism vs. Degrowth, Regenerative Business Models, History of Economy	Positive ecological reciprocity
Tools	Teamcanvas and IKIGAI	Futures Cones, Visioning and Backcasting	Systems map and Actors tree	Ideation	Prototyping and Feedback	Regenerative Business Principles Canvas	Creative Expression
Milestones	Teamcanvas is filled in by 12:30pm.	Vision is created by 3:30pm.	Systems map and actors' tree are created by 12:30pm.	Ideas for alternative pathways identified by 12:30pm.	First prototype created by 12:30pm.	Regenerative business model ready by 3:30pm.	Fair Booth ready by 12:30pm.
08:30-09:00am	**Arrival**	**Coffee + Connect**	**Coffee + Connect**	**Coffee + Connect**	**Coffee + Connect**	**Coffee + Connect**	**Coffee + Connect**
09:00-09:30am	**Intro and getting to know each other**	**Check-in and Daily Goals**	**Check-in and Daily Goals**	**Check-in and Daily Goals**	**Check-in and Daily Goals**	**Check-in and Daily Goals**	**Check-in and Daily Goals**
09:30-10:00am	**Opening and Official welcoming**	**Exploring the Principles of Regenerative Societies** [Tool: **Workshops** with experts to explore the core principles of regenerative societies, exploring alternative concepts such as planetary boundaries, circular economies, sustainable ecosystems, and the Anthropocene.]	**Understand the systems that are connected to your vision** [Tool: **Systems Map** to visualise and understand complex systems, identifying relationships, feedback loops, and leverage points.]	**Identifying alternative pathways** [Tool: **Ideation** to generate ideas on how to achieve the steps needed to achieve a regenerative future (from **backcasting**), combined with systems thinking and stakeholder insights. This approach helps to align strategic actions with systemic dynamics and key actors, leading to more effective regenerative impact.]	**Create your concept** [Tool: **Prototyping** based on identified pathways to develop and test tangible models or solutions (concepts), allowing participants to refine ideas, gather feedback, and iterate towards effective regenerative outcomes.]	**Learning about regenerative business approaches** [Tool: **World Café** to explore regenerative business models through real world case studies, group discussions, and interactive activities.]	**Continuation of Create your Fair Booth** [Tool: **Creative Expression** (Posters, Presentations, Role Play, Sculpture) to visually and interactively communicate your final concept.]
10:00-10.45am	**Presentation of coaches and teams** [Teams are pre-selected for maximum diversity based on demographic characteristics and mentored by a coach throughout the program.]						
10:45-11:00am	**Elevenses Break**						

11.00-12:30pm	**Getting to know your team and coach** [Tool: **Teamcanvas** incl. a team slogan/ motto/movement/shout out]	**Future Lab I** [Tool: **Polak Game** to make the participants reflect on their perceptions of the future and understand how their mindset influences decision-making.]	**Stakeholder mapping** [Tool: **Actors tree** to map key stakeholders and their relationships within a system, helping participants understand roles, influences, and collaboration opportunities for regenerative entrepreneurship.]	**Choosing the most impactful pathway** [Tool: **Impact Staircases** to evaluate and prioritise potential actions based on their scalability, feasibility, and long-term impact, ensuring alignment with regenerative goals and maximising positive outcomes.]	**Continuation of Create your concept**	**Regenerative Business Modelling** [Tool: **Regenerative Business Principles Canvas** to design business models, focusing on regeneration for long-term positive impact.]	**Continuation of Create your Fair Booth**
12:30-2:00pm	**Lunch Break**						
2:00-2:15pm	**Energizer** [Tool: **Line-up game** with simple questions to communicate with each other and have fun.]	**Energizer** [Tool: **Nine-dot puzzle** to encourage creativity, change of perspective and reflection on personal mindsets.]	**Energizer** [Tool: **Systemic triangle** to illustrate the interconnectedness of complex systems, showing how small changes affect the whole.]	**Getting to know Regenerative Initiatives** [Tool: **Ecofield trip** to visit regenerative initiatives such as permaculture initiatives to gain first-hand insights into real world regenerative practices and business models.]	**Energizer** [Tool: **Marshmallow Challenge** to promote creativity, teamwork, and problem-solving, encouraging participants to experiment, fail, and iterate.]	Energizer [Tool: **Rock-paper-scissors tournament** to boost energy and fun on the next-to-last day.]	**Energizer** [Tool: **Appreciation Shower** to foster a supportive and uplifting environment, boosting team morale and bonding.]
2:15- 3:30pm	**Organisational issues** [Tool: **World-Café** to co-create house rules, values, and culture by all participants. Including a brief presentation of the week's curriculum to add to or adapt.]	**Future Lab II** [Tool: **Visioning** through time travel to imagine and articulate future possibilities, enabling participants to envision regenerative pathways and inspire action towards creating their preferred futures.]	**Peer Feedback Session** [Tool: Pairing teams for **peer feedback** to gain diverse perspectives, uncovering blind spots and strengthening systems understanding for more resilient solutions in regenerative entrepreneurship.]		**Test your concept** [Tool: **Presentation/Testing** of concept to showcase where participants are heading, gathering peer feedback, input from coaches, the peer group, and experts.]	**Continuation of Regenerative Business Modelling**	**Regenerative Fair for the Public** to engage the public, showcase regenerative concepts, and promote discussions on regenerative practices.
3:30-3:45pm	**Getting to know Regenerative Enterprises** [Tool: **Ecofield trip** to visit regenerative enterprises to gain first-hand insights into real world regenerative practices.]	**Break**			**Break**		
3:45- 4:45pm		**Future Lab III** [Tool: **Future Cones** to explore and visualise different future scenarios to understand the range of possibilities from probable to preferable futures. This tool fosters future casting, encouraging learners to consider not only what is likely to happen but also what could be desired or possible. **Backcasting** to work backward from a desired future to identify the steps needed to achieve that future.]	**Improve your knowledge on stakeholders** [Tool: **Interviews** to gain first-hand insights or **desktop research** to analyse existing data, ensuring a deeper understanding of their roles, needs, and influence in the system.]		**Adjustment of concept** [Tool: **Feedback canvas** to refine and improve the concept to ensure it better aligns with regenerative goals, addresses potential gaps, and enhances its overall impact based on insights from peers, coaches, and experts.]	**Create your Fair Booth** [Tool: **Creative Expression** (Posters, Presentations, Role Play, Sculpture) to visually and interactively communicate your final concept.]	
4:45- 5:15pm	Reflection of the day [Tool: IKIGAI]	Reflection of the day [Tool: IKIGAI]	Reflection of the day [Tool: IDGs]		Reflection of the day [Tool: IDGs]	Final Reflection of the week [Tool: IKIGAI from day 1]	

Figure 21 - Curriculum of seven-day international summer school on regenerative entrepreneurship, own illustration.

6.3.2.1 Day 1: Teambuilding

	Day 1
Dynamic Innovation Phase	**Phase 1 - Start**
Topic	**Teambuilding**
Intended learning outcomes, including competencies and skills	**Collaboration and cooperation** [Working effectively with diverse teams and stakeholders]; **Respect** [Valuing different opinions, backgrounds, and approaches]
Teaching approaches and teaching methodologies	Teamwork and Cooperative Peer Learning
Theoretical foundations and core content	Inter- and Trans disciplinarity
Tools	Teamcanvas and IKIGAI
Milestones	Teamcanvas is filled in by 12:30pm.
08:30- 09:00am	**Arrival**
09:00- 09:30am	**Intro and getting to know each other**
09:30- 10:00am	**Opening and Official welcoming**
10:00- 10.45am	**Presentation of coaches and teams** [Teams are pre-selected for maximum diversity based on demographic characteristics and mentored by a coach throughout the programme.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Getting to know your team and coach** [Tool: **Teamcanvas** incl. a team slogan/ motto/movement/shout out]

12:30- 2:00pm	**Lunch Break**
2:00-2:15pm	**Energizer** [Tool: **Line-up game** with simple questions to communicate with each other and have fun.]
2:15- 3:30pm	**Organisational issues** [Tool: **World-Café** to co-create house rules, values, and culture by all participants. Including a brief presentation of the week's curriculum to add to or adapt.]
3:30-3:45pm	**Getting to know Regenerative Enterprises** [Tool: **Ecofield trip** to visit regenerative enterprises to gain first-hand insights into real world regenerative practices.]
4:45- 5:15pm	Reflection of the day [Tool: IKIGAI]

The first day of the international summer school initiates the learning journey with a focused emphasis on teambuilding, serving as a foundational element for subsequent collaborative and transdisciplinary work. The teaching intention is to cultivate the interpersonal and social dynamics necessary for effective group collaboration, particularly in heterogeneous, interdisciplinary contexts (Ellis, 2018; 3E Workshop Team 2; 3E Workshop Team 5). The day is structured to promote the development of competencies in cooperation, group coordination, and interpersonal communication, with the ultimate aim of enabling participants to work effectively in diverse teams and multi-stakeholder environments.

From a learning outcome perspective, this initial day targets both cognitive and affective domains. Participants are expected to develop a heightened awareness of and appreciation for diverse perspectives, cultural backgrounds, and epistemological standpoints. Furthermore, the programme seeks to foster a sense of mutual respect, psychological safety, and collaborative engagement, which are critical for the co-creative processes that follow in later stages of the international summer school (IEES Workshop Team 1).

The day's teaching approach is rooted in cooperative peer learning where students act as both knowledge consumers and producers (Ahmed et al., 2024) and teamwork (IEES Workshop Team 2) which emphasises the co-construction of knowledge through social interaction and shared experience (Macintyre, 2019). The theoretical framing draws from the principles of interdisciplinarity and transdisciplinarity (Manring, 2017; Guzmán et al., 2021; IEES Workshop Team 1), which inform both the curriculum design and team formation strategy. These frameworks are essential for addressing socio-ecological challenges.

Upon arrival, participants are welcomed with informal social activities, such as shared coffee breaks and casual dialogue, designed to lower social barriers and initiate peer-to-peer interaction. This informal start transitions into an official opening session, during which the objectives, structure, and ethos of the international summer school are articulated. Teams are then introduced. The teams are pre-assigned to ensure demographic and disciplinary diversity, a strategy grounded in research on the positive effects of heterogeneous teams in innovation and problem-solving contexts (Guzmán et al., 2021). Each team is assigned a facilitating coach who will provide ongoing support and guidance throughout the programme. The coaches serve as role models so that participants can learn from real-world examples and mentors (IEES Workshop Team 2).

Central to the day's activities is Team Canvas developed by Alex Ivanov and Mitya Voloshchuk in 2015 for agile project teams (The Team Canvas, 2024). It serves as a collaborative tool that facilitates explicit articulation of group values, roles, expectations, and working norms. This process includes the creative development of a team-specific slogan or motto, which serves not only to build team identity but also to foster group cohesion and emotional engagement. As detailed earlier, the Team Canvas has demonstrated effectiveness in aligning team dynamics and establishing a shared foundation for collective action.

Following a mid-day break, the programme continues with an energizer activity known as the "Line-Up Game", which consists of participants arranging themselves based on personal characteristics (e.g., birthday, favourite food, language proficiency). While seemingly simple, this exercise facilitates informal communication, introduces playfulness into the group dynamic, and supports the development of interpersonal connections and empathy (Guzmán et al., 2021; IEES Workshop Team 1) through embodied interaction.

In the afternoon, a session on organisational structure and participatory governance is held using the World Café method (Brown and Isaacs, 2005), a facilitation format designed to foster collaborative dialogue around complex questions. In this context, participants collectively formulate a set of house rules, community values, and normative agreements to guide the culture of interaction over the coming days. This process is intended to empower learners through participatory co-creation and to establish a shared normative framework for respectful and inclusive engagement (Ellis, 2018; 3E Workshop Team 1). The session concludes with a presentation of the weekly curriculum, allowing participants to reflect upon, adapt, or contribute to the learning journey in a co-designed manner.

The educational activities of the day are grounded with a field-based experiential learning component (3E Workshop Team 1; 3E Workshop Team 3) in the form of an ecofield trip to a local regenerative enterprise. This visit provides contextualised, real-world insights into regenerative business practices, allowing participants to connect theoretical constructions with practical applications. Observational learning, guided inquiry, and dialogue with practitioners are employed as methods of practice-oriented and applied learning (Manring, 2017).

To conclude the day, participants engage in a guided individual reflection exercise using the IKIGAI framework, a Japanese concept denoting “a reason for being” introduced earlier. This tool supports learners in exploring the intersection of personal passions, societal needs, vocational potential, and professional competencies (Schippers, 2017; Schippers and Ziegler, 2019). The IKIGAI Canvas, previously introduced in the second research paper serves as a self-reflective instrument to help participants situate themselves within the broader aims of societal transformation, thereby bridging personal identity with collective purpose.

6.3.2.2 Day 2: Possible Futures and Visioning

	Day 2
Dynamic Innovation Phase	**Phase 2 - Discover and Explore**
Topic	**Possible Futures and Visioning**
Intended learning outcomes, including competencies and skills	**Future casting** [Developing foresight and the ability to anticipate and shape future scenarios]; **Agency and hope** [Cultivating a proactive mindset and belief in the potential for positive change]; **Critical reflexivity** [Analysing one's own assumptions, biases, and actions to foster deeper learning]
Teaching approaches and teaching methodologies	Foresight and Scenario Thinking
Theoretical foundations and core content	Regenerative Societies, Planetary Boundaries, Uncertainty
Tools	Futures Cones, Visioning and Back casting
Milestones	Vision is created by 3:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**

09:30- 10:45am	**Exploring the Principles of Regenerative Societies** [Tool: **Workshops** with experts to explore the core principles of regenerative societies, exploring alternative concepts such as planetary boundaries, circular economies, sustainable ecosystems, and the Anthropocene.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Future Lab I** [Tool: **Polak Game** to make the participants reflect on their perceptions of the future and understand how their mindset influences decision-making.]
12:30- 2:00pm	**Lunch Break**
2:00-2:15pm	**Energizer** [Tool: **Nine-dot puzzle** to encourage creativity, change of perspective and reflection on personal mindsets.]
2:15- 3:30pm	**Future Lab II** [Tool: **Visioning** through time travel to imagine and articulate future possibilities, enabling participants to envision regenerative pathways and inspire action towards creating their preferred futures.]
3:30-3:45pm	**Break**
3:45- 4:45pm	**Future Lab III** [Tool: **Future Cones** to explore and visualise different future scenarios to understand the range of possibilities from probable to preferable futures. This tool fosters future casting, encouraging learners to consider not only what is likely to happen but also what could be desired or possible.

	Back casting to work backward from a desired future to identify the steps needed to achieve that future.]
4:45- 5:15pm	Reflection of the day [Tool: IKIGAI]

Building upon the interpersonal foundation established on Day 1, the second day of the international summer school transitions into a thematic focus on possible futures and visioning, a critical entry point into anticipatory thinking and regenerative innovation. The overarching goal of this day is to enable participants to develop capacities for foresight, agency, and critical reflexivity, thereby equipping them with the cognitive and affective tools required to engage constructively with uncertainty and complexity.

The intended learning outcomes for this day are threefold. First, participants are expected to enhance their skills in future-casting, defined here as the ability to anticipate, conceptualise, and model plausible future scenarios (3E Workshop Team 2). Second, the day aims to foster a sense of agency and hope, by cultivating a proactive and empowered mindset capable of envisioning and initiating systemic change (3E Workshop Team 4). Third, learners are encouraged to engage in critical reflexivity, involving the examination of personal assumptions, biases, and positionalities as a foundation for deeper learning and responsible action (Ellis, 2018).

The teaching orientation of Day 2 is grounded in foresight and scenario thinking, which emphasise the anticipatory capacities of learners and the co-creation of desirable futures (3E Workshop Team 2; 3E Workshop Team 3). This approach positions learners not merely as recipients of knowledge but as active agents in the construction of regenerative futures.

Theoretical foundations introduced throughout the day include key concepts such as Regenerative Societies (3E Workshop Team 3), Planetary Boundaries (Guzmán et al., 2021) and Uncertainty (Guzmán et al., 2021; IEES Workshop Team 1). These frameworks provide participants with conceptual tools to navigate the complexity of socio-ecological systems and to understand the limitations and possibilities of human agency in shaping long-term trajectories.

The day commences with a “Coffee + Connect” session designed to sustain the relational and dialogic ethos of the programme. This is followed by a group check-in, in which participants collaboratively set intentions and align expectations for the day’s learning journey.

The morning continues with a workshop facilitated by experts to explore the principles of regenerative societies. This session introduces the principles of regenerative societies, inviting participants to critically examine alternative systemic models, including circular economies, sustainable ecosystems, and the challenges posed by the Anthropocene epoch (Ellis, 2018; Guzmán et al., 2021; IEES Workshop Team 1). Participants explore how these frameworks offer counter-narratives to dominant growth-based paradigms, thereby enabling a shift in both mindset and method (Edwards, 2021; 3E Workshop Team 3).

Subsequently, the first part of a three-phase Future Lab sequence begins with an experiential activity known as the Polak Game (Inayatullah, 2008), designed to surface participants’ implicit perceptions of the future. This exercise serves as a diagnostic tool to explore how underlying mental models shape attitudes toward agency and change. The activity prompts reflection on whether individuals hold optimistic, pessimistic, active, or passive orientations toward the future, thereby opening space for transformation.

Following a lunch break, the day resumes with a thematic energizer activity: the Nine-Dot Puzzle, a classic lateral thinking exercise that encourages creativity, perspective-shifting, and problem re-framing. This activity is aligned with the day’s focus on cultivating imaginative and divergent thinking.

The afternoon is dedicated to the continuation of the Future Lab sequence. In Future Lab II, participants engage in visioning exercises using metaphorical “time travel” as a heuristic device to imagine and articulate preferred regenerative futures. This component enables learners to generate bold, values-driven visions for future societies, grounded in ethical, ecological, and social criteria. Through this speculative practice, participants are invited to move beyond reactive planning toward imaginative world-making (Dunne and Raby, 2013).

In Future Lab III, learners work with the Futures Cones framework (Voros, 2003), a visual and conceptual tool that distinguishes between probable, plausible, possible, and preferable futures.

The cone model helps clarify the range and nature of future scenarios and is complemented by the method of back casting (Robinson, 2003), wherein participants work backward from a desirable future to identify the necessary preconditions and transitional steps. This combination of tools fosters systemic thinking, strategic planning, and the translation of visions into actionable pathways.

The day concludes with a continuation of the IKIGAI-based personal reflection, initiated on Day 1. Participants revisit their personal purpose statements and reflect on how their emerging visions of regenerative futures resonate with or challenge their individual IKIGAI frameworks.

6.3.2.3 Day 3: Systems Thinking and Stakeholder Dynamics

	Day 3
Dynamic Innovation Phase	**Phase 2 - Discover and Explore**
Topic	**Systems Thinking and Stakeholder Dynamics**
Intended learning outcomes, including competencies and skills	**Systems thinking** [Understanding complex, interrelated systems and their dynamics]; **Ecosystem thinking** [Recognising the interdependencies within socio-economic and ecological systems]; **Empathy** [Understanding and responding to the emotions and perspectives of others]
Teaching approaches and teaching methodologies	Active and Experiential Learning
Theoretical foundations and core content	Systems Thinking, Social-Ecological Systems
Tools	Systems map and Actors tree
Milestones	Systems map and actors tree are created by 12:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**
09:30- 10:45am	**Understand the systems that are connected to your vision** [Tool: **Systems Map** to visualise and understand complex systems, identifying relationships, feedback loops, and leverage points.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Stakeholder mapping** [Tool: **Actors tree** to map key stakeholders and their relationships within a system, helping participants understand

	roles, influences, and collaboration opportunities for regenerative entrepreneurship.]
12:30- 2:00pm	**Lunch Break**
2:00-2:15pm	**Energizer** [Tool: **Systemic triangle** to illustrate the interconnectedness of complex systems, showing how small changes affect the whole.]
2:15- 3:30pm	**Peer Feedback Session** [Tool: Pairing teams for **peer feedback** to gain diverse perspectives, uncovering blind spots and strengthening systems understanding for more resilient solutions in regenerative entrepreneurship.]
3:30-3:45pm	**Break**
3:45- 4:45pm	**Improve your knowledge on stakeholders** [Tool: **Interviews** to gain first-hand insights or **desktop research** to analyse existing data, ensuring a deeper understanding of their roles, needs, and influence in the system.]
4:45- 5:15pm	Reflection of the day [Tool: IDGs]

The third day of the international summer school builds upon the anticipatory and visioning work conducted on Day 2 by shifting the focus toward systems thinking and stakeholder dynamics. This transition from future-oriented speculation to systemic analysis reflects a deliberate teaching progression, enabling participants to deepen their understanding of the structural, relational, and dynamic dimensions that underpin socio-ecological challenges.

The intended learning outcomes for Day 3 are situated within the broader domain of complexity sciences and participatory systems analysis. Specifically, the day aims to develop participants' competence in systems thinking – the ability to comprehend and model complex, interdependent systems, including feedback loops, emergent properties, and leverage points (Ellis, 2018; 3E Workshop Team 5; Cloud, 2016); ecosystem thinking – the capacity to recognise interdependencies and non-linear dynamics across ecological, economic, and social subsystems (Hodgson and Spours, 2016) and empathy – the skill of understanding and engaging

with the perspectives, needs, and emotions of stakeholders, thereby supporting inclusive and ethical decision-making processes (Guzmán et al., 2021; IEES Workshop Team 1).

To support these outcomes, the day employs an active and experiential learning paradigm (Ellis, 2018). Participants engage directly with real-world complexity through visual, dialogical, and reflective practices that integrate both analytical and affective dimensions of learning.

The theoretical foundations include key concepts from systems theory (Meadows, 2008), social-ecological systems frameworks (Manring, 2017; Ellis, 2018). These bodies of theory provide a scaffold for participants to explore how change processes unfold across interconnected domains and how interventions can be strategically positioned to maximise regenerative impact.

As with previous days, the programme opens with a “Coffee + Connect” session, followed by a group check-in and daily goal-setting exercise. This consistent rhythm reinforces the social learning environment and ensures continuity in group cohesion and shared purpose.

The first session centres on the question: “How is your vision embedded in complex systems?” Utilising the Systems Mapping tool, participants are guided through a process of visualising systemic relationships, identifying key variables, mapping causal loops, and uncovering leverage points (Lynch et al., 2021; Wilkerson and Trellevik, 2021). This activity enables learners to move from abstract visioning toward structural diagnostics, identifying both constraints and opportunities within the systems they seek to transform. As detailed earlier systems mapping has proven to be a suitable tool in entrepreneurship education, fostering both systems literacy and strategic foresight.

Building on it, the next session introduces the actor’s tree, a stakeholder-mapping tool that supports participants in identifying and classifying the actors, institutions, and networks operating within the mapped systems. Through this method, learners explore influence pathways, power dynamics, and collaboration potentials, deepening their understanding of multi-actor engagement in regenerative practice. This exercise is particularly relevant for designing inclusive interventions that are sensitive to local contexts and stakeholder agency.

Following the lunch break, a thematically aligned energizer called the systemic triangle is introduced. This interactive activity illustrates how small perturbations in one part of a system can propagate through the whole, demonstrating non-linear causality and interconnectedness in a tangible and engaging way. By embodying systems dynamics through play, the activity reinforces conceptual understanding through experiential immersion.

The afternoon continues with a peer feedback session, in which project teams are paired to provide formative critique on each other's systems maps and stakeholder analyses. This process is designed to elicit diverse perspectives, uncover blind spots, and stimulate collaborative insight. Peer review serves as a mechanism for reflective learning and contributes to the development of more resilient and contextually grounded systems interventions (Ahmed et al., 2024).

This is followed by a session entitled "Improve Your Knowledge on Stakeholders," wherein participants either conduct semi-structured interviews with real or simulated stakeholders or engage in desktop research to analyse existing stakeholder data. The goal of this session is to cultivate empirical inquiry skills and deepen participants' understanding of stakeholder roles, motivations, and systemic leverage. This exercise underscores the importance of evidence-based design and empathic inquiry in the field of regenerative approach in entrepreneurship.

The day concludes with an individual reflection session structured around the Inner Development Goals (IDGs) framework introduced earlier. Participants are invited to assess their personal growth in areas such as being, relating, thinking, collaborating, and acting, dimensions that are seen as foundational to leadership in societal transformations. This reflective integration helps learners internalise the day's insights and prepares them for the next phase of collaborative project development.

6.3.2.4 Day 4: Exploring Impactful Pathways

	Day 4
Dynamic Innovation Phase	**Phase 3 - Transform**
Topic	**Exploring Impactful Pathways**
Intended learning outcomes, including competencies and skills	**Change of perspective** [Developing the ability to see issues from different cultural, economic, and ecological viewpoints]
Teaching approaches and teaching methodologies	Transformative and Critical Learning, Practice-oriented and Applied Learning
Theoretical foundations and core content	Permaculture, Zero Impact Production, Regenerative Business Models
Tools	Ideation
Milestones	Ideas for alternative pathways identified by 12:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**
09:30- 10:45am	**Identifying alternative pathways** [Tool: **Ideation** to generate ideas on how to achieve the steps needed to achieve a regenerative future (from **back casting**), combined with systems thinking and stakeholder insights. This approach helps to align strategic actions with systemic dynamics and key actors, leading to more effective regenerative impact.]
10:45- 11:00am	**Elevenses Break**

11.00- 12:30pm	**Choosing the most impactful pathway** [Tool: I**mpact Staircases** to evaluate and prioritise potential actions based on their scalability, feasibility, and long-term impact, ensuring alignment with regenerative goals and maximising positive outcomes.]
12:30- 2:00pm	**Lunch Break**
2:00-5:15pm	**Getting to know Regenerative Initiatives** [Tool: **Ecofield trip** to visit regenerative initiatives such as permaculture initiatives to gain first-hand insights into real world regenerative practices and business models.]

Positioned at the midpoint of the international summer school, Day 4 transitions from systems analysis to the strategic exploration of regenerative interventions. Thematically anchored in exploring impactful pathways, this day leverages the foresight, systemic, and empathic capacities developed during the preceding sessions to empower participants to design and evaluate transformative actions aligned with regenerative principles.

The intended learning outcome of Day 4 centres on cultivating a change of perspective, a critical competency in regenerative leadership (IEES Workshop Team 1). This involves the ability to view challenges and opportunities through multiple cultural, ecological, and economic lenses, thereby expanding one's cognitive and ethical frame of reference. Such perspectival agility is essential for designing interventions that are not only effective but also inclusive and contextually appropriate.

The teaching approach guiding this day integrates both transformative and critical learning (Macintyre, 2019) as well as practice-oriented and applied learning (Manring, 2017). Transformative learning encourages deep shifts in participants' worldviews through reflection, dialogue, and confrontation with complexity. The emphasis on applied and practice-oriented learning supports the translation of theoretical insights into grounded, context-responsive action.

Theoretical foundations introduced throughout the day include permaculture design principles (Ellis, 2018), zero-impact production systems (Ellis, 2018), and regenerative business models

(Hahn and Tampe, 2021; 3E Workshop Team 3). These frameworks provide concrete examples of how ecological intelligence, circularity, and value creation can be integrated into enterprise design and community development.

Consistent with the learning rhythm established in previous days, Day 4 begins with a "Coffee + Connect" session followed by a daily check-in and articulation of learning goals. This routine supports continuity in group dynamics and ensures that the day's thematic and cognitive transitions are scaffolded through dialogue and intention-setting.

The first core session, entitled "Identifying Alternative Pathways," employs ideation techniques inspired by design thinking[49] to stimulate creative problem-solving and collaborative innovation. Drawing upon prior work in back casting (Day 2), systems mapping (Day 3), and stakeholder analysis, participants engage in an integrative ideation process to generate actionable ideas for achieving regenerative futures. This synthesis-oriented session reinforces the interdependencies of vision, system, and agency, aligning strategic action with structural realities and actor dynamics.

Building on the ideation process, the second session, "Choosing the Most Impactful Pathway", introduces the impact staircase framework (van Tulder et al., 2021). This evaluative tool enables participants to prioritise and refine their proposed interventions according to criteria such as scalability, feasibility, systemic leverage, and long-term impact. The Impact Staircase encourages strategic discernment, helping participants to assess which pathways are most likely to generate meaningful and sustained contributions to regenerative transitions.

Given the cognitive and emotional intensity of the first half of the programme, the afternoon is intentionally designed as a decelerated and immersive field-based experience (3E Workshop Team 1; 3E Workshop Team 3). Entitled "Getting to Know Regenerative Initiatives", this session takes the form of an ecofield trip to visit local regenerative enterprises, such as permaculture farms, ecological cooperatives, or zero-waste initiatives. These site visits offer

[49] Design Thinking is a human-centered, iterative problem-solving approach that fosters creativity, collaboration, and innovation introduced into entrepreneurship education primarily in the early 2000s and gained widespread adoption throughout the 2010s via David Kelley co-founded the Stanford d.school (Hasso Plattner Institute of Design at Stanford).

participants first-hand exposure to the realities of regenerative practice, including both inspirational models and the challenges of implementation.

This experiential component serves several teaching purposes: it grounds abstract concepts in real-world applications; it offers tacit knowledge and embodied learning; and it provides opportunities for dialogue with practitioners, further enriching participants' understanding of regenerative entrepreneurship in context (Ellis, 2018). By engaging with living examples of permaculture and regenerative design, participants witness how theory becomes practice, and how practice informs and transforms theory.

In this way, Day 4 acts as a pivotal bridge between analytical understanding and embodied engagement. It supports the integration of systems thinking with creative ideation and practical evaluation, preparing participants for the collaborative project work in the subsequent days. Importantly, it deepens participants' ability to navigate complexity with empathy, creativity, and critical realism, skills indispensable for leading societal transformation in uncertain times.

6.3.2.5 Day 5: Concept Creation and Testing

	Day 5
Dynamic Innovation Phase	**Phase 3 - Transform**
Topic	**Concept Creation and Testing**
Intended learning outcomes, including competencies and skills	**Democratic and open/direct decision-making ability** [Engaging in participatory governance and inclusive leadership], **Creativity skills** [Encouraging innovation and the ability to develop novel solutions]
Teaching approaches and teaching methodologies	Transformative and Inquiry-Based Learning
Theoretical foundations and core content	Biomimetic design, Industrial ecology, Co-Creation and Co-operation, Symbiosis
Tools	Prototyping and Feedback
Milestones	First prototype created by 12:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**
09:30- 10:45am	**Create your concept** [Tool: **Prototyping** based on identified pathways to develop and test tangible models or solutions (concepts), allowing participants to refine ideas, gather feedback, and iterate towards effective regenerative outcomes.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Continuation of Create your concept**
12:30- 2:00pm	**Lunch Break**

2:00-2:15pm	**Energizer** [Tool: **Marshmallow Challenge** to promote creativity, teamwork, and problem-solving, encouraging participants to experiment, fail, and iterate.]
2:15- 3:30pm	**Test your concept** [Tool: **Presentation/Testing** of concept to showcase where participants are heading, gathering peer feedback, input from coaches, the peer group, and experts.]
3:30-3:45pm	**Break**
3:45- 4:45pm	**Adjustment of concept** [Tool: **Feedback canvas** to refine and improve the concept to ensure it better aligns with regenerative goals, addresses potential gaps, and enhances its overall impact based on insights from peers, coaches, and experts.]
4:45- 5:15pm	Reflection of the day [Tool:IDGs]

As the international summer school moves into its final stages, Day 5 builds directly on the ideation and contextual engagement of Day 4, transitioning into the phase of conceptualisation and prototyping. With a focus on iterative design, testing, and participatory evaluation, this day marks a critical moment in which participants move from theoretical and exploratory work toward the articulation of tangible regenerative interventions.

The overall theme of the day, Concept Creation and Testing, reflects a teaching intention to foster both creative agency and collaborative rigor. Participants are invited to transform their visions and systemic insights into prototype solutions, integrating ecological principles, stakeholder input, and practical feasibility into coherent models for regenerative enterprise or initiative.

The intended learning outcomes include the development of two key competency areas: democratic and open decision-making, fostering the capacity to engage in inclusive governance structures, facilitate open dialogue, and make shared decisions with transparency and equity (3E Workshop Team 2) as well as creativity and innovation skills, enhancing the ability to

generate and refine novel solutions in response to complex challenges, with an emphasis on iterative development and experimentation (3E Workshop Team 1).

To support these outcomes, the teaching approach employed is rooted in transformative and inquiry-based learning (Macintyre, 2019). Theoretical foundations and core content include biomimetic design (Ellis, 2018), industrial ecology (Ellis, 2018), co-creation and co-operation (Ellis, 2018; 3E Workshop Team 1) and symbiosis (Ellis, 2018).

As with all previous days, Day 5 begins with a “Coffee + Connect” session, a group check-in, and the articulation of daily goals, sustaining the rhythm of reflective, community-based learning.

The morning session is fully dedicated to the process of “Create Your Concept”. Utilising prototyping methods, participants begin shaping their conceptual ideas, emerging from the prior ideation and impact pathway sessions, into tangible formats such as models, visualisations, service blueprints, or mock-ups. The process emphasises design thinking’s iterative loop of building, testing, and refining. This hands-on activity enables participants to experiment with form, function, and feasibility, while being encouraged to embrace failure as a learning tool and iterate continuously toward more effective solutions.

Following the lunch break, the group engages in a thematic energizer, the marshmallow challenge, a creativity-driven team activity in which participants build the tallest possible freestanding structure using limited materials, including a marshmallow. The exercise fosters collaborative creativity, prototyping under constraint, and resilience in failure, reinforcing the day’s focus on design iteration and team dynamics (Ellis, 2018; 3E Workshop Team 1; 3E Workshop Team 2; 3E Workshop Team 5).

The afternoon continues with the session “Test Your Concept,” during which project teams present and trial their prototypes. This takes place in a semi-public feedback format involving peer teams, assigned coaches, and invited experts. The objective is twofold: first, to communicate the conceptual clarity and regenerative intention of each prototype; and second, to gather multi-stakeholder input that will guide further refinement. The emphasis is not on perfection but on constructive dialogue and adaptive learning.

Following this, participants engage in the session “Adjustment of Concept”, utilising a classical feedback canvas[50] as a structured reflection tool. This method facilitates critical synthesis of the feedback received, helping participants to identify strengths, gaps, assumptions, and points of improvement in their emerging concepts. The emphasis here is on aligning each prototype more closely with regenerative goals, ensuring that ecological, social, and systemic dimensions are addressed with coherence and impact orientation.

The day concludes with a guided group reflection, drawing again on the Inner Development Goals (IDGs) framework mentioned before.

[50] A simple feedback canvas for testing a concept could include four sections: What worked well, What could be improved, Questions I have, and New ideas or suggestions.

6.3.2.6 Day 6: Business Modelling

	Day 6
Dynamic Innovation Phase	**Phase 4 - Create**
Topic	**Business Modelling**
Intended learning outcomes, including competencies and skills	**Peaceful problem-solving skills** [Addressing challenges through non-adversarial, constructive approaches]; **Critical thinking** [Evaluating information, questioning dominant narratives, and formulating independent judgments]
Teaching approaches and teaching methodologies	Outcome-driven Learning
Theoretical foundations and core content	Neoliberalism vs. Degrowth, Regenerative Business Models, History of Economy
Tools	Regenerative Business Principles Canvas
Milestones	Regenerative business model ready by 3:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**
09:30- 10:45am	**Learning about regenerative business approaches** [Tool: **World Café** to explore regenerative business models through real world case studies, group discussions, and interactive activities.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Regenerative Business Modelling** [Tool: **Regenerative Business Principles Canvas** to design business models, focusing on regeneration for long-term positive impact.]
12:30- 2:00pm	**Lunch Break**

2:00-2:15pm	**Energizer** [Tool: **Rock-paper-scissors tournament** to boost energy and fun on the next-to-last day.]
2:15- 3:30pm	**Continuation of Regenerative Business Modelling**
3:30-3:45pm	**Break**
3:45- 4:45pm	**Create your Fair Booth** [Tool: **Creative Expression** (Posters, Presentations, Role Play, Sculpture) to visually and interactively communicate your final concept.]
4:45- 5:15pm	Final Reflection of the week [Tool: IKIGAI from day 1]

Day 6 of the international summer school marks a significant shift from prototyping toward the strategic grounding of concepts within economic frameworks. Under the overarching theme of business modelling, participants engage in critical reflection and creative application to position their regenerative concepts within models that challenge conventional economic logics and support societal transformation. This day not only consolidates previous learnings but also deepens the participants' understanding of the socio-economic paradigms that frame and constrain regenerative action.

The intended learning outcomes of Day 6 focus on developing peaceful problem-solving skills and enhancing critical thinking. In this context, peaceful problem-solving entails navigating complexity, addressing conflicts, and resolving challenges through non-adversarial, constructive engagement, thereby cultivating collaborative environments that prioritise relational integrity and collective wellbeing (3E Workshop Team 2). Critical thinking, in turn, is essential for evaluating dominant narratives, especially those rooted in neoliberal economic ideologies, and for envisioning alternative trajectories rooted in equity, care, and long-term planetary health (3E Workshop Team 1).

The teaching approach employed on this day is grounded in outcome-driven learning, where participants are guided to make explicit connections between intended regenerative impacts and the business models needed to sustain them (IEES Workshop Team 4). This approach

emphasises the alignment between values, strategy, and structure, encouraging learners to build ventures that are not only innovative but also coherent with regenerative principles.

The theoretical foundations and core content for the day draw on an exploration of Neoliberalism (3E Workshop Team 2; 3E Workshop Team 3) versus Degrowth (Edwards, 2021; 3E Workshop Team 3), the history of economic thought, and emergent models of regenerative business. Through this lens, participants are introduced to critiques of extractive and growth-dependent systems, while simultaneously exploring visions of economy that prioritise ecological integrity, social justice, and intergenerational equity.

The day begins with the familiar ritual of "Coffee + Connect", followed by a group check-in and shared articulation of daily learning goals.

The first session, "Learning about Regenerative Business Approaches", is conducted in a world café format (Brown and Isaacs, 2005), fostering dynamic and participatory learning. Participants circulate through multiple discussion tables where they engage with case studies of existing regenerative enterprises, analyse the principles underpinning their success, and collectively interrogate what it means to conduct business in service of regeneration rather than extraction. The format encourages cross-pollination of ideas and ensures that all voices are heard, mirroring the pluralistic, democratic ethos at the heart of regenerative practice.

Building on this collective learning, participants then move into the session "Regenerative Business Modelling", where they begin designing their own business models using the Regenerative Business Principles Canvas[51]. This tool supports participants in mapping their concepts across multiple domains, including governance, stakeholder relationships, material flows, value creation, and impact measurement, while ensuring alignment with the ecological and social systems within which they are embedded. Rather than seeking scalability for its own sake, participants are encouraged to model enterprises that are context-sensitive, life-affirming, and resilient.

[51] In accordance with the traditional business model canvas, the Regenerative Business Principles Canvas is a custom-designed model based on the work of Hahn and Tampe (2021). Further information on the Business Model Canvas can be found in footnote 72.

Following the lunch break, the group engages in a light-hearted energizer, a Rock-Paper-Scissors Tournament, to recharge energy and build camaraderie. This moment of play also offers an embodied reminder of iterative learning, decision-making under uncertainty, and the importance of flexibility.

The afternoon is dedicated to continuing work on the regenerative business models, allowing time for iteration, coach feedback, and peer exchange. This deep dive fosters both rigor and creativity, ensuring that models are not only theoretically sound but also communicable and actionable.

The final session of the day is “Create Your Fair Booth”, in which participants use creative expression, such as posters, storytelling, visual installations, or role-play, to communicate their business concepts. This performative and expressive task serves as both a synthesis of prior work and a preparation for the closing fair. It invites participants to externalise their learning in multisensory, embodied ways that go beyond conventional business presentations, making the intangible values of regeneration visible and shareable (3E Workshop Team 1).

The day concludes with a personal reflection session using the IKIGAI framework, which was introduced during the early days of the international summer school. Participants return to their initial reflections on purpose, passion, and contribution, now informed by a rich journey of systemic exploration, experiential learning, and collaborative creation. In connecting their personal IKIGAI with the regenerative business models they have developed, participants are encouraged to integrate inner purpose with outer action, closing the loop between self, society, and system.

In this way, Day 6 acts as a critical bridge between ideation and implementation, individual reflection and collective articulation, preparing participants for the final day’s public engagement and celebration of learning.

6.3.2.7 Day 7: Concept Presentation

	Day 7
Dynamic Innovation Phase	**Phase 5 - Implement**
Topic	**Concept Presentation**
Intended learning outcomes, including competencies and skills	**Soft skills** [Strengthening interpersonal, adaptability, and communication skills to navigate complex environments]
Teaching approaches and teaching methodologies	Outcome-driven and Active Learning
Theoretical foundations and core content	Positive ecological reciprocity
Tools	Creative Expression
Milestones	Fair Booth ready by 12:30pm.
08:30- 09:00am	**Coffee + Connect**
09:00- 09:30am	**Check-in and Daily Goals**
09:30- 10:45am	**Continuation of Create your Fair Booth** [Tool: **Creative Expression** (Posters, Presentations, Role Play, Sculpture) to visually and interactively communicate your final concept.]
10:45- 11:00am	**Elevenses Break**
11.00- 12:30pm	**Continuation of Create your Fair Booth**
12:30- 2:00pm	**Lunch Break**
2:00-2:15pm	**Energizer** [Tool: **Appreciation Shower** to foster a supportive and uplifting environment, boosting team morale and bonding.]

2:15- 5:15pm	**Regenerative Fair for the Public** to engage the public, showcase regenerative concepts, and promote discussions on regenerative practices.

The final day of the international summer school, Day 7, marks the culmination of the learning journey, with the central focus on concept presentation. This day functions not only as a moment of consolidation and celebration but also as an important step in transitioning participants' ideas into public discourse and social engagement. The emphasis is placed on applied communication, creative articulation, and interpersonal resonance, as participants share their regenerative concepts in an open, participatory format.

The intended learning outcomes for Day 7 focus on the development and application of soft skills, including interpersonal communication, adaptability, and public engagement (IEES Workshop Team 1). These competencies are critical for navigating the uncertainties and relational complexities inherent in regenerative practice. The ability to present ideas compellingly, respond empathetically to diverse audiences, and foster constructive dialogue is as crucial to societal transformation as analytical or technical proficiency.

The teaching framework guiding this day is based on outcome-driven (IEES Workshop Team 4) and active learning (Ellis, 2018). Building on the preparatory and exploratory phases of the previous days, the focus shifts toward real-world application and the translation of regenerative principles into communicative action. Participants are invited to express not only the intellectual coherence of their models but also the affective, ethical, and relational dimensions that define regeneration.

In terms of theoretical foundations and content, the day draws upon the concept of positive ecological reciprocity, the idea that human interventions can be designed to restore, enhance, and co-evolve with ecological systems, rather than degrade them (Ellis, 2018). This notion encapsulates the spirit of regenerative entrepreneurship and underlines the need for solutions that are relational, responsive, and reparative.

The day opens, as with every day of the programme, with "Coffee + Connect", followed by a brief check-in and goal setting session.

The morning is then dedicated to the continuation and finalisation of the fair booths, in which participants use diverse forms of creative expression, including posters, multimedia presentations, sculptures, storytelling, and role-play, to visually and interactively communicate their regenerative concepts. These booths are not simply display tools, but immersive experiences that invite curiosity, provoke dialogue, and encourage embodied engagement with complex ideas. This extended timeframe allows teams to refine their messaging, rehearse their delivery, and collaborate closely with peers and coaches to ensure clarity, resonance, and impact.

Following the lunch break, a light-hearted and emotionally meaningful energizer, the appreciation shower, is conducted. In this activity, participants share words of gratitude and affirmation with one another, fostering a supportive, inclusive, and celebratory atmosphere. Beyond its emotional significance, this practice reinforces the values of recognition, relationality, and care.

The day culminates in the “Regenerative Fair for the Public”, a key moment of transition from internal reflection to external engagement. Open to local stakeholders, community members, experts, and curious visitors, the fair creates a platform for dialogue between learners and the broader public (Ahmed et al., 2024). It serves as both an exhibition space and a forum for exchange, where participants can receive real-world feedback, generate interest in their ideas, and potentially catalyse future collaborations (Ahmed et al., 2024). The event symbolises the permeability between learning environments and the world outside, underlining the international summer school’s commitment to praxis, community embeddedness, and societal transformation.

Although the formal programme ends with the public fair, the spirit of Day 7 extends beyond the temporal boundaries of the international summer school. It affirms the central message of the entire experience: that regeneration is not merely a conceptual framework, but a lived practice requiring courage, creativity, empathy, and sustained collective effort. Participants leave not only with refined concepts and expanded skill sets but with a renewed sense of purpose and connection, equipped to carry their insights forward into their personal and professional ecosystems.

6.4 Implications and Discussion

The third research chapter offered an initial attempt to define what constitutes regenerative approaches in entrepreneurship education. Embedding principles of regeneration and systems thinking enables entrepreneurship education to move beyond growth-centric paradigms toward models that foster social, ecological, and economic flourishing (Ellis, 2018; Hahn and Tampe, 2021; Macintyre, 2019). In such a paradigm, entrepreneurial practice does not merely avoid harm or maintain the status quo, it actively contributes to regenerating ecosystems, economies, and communities. This shift positions entrepreneurship as an agent of net-positive impact, a fundamentally different understanding of its role in society. It moves beyond *conventional sustainability approaches*, fostering a holistic understanding of sustainability that focuses on the regeneration of ecological and social systems (Ellis, 2018).

Rather than presenting a fixed model, this chapter outlines key elements that shape such a paradigm. Synthesised within the *Dandelion Collection*, the research identifies key elements such as content, teaching approach, roles, learning environments, and intended outcomes that foster regenerative approaches in entrepreneurship education.

Aligning with established theories on transformative learning, and systems thinking, the findings reinforce the argument that entrepreneurship education, including social and sustainable entrepreneurship, must extend beyond purely economic objectives (Ellis, 2018; Hahn and Tampe, 2021; Macintyre, 2019). Additionally, the *Dandelion Collection* echoes prior research emphasising systems thinking as a fundamental competence and a key component of effective regenerative-oriented education (Diepolder et al., 2021; Foucrier and Wiek, 2019; Lans et al., 2014).

The results further indicate that a regenerative approach to entrepreneurship education necessitates non-traditional teaching methods. Specifically, experiential learning (Ellis, 2018), real-world engagement, and practice-oriented, applied learning in collaboration with communities (Ahmed et al., 2024) emerge as crucial components. Additionally, interactive and participatory formats (Macintyre, 2019) contribute to fostering a holistic and impactful learning environment. However, these findings suggest that regenerative approaches in entrepreneurship education should not only focus on content and delivery but also on re-evaluating institutional structures and the evolving roles of educators (Ellis, 2018).

Despite these insights, certain limitations must be acknowledged. The study relies on workshop data and literature reviews, potentially introducing selection bias in the identification of teaching approaches and theoretical foundations. Moreover, the applicability of the requirement model may vary across different educational settings, necessitating further empirical validation. Feedback from the methodological process suggests that the model, in its current form, could benefit from greater structure and clarity, as its elements appear loosely clustered. Future refinements should focus on improving its practical application by offering a clearer structure for educators and learners while embedding the model within broader institutional and socio-ecological contexts.

To address this feedback, the methodological approach was supplemented with the *Comprehensive Framework for Entrepreneurship Education* proposed by Vallière et al. (2014), which offers a robust theoretical foundation and was employed to demonstrate the application of the model through a concrete educational framework, operationalised in the form of a seven-day international summer school.

However, sustaining engagement with regenerative approaches post-programme remains a challenge. Institutional integration, follow-up initiatives, and public engagement could enhance the long-term impact of such educational interventions. From a methodological perspective, the international summer school embraces a holistic and systemic approach, which inherently contradicts the expectation of producing concrete business ideas within a short timeframe, such as a one-week programme. This raises a broader question within entrepreneurship education: to what extent can systems thinking and regenerative approaches be meaningfully integrated into short-term programmes? Future research should explore strategies to sustain these approaches over time and embed them into long-term educational models.

Another critical gap identified in this work is the lack of systematic evaluation regarding whether learners truly acquire the intended competencies. While the educational design is carefully aligned with regenerative goals, its effectiveness in producing measurable learning outcomes has not yet been fully assessed. This raises a central question: How can complex, often intangible competencies, such as systems thinking, ecological empathy, or regenerative leadership, be meaningfully evaluated?

To address this, future programmes might integrate reflective assessment tools, such as learning journals, peer feedback, and portfolio work, supported by qualitative input from facilitators and

external partners. These methods are better suited to capturing personal development, systems understanding, and relational learning than traditional exams or rubrics. Additionally, implementing competency-based self-assessment frameworks, ideally co-created with learners, could enhance both transparency and learner ownership of the educational process.

Looking ahead, future research should prioritise the empirical validation and refinement of regenerative education frameworks, while also exploring strategies for embedding regenerative approaches in entrepreneurship more deeply into mainstream educational contexts. By addressing these open questions and implementation barriers, regenerative approaches in entrepreneurship education can become a powerful contributor to both entrepreneurial innovation and broader societal transformations.

Summing up, this research underscores the need to rethink entrepreneurship education through integrating regenerative approaches and systems thinking perspectives. The proposed requirement model and international summer school programme offer innovative pathways for achieving this goal, yet challenges remain.

7 Points for Discussion and Future Research

This chapter builds on the insights developed throughout this dissertation by elaborating personal and methodological reflections, as well as on key discussion points and opportunities for future research. It serves as a complement to the implications and discussions already provided at the end of each individual research chapters.

7.1 My Role as a Researcher

As a researcher, I am continually challenged to balance the rigor and relevance of my work. The initial motivation for undertaking this PhD stemmed from a clearly identified point of relevance as stated in the introduction. Accordingly, throughout the course of this research, the emphasis has occasionally shifted more towards relevance than rigor. This shift can be attributed to my concurrent role as an educator, which has grounded my work in practical experience.

To address potential criticisms regarding this, I have engaged in critical reflection and conducted feedback sessions with colleagues to explore how greater rigor could be integrated into the research. As a result, the section on theoretical context was further developed and elaborated to strengthen its academic foundation. In addition, all methodological approaches employed in this research were conducted rigorously and systematically, following established research criteria such as reliability, replicability, and validity.

However, I believe that no research can ever be replicated in exactly the same way. Even if the same method is applied, the context, the researchers involved, and other surrounding conditions inevitably differ from one study to another. This means that achieving absolute rigor is not fully possible, as the uniqueness of each research situation limits exact reproducibility. Nevertheless, maintaining a conscious balance between methodological rigor and practical relevance remained a central and continuous aim throughout my dissertation.

My dual role as both educator and researcher has inevitably influenced the selection, interpretation, and framing of the research. This positionality introduces a degree of bias, particularly in how problems are identified, how data is interpreted, and which aspects are prioritised. My close involvement in educational practice, while enriching the research with practical insights, also increases the risk of subjective assumptions shaping the analysis.

To critically engage with this issue, I have actively incorporated reflexive practices throughout the research process. This includes regular reflection on my own positionality, as well as structured feedback sessions with academic colleagues, practitioners, and members of the broader community. These discussions have served as an important corrective mechanism, helping to identify potential blind spots, challenge assumptions, and strengthen the objectivity and rigor of the work. By embracing feedback from diverse perspectives, I have aimed to balance personal experience with academic scrutiny and thereby enhance the credibility and validity of the research.

7.2 Strucutral and Methodological Considerations

As stated earlier, the dissertation adopts an unconventional three-part structure of research chapters, which forms an integral component of its overarching methodological approach. This structure reflects the dissertation's original conception as a cumulative dissertation consisting of three interconnected research contributions that build sequentially on one another. Each chapter extends the insights of the previous one, with the third and final one reflecting the most advanced stage of the research process and integrating the fullest scope of knowledge developed over the course of the dissertation. Due to administrative constraints, this cumulative format was later adapted, following consultation with senior staff of the PhD programme (Prof. Slavica Singer, Ph.D., Professor Emeritus, UNESCO Chair in Entrepreneurship Education, J.J. Strossmayer University in Osijek), into a monograph that preserves the coherence and holistic ambition of the overall research endeavour.

In addition to being included in this dissertation, the research contributions have either been presented at academic conferences or published. This approach has not only increased the visibility and dissemination of the research but has also enhanced its academic relevance by integrating feedback from the scholarly community throughout the development of the dissertation.

It can be reflected that each research contribution places emphasis on different aspects, which is evident in their varying structures. In some research chapters, the introduction is more detailed, while in others the focus lies more heavily on the results section or on examples of how the method has been applied in other contexts. This variation is due to the originally intended cumulative design of this dissertation with three interlinked research chapters, each with its own thematic priorities and formal requirements. Therefore, the heterogeneity among

the research chapters is not a sign of inconsistency but rather reflects the diversity of the underlying sources and the specific relevance of certain aspects in each case.
To address this concern and ensure that the three research chapters are meaningfully connected through a common research agenda, the dissertation includes several integrative components that apply across all three chapters. These consist of an overarching introduction, a comprehensive theoretical context and literature review, a detailed explanation of the methodological approach, an integrated discussion with directions for future research, and a concluding chapter. Collectively, these elements establish a coherent and unified narrative for the dissertation.

In terms of the methodological strategy of this dissertation, all three research chapters applied a qualitative approach to answer the research question(s). While this allowed for a rich, in-depth exploration of the research question(s), it also invites reflection on methodological limitations. A potential improvement for future research could be the integration of quantitative methods to complement the qualitative findings, such as pre- and post-assessments through learner questionnaires or surveys.
In addition, the research draws primarily on workshop data and literature reviews, which, as highlighted earlier in the respective research chapter section “Implications and Discussion”, may introduce selection bias.

7.3 Scientific Contributions from a Content Perspective

The following paragraph revisits and reflects on the overall scientific contributions from a content perspective culminating in the *Dandelion Collection* and its application in form of the *Seven-day International Summer School on Regenerative Approaches in Entrepreneurship*. Although these contributions were already outlined in the “Implications and Discussion” section of the third research chapter, they are examined here once more.

The *Dandelion Collection* included in this dissertation, which is based on the foundational work of Gailly (2008) and Gedeon (2014), offers a rich set of concepts, practices, and illustrative examples. However, it should be acknowledged that the requirement model currently functions more as a loosely connected collection of ideas rather than a fully coherent or systematically integrated educational model. The relationships between its components are often implicit, which may reduce clarity and limit its practical applicability for educators seeking structured

guidance. While the selection of elements is grounded in literature and empirical insights, the arrangement may appear somewhat ad hoc, reflecting thematic aggregation rather than a unified instructional design. To address this, the *Comprehensive Framework for Entrepreneurship Education* by Valliere et al. (2014) was chosen to inform the design decisions for the international summer school curriculum. Nonetheless, there remains potential to incorporate additional frameworks in the future.

This tension, between the holistic ambitions of regenerative approaches in entrepreneurship education and the conventional structure of the requirements model, raises a broader question about whether it may require fundamentally different educational architectures.

7.4 Empirical and Institutional Challenges

Despite increasing interest in regenerative and systems-oriented approaches, empirical research in this field remains limited. Short-term interventions such as international summer schools provide valuable insights but cannot reliably indicate long-term shifts in behaviour, mindset, or entrepreneurial practice. This raises concerns about the capacity of isolated programmes to foster regenerative approaches without deeper institutional integration. Higher education institutions (HEIs) must therefore be understood not only as providers of individual courses but as potential agents of societal transformation. Achieving this requires structural change: interdisciplinary learning environments, stronger engagement with local communities, and institutional cultures that embody regenerative values. These challenges also provoke deeper questions regarding the contemporary relevance of universities, the compatibility of regenerative aims with dominant capitalist logics, and the role of entrepreneurship education within such systems. A paradigm shift may need to start far earlier in the educational trajectory, potentially in schools or even early childhood education, where foundational worldviews and values take shape.

7.5 Broader Conceptual Reflections and Future Research Directions

This dissertation raises a range of conceptual questions that extend beyond its empirical scope but are crucial for future scholarship. Regeneration risks becoming a buzzword, much like “sustainability”, if not grounded in clear theory and rigorous application. Values and worldviews are deeply context-dependent, suggesting that no universal regenerative approach

or framework can be imposed across cultural or institutional settings. This invites further inquiry into whether regeneration is the appropriate paradigm, whether alternatives may emerge, and how regenerative values intersect with existing economic systems. The roles of technology, artificial intelligence, and new forms of value creation also require further exploration. Finally, educators play a central role as regenerative approaches depend on intrinsic motivation, authenticity, and the capacity to model values in environments that may not naturally support them as the research has shown. This raises questions about academic responsibility, the need for more radical institutional thinking, and the role of policy in enabling transformative education.

Future research should concentrate on further developing and empirically validating the emerging requirement model for regenerative approaches in entrepreneurship education. Longitudinal studies are essential for understanding how regenerative approaches evolve and how they influence learners' actions and decision-making beyond the classroom. Comparative studies across cultural and institutional contexts can illuminate how regenerative approaches can be embedded effectively in diverse HEI environments. Moreover, research should explore the lived experiences of learners and educators, examining the emotional, relational, and reflective dimensions of regenerative learning. Further investigation into interdisciplinary collaboration, institutional support structures, and policy frameworks will help clarify conditions for effective implementation and scalability. Such research is necessary to advance a more coherent, context-sensitive, and practically grounded understanding of how transformative learning environments can be designed and sustained. This perspective aligns with critiques of the fragmented, siloed teaching practices still prevalent in many institutions. As Singer (2020) and others have argued, overcoming disciplinary boundaries is essential to cultivating the integrative and polymathic thinking required for meaningful change in both education and society at large.

However, this dissertation only marks the beginning of my broader research journey. I acknowledge that the work presented here contains limitations, blind spots and areas requiring further development. However, over the course of this PhD, which officially began in May 2023, I have observed a growing alignment between my initial motivations and the emerging academic discourse. An increasing number of researchers are recognising the need to move beyond *conventional sustainability approaches* towards regenerative approaches in entrepreneurship education (Ellis, 2018; Macintyre, 2019, Hahn and Tampe, 2021) resulting in

a new paradigm. This includes rethinking what, how and why we teach in entrepreneurship education, potentially calling into question subject-based, compartmentalised learning and inviting more transdisciplinary, holistic teaching rooted in real-world complexity.

8 Conclusion

Reflecting on the overarching vision of this dissertation, one that reimagines entrepreneurship as a force for regeneration and positions entrepreneurial practice as an active contributor to net-positive ecological and social outcomes, it becomes clear that realising such a paradigm requires a profound transformation in how entrepreneurship education is conceptualised and delivered.

Importantly, this vision is neither abstract nor unattainable. Rather, it is already emerging through incremental yet meaningful developments. Several scholars (e.g. Banerjee et al., 2021; Branzei, 2021; Das and Bocken, 2024; Guzman et al., 2021; Hahn and Tampe, 2021; Ellis, 2018; Lynch et al., 2021; Muñoz et al., 2024) have articulated and advanced regenerative approaches that challenge dominant growth-oriented paradigm of entrepreneurship. The empirical findings of this dissertation further demonstrate that this shift is already underway.

The first research paper shows that systems thinking perspectives are embedded across many social and sustainable entrepreneurship competency frameworks enabling learners to see and understand interconnections, feedback loops, and unintended consequences for addressing socio-ecological challenges with entrepreneurial means. Building on this foundation, the second research paper highlights a growing range of educational tools that help bridge the persistent knowledge–action gap in entrepreneurship education. Finally, the third research chapter introduces the *Dandelion Collection* and demonstrates the application of the model through a concrete educational framework, operationalised as a seven-day international summer school, thereby providing strong evidence that a coherent educational framework has been established as a first step toward regenerative approaches in entrepreneurship education. This framework integrates key elements, including curriculum content, teaching methods, educator roles, learning environments, and intended learning outcomes.

At the same time, the limitations of *conventional sustainability approaches*, still largely tied to economic growth, efficiency, and individual opportunity, underscore the urgency of adopting paradigms that are systemic, integrative, and deeply attuned to social–ecological challenges (Brentnall and Higgins, 2024; Ellis, 2018; Hahn and Tampe, 2021; Lynch et al., 2021). Grounded in transformative learning theory and systems thinking, this dissertation provides both a theoretical and empirical foundation for advancing entrepreneurship education toward

regenerative approaches, particularly within the domains of social and sustainable entrepreneurship. The findings confirm that such a transition is not only necessary, but also feasible. As demonstrated in the final research chapter, the scholarly literature already offers clear guidance on the educational conditions required to support this transformation.

Embedding principles of regeneration and systems thinking enables entrepreneurship education to move beyond growth-centric paradigms toward models that foster social, ecological, and economic flourishing (Ellis, 2018; Hahn and Tampe, 2021; Macintyre, 2019). In such a paradigm, entrepreneurial practice does not merely avoid harm or maintain the status quo, it actively contributes to regenerating ecosystems, economies, and communities. This shift positions entrepreneurship as an agent of net-positive impact, a fundamentally different understanding of its role in society.

However, realising this vision demands more than new educational or curricular reforms, it requires a profound value shift. It necessitates redefining what entrepreneurship is for, and which forms of value creation merit societal recognition. This dissertation demonstrates the imperative to move beyond profit as the dominant metric and toward viewing entrepreneurship as a practice capable of regenerating the social-ecological systems on which all economies depend. Recognising and acting on this value shift remains one of the greatest challenges ahead.

This shift requires the involvement of educators, institutions, policymakers, researchers and practitioners. Educators can incorporate regenerative approaches and systems thinking into curricula, modelling these values in their daily practice. Institutions should reward transformative learning approaches and foster interdisciplinary, community-engaged learning. Policymakers can align educational strategies with regenerative goals and enable long-term collaboration across sectors. Researchers can deepen theoretical and empirical understanding, particularly around assessment, competencies, and institutional change. Practitioners and learners can challenge dominant business norms, explore regenerative models, and pursue entrepreneurial practice that regenerate ecological and social systems.

As an educator myself, I would like to highlight that educators must play a pivotal role in enabling this paradigm shift. Their leadership, courage, and willingness to embody regenerative approaches in both their teaching and everyday academic practice are essential. While institutional structures, policy makers, and societal actors all influence what is possible, higher

education, particularly in the German context, with its substantial academic freedom, provides a protected space in which such change can be initiated and modelled. Educators must therefore act as exemplary, co-learning with their students and demonstrating in practice what regenerative approaches in entrepreneurship can look like.

Evidence from emerging regenerative business practices outside academia (Hahn and Tampe, 2021) shows that this shift is already underway in the real world. Yet higher education often lags behind these developments. This dissertation thus calls upon educators, institutions, and policymakers to ensure that future entrepreneurs are prepared to operate not against, but in alignment with, the social-ecological systems that sustain us. Reconceptualising entrepreneurship as a contributor to solving socio-ecological challenges, rather than a driver of them, is imperative.

Ultimately, this dissertation seeks to contribute meaningfully to the paradigm shift required at this critical moment, one that reimagines entrepreneurship as a force for regeneration, and positions entrepreneurial practice as an active agent in generating net-positive impacts on ecological and social systems. The *Dandelion Collection* and its illustrated application in the form of a seven-day international summer school represent an initial step toward translating this emerging paradigm into a tangible and lived reality within entrepreneurship education and practice.

9 Literature

Ahmed, M.M., Roholt, R.V.L., Catalano, J.M., **2024**. An Upside-Down Approach to Social Innovation at Institutions of Higher Education. Nonprofit and Social Economy. https://anserj.ca/index.php/cjnser/article/view/662.

Amatucci, F.M., Pizarro, N., Friedlander, J., **2013**. Sustainability: A Paradigmatic Shift in Entrepreneurship Education. New England Journal of Entrepreneurship, 16(1). https://digitalcommons.sacredheart.edu/neje/vol16/iss1/3.

Anbarasan, P., Sushil, P., **2019**. Stakeholder engagement in sustainable enterprise: Evolving a conceptual framework, and a case study of ITC. Bus. Strategy Environ, 27, 282–299; https://doi.org/10.1002/bse.1999.

Aria, M., Cuccurullo, C., **2017**. bibliometrix: An R-tool for comprehensive science mapping analysis, Journal of Informetrics, Elsevier, 11(4), pp 959-975.

Atiq, M., Karatas-Özkan, M., **2013**. Sustainable corporate entrepreneurship from a strategic corporate social responsibility perspective. Int. J. Entrep. Innov., 14, 5–14; https://doi.org/10.5367/ijei.2013.0102.

Austin, J., Stevenson, H., Wei–Skillern, J., **2006**. Social and Commercial Entrepreneurship: Same, Different, or Both? Entrep. Theory Pract., 30(1), 1-22; https://doi.org/10.1111/j.1540-6520.2006.00107.x.

Aoustin, E., **2023**. Regenerative leadership: what it takes to transform business into a force for good, Field Actions Science Reports, Special Issue 25, 2023, 92-97.

Bacigalupo, M., Kampylis, P., Punie, Y., Van den Brande, G., **2016**. EntreComp: The Entrepreneurship Competence Framework. Luxemb. Publ. Off. Eur. Union, EUR 27939 EN, https://data.europa.eu/doi/10.2791/160811.

Baggen, Y., Lans, T., Gulikers, J., **2021**. Making Entrepreneurship Education Available to All: Design Principles for Educational Programs Stimulating an Entrepreneurial Mindset. Entrep. Educ. Pedagogy, 5(3), 347-374; https://doi.org/10.1177/2515127420988517.

Banerjee, S.B., Jermier, J.M., Peredo, A.M., Perey, R., **2021**. Theoretical perspectives on organizations and organizing in a post-growth era. Sage. https://doi.org/10.1177/1350508420973629.

Baran, G., **2020**. Design science approach in education management, INTED2020 Proceedings, pp.8721-8727, https://doi.org/10.21125/inted.2020.2375.

Barth, M., Godemann, J., Rieckmann, M., Stoltenberg, U., **2007**. Developing key competencies for sustainable development in higher education, International Journal of Sustainability in Higher Education. Edited by M. Adomssent, 8(4), pp. 416–430. https://doi.org/10.1108/14676370710823582.

Battistoni, C., Giraldo Nohra, C., Barbero, S., **2019**. A Systemic Design Method to Approach Future Complex Scenarios and Research Towards Sustainability: A Holistic Diagnosis Tool. Sustainability 2019, 11, 4458.

Benessaiah, E., **2021**. Crisis, transformation, and agency: Why are people going back-to-the-land in Greece?, https://doi.org/10.1007/s11625-021-01043-5.

Bianchi, G., Pisiotis, U., Cabrera Giraldez, M., **2022**. GreenComp. The European sustainability competence framework. Publications Office of the European Union: Luxembourg. https://publications.jrc.ec.europa.eu/repository/handle/JRC12804.

Biberhofer, P., Lintner, C., Bernhardt, J., Rieckmann, M., **2019**. Facilitating Work Performance of Sustainability-Driven Entrepreneurs through Higher Education: The Relevance of Competencies, Values, Worldviews and Opportunities, Int. J. Entrep. Innov. 2019, 20, 21–38.

Biggs, John B., Tang, C.K.C Kim Chow., **2011**. Teaching for quality learning at university: what the student does. Maidenhead: McGraw-Hill. ISBN 9780335242757.

Birney, A., Cubista, J., Papi-Thornton, D., Winn, L., **2019**. Systems change education in an innovation context. New Haven: Forum for the Future/School of System Change/Systems-led Leadership/Evolutions Lab, Available at: https://systemschangeeducation.com/wp-content/uploads/2019/04/Systems-Change-Education-Report-daniela_papi.pdf (last accessed on 29/08/2023).

Bischoff, K., Volkmann, C.K., **2018**. Stakeholder support for sustainable entrepreneurship-a framework of sustainable entrepreneurial ecosystems. Int. J. Entrep. Ventur., 10, 172–201; https://doi.org/10.1504/IJEV.2018.092714.

Booth, A., Sutton, A., Clowes, M., Martyn-St James, M., **2022**. Systematic approaches to a successful literature review, Third edition. Los Angeles: SAGE.

Brown, J., Isaacs, D., **2005**. The World Café: Shaping Our Futures Through Conversations That Matter. San Francisco: Berrett-Koehler Publishers.

Braun, V., Clarke, V., **2006.** Using thematic analysis in psychology**.** Qual. Res. Psy. 3(2):77-10. https:/doi.org/10.1191/1478088706qp063oa.

Braun, V., Clarke, V., **2012**. Thematic analysis. In APA handbook of research methods in psychology, H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, and K. J. Sher, Eds.; American Psychological Association: Washington, DC, USA, Vol. 2, pp. 57-71.

Brentnall, C., Higgins, D., **2024**. Entrepreneurship Educators in an Age of Climate and Ecological Breakdown. Entrep. Educ. Pedagogy 25151274241277828. https://doi.org/10.1177/25151274241277828.

Buckton, S.J., Fazey, I., Sharpe, B., Om, E.S., Doherty, B., **2023**. The Regenerative Lens: A conceptual framework for regenerative social-ecological systems. One Earth. Good Shift Publications.

Burkett, I., **2024**. Learning Towards Zero: Learning in and from Practice in Systems Innovation.

Cai, Y., Ahmad, I., **2023**. From an Entrepreneurial University to a Sustainable Entrepreneurial University: Conceptualization and Evidence in the Contexts of European University Reforms. High. Educ. Policy.**,** 36, 20–52; https://doi.org/10.1057/s41307-021-00243-z.

Chaker, H., Jarraya, H., **2021**. Combining teaching "about" and "through" entrepreneurship: A practice to develop students' entrepreneurial competencies. Ind. High. Educ, 35, 432-442; https://doi.org/10.1177/0950422221991005.

Chaplin, G., Wyton, P., **2014**. Student engagement with sustainability: understanding the value–action gap. Int. J. Sustain. High. Educ.**,** 15, 404-417; https://doi.org/10.1108/IJSHE-04-2012-0029.

Das, A., Bocken, N., **2024**. Regenerative business strategies: A database and typology to inspire business experimentation towards sustainability. Sustain. Prod. Consum. 49, 529–544. https://doi.org/10.1016/j.spc.2024.06.024.

Dentoni, D., Blok, V., Lans, T., Wesselink, R., **2012**. Developing human capital for agri-food firms' multi-stakeholder interactions, International Food and Agri-business Management Review 15, 61e68.

Derre, B., Baggen, Y., **2025**. Empowering the Next Generation of Entrepreneurial Change Agents: A Design Science Approach to Transforming Entrepreneurial Education. Springer Cham, https://doi.org/10.1007/978-3-031-82251-3.

Diepolder, C.S., Weitzel, H., Huwer, J., **2021**. Competence Frameworks of Sustainable Entrepreneurship: A Systematic Review, Sustainability, 13(24), p. 13734; https://doi.org/10.3390/su132413734.

Dimov, D., Johnsen, C.G., Meier Sørensen, B., **2025**. The future within: Commitment, hope, and values in entrepreneurship, Journal of Business Venturing Insights, Volume 23, https://doi.org/10.1016/j.jbvi.2025.e00543.

Duarte Dias, B., **2018**. Regenerative development - Building evolutive capacity for healthy living systems. Int. J. Des. Nat. Ecodynamics. https://doi.org/10.2495/DNE-V13-N3-315-323.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., **2021**. How to conduct a bibliometric analysis: An overview and guidelines, Journal of Business Research, 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070.

Dunne, A., Raby, F., **2013**. Speculative Everything: Design, Fiction and Social Dreaming, The MIT Press.

Du Plessis, C., **2012**. Towards a regenerative paradigm for the built environment. Building Research and Information, Volume 40, 2012 - Issue 1: Regenerative design and development, 40, p. 7–22.

Edwards, M.G., **2021**. The growth paradox, sustainable development, and business strategy. Bus. Strategy Environ. https://doi.org/10.1002/bse.2790.

Elkington, J., **1997**. Cannibals with forks: The triple bottom line of 21st century business. Oxford: Capstone Publishing.

Ellis, N.R., **2018**. Beyond Mechanism: An Organicist Business Education for the Anthropocene. CSR Sustain. Ethics Gov. https://doi.org/10.1007/978-3-319-71449-3_2.

Estrada, E., **2023**. What is a Complex System, After All?. Foundations of Science .https://doi.org/10.1007/s10699-023-09917-w.

Etzkowitz, H., Leydesdorff, L., **1998**. The endless transition: A 'Triple Helix' of university industry government relations. Minerva, 36, 203–208; https://doi.org/10.1023/A:1017159001649.

European Commission, Directorate-General for Research and Innovation - Georghiou, L., **2018**. A European ecosystem for social innovation. Publications Office: Luxembourg.https://data.europa.eu/doi/10.2777/51734.

Fayolle, A., Gailly, B. **2008**. From craft to science: teaching models and learning processes in entrepreneurship education. Journal of European Industrial Training 32(7): 569-593.

Fayolle, A., Gailly, B. **2015**. The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. Journal of Small Business Management, 53(1), 75–93. https://doi.org/10.1111/jsbm.12065.

Filser, M., Kraus, S., Roig-Tierno, N., Kailer, N., Fischer, U., **2019**. Entrepreneurship as catalyst for sustainable development: Opening the black box. Sustainability, 11(16), 4503. https://doi.org/10.3390/su11164503.

Folke, C., Hahn, T., Olsson, P., **2005**. Adaptive governance of social-ecological systems. Annual Review of Environment and Resources 30(1): 441–473.

Foucrier, T., Wiek, A., **2019**. A Process-Oriented Framework of Competencies for Sustainability Entrepreneurship. Sustainability, 11, 7250; https://doi.org/10.3390/su11247250.

Freire, P., **1970**. Pedagogy of the Oppressed. New York: Continuum.

García-Feijoo, M., Eizaguirre, A., Rica-Aspiunza, A., **2020**. Systematic Review of Sustainable-Development-Goal Deployment in Business Schools, Sustainability, 12, 440. https://doi.org/10.3390/su12010440.

Gedeon, S. **2014**. Application of best practices in university entrepreneurship education: Designing a new MBA program. European Journal of Training and Development, 38(3), 231–253. https://doi.org/10.1108/EJTD-05-2013-0058.

Geschwind, L., Kekäle, J., Pinheiro, R., Sørensen, M.P., **2019**. Responsible Universities in Context. In The Responsible University: Exploring the Nordic Context and Beyond; Sørensen, M.P., Geschwind, L., Kekäle, J. Pinheiro, R., Eds.; Palgrave Macmillan: London, 2019; pp. 3-29; https://doi.org/10.1007/978-3-030-25646-3_1.

Geels, F. W., **2004**. From sectoral systems of innovation to socio-technical systems. Insights about dynamics and change from sociology and institutional theory. Research Policy 33: 897–920.

Gibbons, L.V., **2020**. Regenerative, The New Sustainable, Sustainability, 12(13), p. 5483. https://doi.org/10.3390/su12135483.

Gümüsay, A.A., Reinecke, J., **2022**. Researching for Desirable Futures: From Real Utopias to Imagining Alternatives. J. Manag. Stud. 59, 236–242. https://doi.org/10.1111/joms.12709.

Guzmán, C., Potter, T., Aguirre, A.A., Astle, B., **2021**. The planetary health education framework. Planet. Health. https://www.academia.edu/download/96173855/Ed_Framework_Web.pdf__filename_UTF-8Ed_Framework_Web.pdf.

Hahn, T., Tampe, M., **2021**. Strategies for regenerative business. Strateg. Organ. 19, 456–477. https://doi.org/10.1177/1476127020979228.

Hall, D. A., Rangunathan, T., Tan, Y. S., Wong, L. W. L., Dass, S. C., Low, J., Al-Atabi, M. **2023**. Impact of defining ikigai in developing future-ready university graduates with self-leadership skills: A whole university mixed-methods study during Covid-19. Asia Pac. J. Educ. 2023, 43(3), 660-691. https:/doi.org/10.1080/02188791.2023.2231645.

Harzing, A-W., Alakangas, S., **2016**. Google Scholar, Scopus and the Web of Science: a longitudinal and cross-disciplinary comparison, Scientometrics 106, 787–804, https://doi.org/10.1007/s11192-015-1798-9.

Harzing, A.-W., **2020**. Publish or Perish User's Manual, Available online: https://harzing.com/resources/publish-or-perish/manual/ using/query-results/accuracy, last accessed on 07/01/2024.

Hermann, R.R., Bossle, M.B., **2020**. Bringing an entrepreneurial focus to sustainability education: A teaching framework based on content analysis, J. Cl. Prod., 246, 119038. https://doi.org/10.1016/j.jclepro.2019.119038.

Hesselbarth, C., Schaltegger, S., **2014**. Educating change agents for sustainability – learnings from the first sustainability management master of business administration, J. Clean. Prod. 62, pp. 24–36; https://doi.org/10.1016/j.jclepro.2013.03.042.

Hevner, A., **2007**. A Three Cycle View of Design Science Research Scandinavian Journal of Information Systems, 87–92.

Hossain, N., Dayarathna, V., Nagahi, M., Jaradat, R., **2020**. Systems Thinking: A Review and Bibliometric Analysis, Systems 2020, 8, 23. https://www.mdpi.com/2079-8954/8/3/23.

Iacovidou, E., Hahladakis, J. N., Purnell, P., **2021**. A systems thinking approach to understanding the challenges of achieving the circular economy. Environ. Sci. Pollut. Res. Int, 28, 24785-24806; https://doi.org/10.1007/s11356-020-11725-9.

Inayatullah, S. **2008**. Six Pillars: Futures Thinking for Transforming. Foresight, 10(1), 4–21. https://doi.org/10.1108/14636680810855991.

Joensuu-Salo, S., Viljamaa, A., Varamäki, E., **2022**. Testing the EntreComp framework and its relation to start-up behaviour in seven European countries. J. Small Bus. Enterpr. Dev. 29, pp. 920-939. https://doi.org/10.1108/JSBED-04-2021-0156.

Katzenbach, J.R., Smith, D.K., **2008**. The Discipline of Teams; Harv. Bus. P.: Brighton, MA, USA.

Klapper, R. G., Fayolle, A., **2023**. A transformational learning framework for sustainable entrepreneurship education: The power of Paulo Freire's educational model. The International Journal of Management Education. https://doi.org/10.1016/j.ijme.2022.100729.

Kolb, M., Fröhlich, L., Schmidpeter, R., **2017**. Implementing sustainability as the new normal: Responsible management education – From a private business school's perspective, The

International Journal of Management Education, 15(2), pp. 280–292. https://doi.org/10.1016/j.ijme.2017.03.009.

Korsgaard, S. T., **2007**. Social Constructionism: And Why it Should Feature in Entrepreneurship Theory. Aarhus Sch. Bus., Aarhus University, CORE - Cent. Organ. Ren. Evol.

Krah, J.M., Reimann, J., Molitor, H., **2021**. Sustainability in Brandenburg Study Programs. Perspectives for Anchoring Sustainability in Higher Education Curricula. Sustainability 13, 3958. https://doi.org/10.3390/su13073958.

Krawczyk-Bryłka, B., Stankiewicz, K., Ziemiański, P., and Tomczak, M. T., **2020**. Effective collaboration of entrepreneurial teams, implications for entrepreneurial education. Educ. Sci., 10(12), 364. https://doi.org/10.3390/educsci10120364.

Krueger, N. F., Hansen, D. J., Treffers, T., Welsh, D. H. B., **2011**. Thinking "Sustainably": The Role of Intentions, Cognitions, and Emotions in Understanding New Domains of Entrepreneurship, Social and Sustainable Entrepreneurship (Advances in Entrepreneurship, Firm Emergence and Growth), 13, 275–309. https://doi.org/10.1108/S1074-7540(2011)0000013014.

Lambrechts, W., Mulà, I., Ceulemans, K., Molderez, I., Gaeremynch, V., **2013**. The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management, Journal of Cleaner Production, 48, pp. 65–73. https://doi.org/10.1016/j.jclepro.2011.12.034.

Lans, T., Blok V., Wesselink, R., **2014**. Learning apart and together: towards an integrated competence framework for sustainable entrepreneurship in higher education. J. Clean. Prod. 62, 37-47; https://doi.org/10.1016/j.jclepro.2013.03.036.

Lazar, M., Miron-Spektor, E., Agarwal, R., Erez, M., Goldfarb, B., Chan, F., **2020**. Entrepreneurial Team Formation. Acad. Manag. Ann. 14, 1–77. https:/doi.org/10.5465/annals.2017.0131.

Lindgren, M., Packendorff, J., **2009**. Social constructionism and entrepreneurship: Basic assumptions and consequences for theory and research. Int. J. Entrep. Beh. Res.15(1):25-47 https://doi.org/10.1108/13552550910934440.

Linnér, B.-O., Wibeck, V., **2019**. Sustainability Transformations: Agents and Drivers across Societies, Cambridge University Press. doi:10.1017/ 9781108766975.

López-Núñez, M.I., Rubio-Valdehita, S., Armuña, C., Pérez-Urria, E., **2022**. EntreComp Questionnaire: A Self-Assessment Tool for Entrepreneurship Competencies. Sustainability 14, 2983. https://doi.org/10.3390/su14052983.

Luhmann, N., **1984**. Soziale Systeme: Grundriß einer allgemeinen Theorie, Frankfurt: Suhrkamp.

Lynch, M., Andersson, G., Ramstad-Johansen, F., **2021**. Merging Systems Thinking with Entrepreneurship: Shifting Students' Mindsets towards Crafting a More Sustainable Future, Sustainability, 13(9), p. 4946. https://doi.org/10.3390/su13094946.

Macintyre, T., **2019**. The transgressive gardener: Cultivating learning-based transformations towards regenerative futures. PQDT-Glob.

Manring, S.L., **2017**. The role of management education in transdisciplinary collaborations for sustainable social-economic-ecological systems. Sustain. Manag. Educ.

Markman, G. D., Waldron, T. L., Gianiodis, P. T., Espina, M. I., **2019**. E pluribus unum: Impact entrepreneurship as a solution to grand challenges, Academy of Management Perspectives, 33(4), 371–382. https://doi.org/10.5465/amp.2019.0130.

MacArthur Foundation, **2025**. Available at https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview. Accessed: 21.12.25.

Meadows, D.H., Meadows, D.L., Randers, J., Behrens, W.W., **1972**. The Limits to Growth: A Report for Club of Rome's Project on the Predicament of Mankind, Universe Books, New York.

Meadows, D.H., **1999**. Leverage Points: Places to Intervene in a System.

Meadows, D., **2008**. Thinking in Systems. A Primer. Earthscan.: London, VA, USA.

Merriam, S. B., **2009.** Qualitative research: A guide to design and implementation (3rd ed.). Jessey-Bass.

Midgley, G., Lindhult, E., **2021**. A systems perspective on systemic innovation. Syst. Res. Behav. Sci. 38, 635–670. https://doi.org/10.1002/sres.2819.

Mishra, C.S., Zachary, R.K., **2015**. The Theory of Entrepreneurship. Entrep. Res. J. 5. https://doi.org/10.1515/erj-2015-0042.

Moberg, S.K., Holse, E.K., **2022**. Sustainable entrepreneurship:A study of how the term is understood and implemented in Danish universities. Danish Found. Entrepr., Research report.

Mollison, B., Slay, R., M., **1997**. Permaculture: A Designers' Manual. Tagari Publications.

Molitor, H., Krah, J., Reimann, J., Bellina, L., Bruns, A., Arbeitsgemeinschaft Für Nachhaltigkeit An Brandenburger Hochschulen, **2023**. Zukunftsfähige Curricula gestalten - eine Handreichung zur curricularen Verankerung von Hochschulbildung für nachhaltige Entwicklung 2890 KB, 40 pages. https://doi.org/10.57741/OPUS4-388.

Moon C., Walmsley, A., Apostolopoulos, N., **2022**. EntreComp and GreenComp for Entrepreneurship. What Is the 'Real' Relationship? Proce. 17th Eur. Conf. Inno. Entrep, 17, 726–732. https://doi.org/10.34190/ecie.17.1.858.

Muñoz, P., Branzei, O., **2021**. Regenerative Organizations: Introduction to the Special Issue. Organ. Environ. 34, 507–516. https://doi.org/10.1177/10860266211055740.

Neergaard, H., Robinson, S. and Jones, S., **2021**. Transformative learning in the entrepreneurship education process: the role of pedagogical nudging and reflection. International Journal of Entrepreneurial Behavior and Research, Vol. 27 No. 1, pp. 251-277. https://doi.org/10.1108/IJEBR-04-2020-0235.

Newman, I., Benz, C.R., **1998**. Qualitative-quantitative research methodology: Exploring the interactive continuum. Southern Illinois University Press.

Nishi, M., Subramanian, S. M., **2023**. Ecosystem Restoration through Managing Socio-Ecological Production Landscapes and Seascapes (SEPLS). Springer, https://doi.org/10.1007/978-981-99-1292-6.

Terán-Yépez, E., Marín-Carrillo, G.M., **2020**. del Pilar Casado-Belmonte, M.; de las Mercedes Capobianco-Uriarte, M. Sustainable entrepreneurship: Review of its evolution and new trends. J. Clean. Prod, 252; https://doi.org/10.1016/j.jclepro.2019.119742.

O'Flaherty J., Liddy M., **2018**. The impact of development education and education for sustainable development interventions: a synthesis of the research, Environ. Educ. Res, 24:7, 1031-1049; https://doi.org/10.1080/13504622.2017.1392484.

Page, M.J., McKenzie, J., Bossuyt, P., Boutron, I., Hoffmann, T., Mulrow, C., Shamseer, L. Tetzlaff, J., Akl, E., Brennan, S., Chou, R., Glanville, J., Grimshaw, J., Hróbjartsson, A., Lalu, M., Li, T., Loder, E., Mayo-Wilson, E., McDonald, S., McGuinness, L., Stewart, L., Thomas, J., Tricco, A., Welch, V., Whiting, P., Moher, D., **2021**. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews, Systematic Reviews, 10(1), p. 89. https://doi.org/10.1186/s13643-021-01626-4.

Patzelt, H., Preller, R., Breugst, N., **2021**. Understanding the Life Cycles of Entrepreneurial Teams and Their Ventures: An Agenda for Future Research. Entrep. Theor. Pract, 45(5), 1119-1153. https://doi.org/10.1177/1042258720978386.

Piperopoulos, P., Dimov, D., **2014**. Burst Bubbles or Build Steam? Entrepreneurship Education, Entrepreneurial Self-Efficacy, and Entrepreneurial Intentions, J. Small. Bus. Manag., 53(4); https://doi.org/10.1111/jsbm.12116.

Planck, S., Wilhelm, S., Kobilke, J., Sailer, K., **2024**. Greater than the Sum of Its Parts: Combining Entrepreneurial and Sustainable Competencies in Entrepreneurship Education. Sustainability 16, 3725. https://doi.org/10.3390/su16093725.

Planck, S., Sailer, K., Stark, W., **2025**. Dynamic Innovation: An Empirical Investigation of Patterns of Entrepreneurial Innovation Processes, in the process of publication as of 29.04.25.

Ploum, L., Blok, V., Lans, T., and Omta, O., **2018**. Toward a validated competence framework for sustainable entrepreneurship. Organ. Environ. 31(2), 113-132; https://doi.org/10.1177/1086026617697039.

Raţiu, A., Maniu, I., Pop, E.-L., **2023**. EntreComp Framework: A Bibliometric Review and Research Trends. Sustainabilit, 15, 1285. https://doi.org/10.3390/su15021285.

Raworth, K., **2017**. Doughnut economics: seven ways to think like a 21st century economist. Chelsea Green Publishing.

Redman, A., Wiek, A., **2021**. Competencies for Advancing Transformations Towards Sustainability, Frontiers in Education, 6, p. 785163. Available at: https://doi.org/10.3389/feduc.2021.785163.

Rieckmann, M., **2012**. Future-oriented higher education: which key competencies should be fostered through university teaching and learning? Futures 44, 127e135.

Robinson, J. B., **2003**. Future Subjunctive: Backcasting as Social Learning. Futures, 35(8), 839–856. https://doi.org/10.1016/S0016-3287(03)00039-9.

Roobeek, A., de Ritter, M., **2016**. Rethinking business education for relevance in business and society in times of disruptive change. Presented at the Academy of Management, Anaheim, LA, USA.

Roorda, N., **2010**. Sailing on the winds of change. The Odyssey to sustainability of the universities of applied Sciences in the Netherlands. PhD thesis, Maastricht University.

Rosário, A.T., Raimundo, R.J., Cruz, S.P., **2022**. Sustainable Entrepreneurship: A Literature Review. Sustainability, 14(9), 5556. https://doi.org/10.3390/su14095556.

Rychen, D.S., Salganik, L.K., **2003**. Key Competencies for a Successful Life and a Well-Functioning Society. Hogrefe and Huber, Germany.

Schaltegger, S., Wagner, M., **2011**. Sustainable entrepreneurship and sustainability innovation: categories and interactions. Bus. Strategy Environ., 20, 222e237.

Schippers, M., **2017**. IKIGAI: Reflection on life goals optimizes performance and happiness. ERIM Inaugural Address Series Research in Management, Erasmus Res. Inst. Manag.

Schippers, M. C., Ziegler, N., **2019**. Life crafting as a way to find purpose and meaning in life. Front. Psych., 2019, 10, 462158. https://doi.org/10.3389/fpsyg.2019.02778.

Schneidewind, U., **2019**. Die Große Transformation. Eine Einführung in die Kunst gesellschaftlichen Wandels. or The Great Transformation. An introduction to the art of social change (engl.), Frankfurt a. M. Fischer Taschenbuch.

Schot, J., Kanger, L., **2018**. Deep transitions: Emergence, acceleration, stabilization and directionality, Research Policy 47 (6): 1045-1059.

Senge, P.M., **1990**. The Art and Practice of the Learning Organization; Doubleday: New York, NY, USA; p. 7.

Sidiropoulos, E., **2014**. Education for sustainability in business education programs: a question of value, Journal of Cleaner Production, 85, pp. 472–487. https://doi.org/10.1016/j.jclepro.2013.10.040.

Shepherd, D.A., Patzelt, H., **2011**. The New Field of Sustainable Entrepreneurship: Studying Entrepreneurial Action Linking "What is to be Sustained" with "What is to be Developed". Entrep. Theory Pract., 35, 137–163.; https://doi.org/10.1111/j.1540-6520.2010.00426.x.

Siedhoff, S., **2019**. Design science research, in Seizing Business Model Patterns for Disruptive Innovations. Forschungsreihe der FH Münster. Springer Spektrum, Wiesbaden. pp. 29-43, https://doi.org/10.1007/978-3-658-26336-2_3.

Singer, S., **2020**. Polymathy as the missing link to increase access to relevant knowledge, p. 196- 199 in Humanistic futures of learning: perspectives from UNESCO Chairs and UNITWIN Networks, https://unesdoc.unesco.org/ark:/48223/pf0000372577.

Snyder, H., **2019**. Literature review as a research methodology: An overview and guidelines, Journal of Business Research, Volume 104, Pages 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039.

Sourgiadaki, M., Karkalakos, S., **2023**. "GreenComp" as a tool for examining motivation of vocational teachers to create learning opportunities for the green transition. SN Soc. Sci 3, 114. https://doi.org/10.1007/s43545-023-00699-3.

Sterling, S., **2004**. Higher Education, Sustainability, and the Role of Systemic Learning, in P.B. Corcoran and A.E.J. Wals (eds) Higher Education and the Challenge of Sustainability. Dordrecht: Springer Netherlands, pp. 49–70. https://doi.org/10.1007/0-306-48515-X_5.

Stockholm Resilience Centre, **2025**. A new way of viewing the Sustainable Development Goals. Available at: https://www.stockholmresilience.org/research/research-news/2016-06-14-the-sdgs-wedding-cake.html. Accessed: 21.12.25.

Stroh, D., **2015**. Systems Thinking for Social Change: A Practical Guide to Solving Complex Problems, Avoiding Unintended Consequences, and Achieving Lasting Results, White River Junction, Vermont: Chelsea Green Publishing.

Swanson, L., Zhang, D., **2014**. Linking Social Entrepreneurship and Sustainability. J. Soc. Entrep. 5; https://doi.org/ 10.1080/19420676.2014.880503.

Teece, D.J., **2018**. Dynamic capabilities as (workable) management systems theory. J. Manag. Organ, 24, 359–368; https:/doi.org/10.1017/jmo.2017.75.

The Team Canvas, **2024**. Available online: https://theteamcanvas.com/about/ (last accessed on 11/04/2024).

Tobon, S., Luna-Nemecio, J., **2021**. Proposal for a new talent concept based on socioformation, Educational Philosophy and Theory, 53(1), pp. 21–33. https://doi.org/10.1080/00131857.2020.1725885.

Trivedi, C., Misra, S., **2015**. Relevance of Systems Thinking and Scientific Holism to Social Entrepreneurship. J. Entrep. 24(1), 37-62; https://doi.org/10.1177/0971355714560658.

UNESCO, **2017**. Education for Sustainable Development Goals: Learning Objectives, Paris: France.

United Nations Department of Economic and Social Affairs (UN), **2025**. The 17 Goals. Available at https://sdgs.un.org/goals. Accessed: 21.12.25.

United Nations General Assembly, **1987**. Report of the world commission on environment and development: Our common future. Oslo, Norway: United Nations General Assembly, Development and International Co-operation: Environment.

Valliere, D., Gedeon, S.A., and Wise, S., **2014**. A Comprehensive Framework for Entrepreneurship Education. Special Issue on Entrepreneurial Education in the Journal of Business and Entrepreneurship, Vol 26, No 1, pp. 89-120.

Van den Akker, J., McKenney, S., Gravemeijer, K.P.E., **2006**. Introducing educational design research, https://doi.org/10.4324/9780203088364-9.

van Tulder, R., Keen, N., van Zanten, J. A., and Gehrels, F., **2021**. Principles of Sustainable Business: Frameworks for Corporate Action on the SDGs. Routledge.

Voros, J., **2003**. A Generic Foresight Process Framework. Foresight, 5(3), 10–21. https://doi.org/10.1108/14636680310698379.

Wagner, M., Schaltegger, S., Hansen, E.G., Fichter, K., **2021**. University-linked programmes for sustainable entrepreneurship and regional development: how and with what impact? Small Bus. Econ. 56, 1141–1158. https://doi.org/10.1007/s11187-019-00280-4.

Wals, A., Tassone, V., Hampson, G., Reams, J., **2016**. Learning for walking the change: eco-social innovation through sustainability-oriented higher education. In Routledge Handbook of Higher Education for Sustainable Development; Barth, M., Michelsen, G., Rieckmann, M., Thomas, I. Eds., Routledge: London, pp. 25-39; https://doi.org/10.4324/9781315852249.

Weinert, F.E., **2001**. Concept of Competence: A Conceptual Clarification. In Defining and Selecting Key Competencies, Rychen, D.S., Salganik, L.H., Eds.; Horgrefe and Huber Publishers: Seattle, WA, USA, pp. 45–65.

Wiek, A., Withycombe, L., Redman, C.L., **2011**. Key competencies in sustainability: a reference framework for academic programme development. Sustainability Sci-ence 6 (2), 203e219.

Wilhelm, S., Planck, S., **2024**. Systems Thinking in Entrepreneurship Education: An Examination of Competencies and Pedagogical Approaches for Sustainable Transformation. Presented at the Region, Entrepreneurship, Development, Osijek, Croatia.

Wilkerson, B., Trellevik, L. K. L., **2021**. Sustainability-oriented innovation: Improving problem definition through combined design thinking and systems mapping approaches. Think. Skil. Creat., 42, 100932. https://doi.org/10.1016/j.tsc.2021.100932.

Williams, A., Kennedy, S., Philipp, F., and Whiteman, G., **2017**. Systems thinking: A review of sustainability management research. J. Clean. Prod, 148, 866–881; https://doi.org/10.1016/j.jclepro.2017.02.002.

Zahra, S.A., Gedajlovic, E., Neubaum, D.O., Shulman, J.M., **2009**. A typology of social entrepreneurs: motives, search processes and ethical challenges. J. Bus. Ventur., 24, 519e532; https://doi.org/10.1016/j.jbusvent.2008.04.007.

Zhang, X., Skitmore, M., De Jong, M., Huisingh, D., Grey, M., **2015**. Regenerative sustainability for the built environment - from vision to reality: an introductory chapter. Journal of Cleaner Production, 109, pp. 1-10.

10 Appendix

Appendix A

1	Adomßent, M et al.	2014	Emerging areas in research on higher education for sustainable development – management education, sustainable consumption and perspectives from Central and Eastern Europe	10.1016/j.jclepro.2013.09.045
2	Borges, JC et al.	2017	Hidden curriculum in student organizations: Learning, practice, socialization and responsible management in a business school	10.1016/j.ijme.2017.03.003
3	Cincera, J et al.	2018	Designing a sustainability-driven entrepreneurship curriculum as a social learning process: A case study from an international knowledge alliance project	10.1016/j.jclepro.2017.05.051
4	Cui, J.	2021	The Impact of Entrepreneurship Curriculum with Teaching Models on Sustainable Development of Entrepreneurial Mindset among Higher Education Students in China: The Moderating Role of the Entrepreneurial Climate at the Institution	10.3390/su13147950
5	de Bronstein, A.A. et al.	2022	Introducing an Innovative International Format for Experience-Based Sustainability Entrepreneurship Education: The YEEES Sustainability Camps	10.1007/978-3-031-11578-3_7
6	Diepolder et al.	2021	Competence Frameworks of Sustainable Entrepreneurship: A Systematic Review	10.3390/su132413734
7	Dyllick, T	2015	Responsible management education for a sustainable world: The challenges for business schools	10.1108/JMD-02-2013-0022
8	Filser, M et al.	2019	Entrepreneurship as Catalyst for Sustainable Development: Opening the Black Box	10.3390/su11164503

9	Fourcier et al.	2019	A Process-Oriented Framework of Competencies for Sustainability Entrepreneurship	10.3390/su11247250
10	García Feijoo, M et al.	2020	Systematic Review of Sustainable-Development-Goal Deployment in Business Schools	10.3390/su12010440
11	Halberstadt, J et al.	2019	Skills and knowledge management in higher education: how service learning can contribute to social entrepreneurial competence development	10.1108/JKM-12-2018-0744
12	Hermann, R.R. and Bossle, M.B.	2020	Bringing an entrepreneurial focus to sustainability education: A teaching framework based on content analysis	10.1016/j.jclepro.2019.119038
13	Hermann, R.R. et al.	2022	Lenses on the post-oil economy: integrating entrepreneurship into sustainability education through problem-based learning	10.1080/09650792.2020.1823239
14	Hesselbarth, C and Schaltegger, S	2014	Educating change agents for sustainability – learnings from the first sustainability management master of business administration	10.1016/j.jclepro.2013.03.042
15	Hsu, J.L. and Pivec, M.	2021	Integration of Sustainability Awareness in Entrepreneurship Education	10.3390/su13094934
16	Isac, C. et al.	2023	Enhancing Students' Entrepreneurial Competencies through Extracurricular Activities, A Pragmatic Approach to Sustainability-Oriented Higher Education	10.3390/su15118708
17	Jardim, J.	2021	Entrepreneurial Skills to Be Successful in the Global and Digital World: 1Proposal for a Frame of Reference for Entrepreneurial Education	10.3390/educsci11070356
18	Klofsten, M et al.	2019	The entrepreneurial university as driver for economic growth and social change - Key strategic challenges	10.1016/j.techfore.2018.12.004

19	Kolb, M et al.	2017	Implementing sustainability as the new normal: Responsible management education – From a private business school's perspective	10.1016/j.ijme.2017.03.009
20	Kosnik, RD et al.	2013	Transformational Learning In Business Education: The Pivotal Role Of Experiential Learning Projects	10.19030/ajbe.v6i6.8166
21	Kuzin, D.V.	2018	Global competences and challenges for entrepreneurship educators	10.32861/JSSR.SPI1.54.60
22	Lambrechts, W et al.	2013	The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management	10.1016/j.jclepro.2011.12.034
23	Lans, T. et al.	2014	Learning apart and together: towards an integrated competence framework for sustainable entrepreneurship in higher education	10.1016/j.jclepro.2013.03.036
24	Lourenço, F et al.	2013	Promoting sustainable development: The role of entrepreneurship education	10.1177/0266242611435825
25	Mets, T. et al.	2021	Entrepreneurship Education Challenges for Green Transformation	10.3390/admsci11010015
26	Moon, C.	2015	Ecie proceedings of the 10th european conference on innovation and	ISBN:978-1-910810-49-1
27	Moon, C.	2017	Proceedings of the 12th European Conference on Innovation and Entrepreneurship: Novancia Business School Paris, France 21-22 September 2017	ISBN:978-1-911218-55-5
28	Moon, C. et al.	2022	EntreComp and GreenComp for Entrepreneurship. What is the 'Real' Relationship?	10.34190/ecie.17.1.858

29	Moon, C.J. et al.	2023	Enterprise and Entrepreneurship Education: Exploring a new Dynamic Model to Integrate Sustainability within Curricula	10.34190/ecie.18.2.1650
30	Muff, K	2013	Developing globally responsible leaders in business schools: A vision and transformational practice for the journey ahead	10.1108/02621711311328273
31	Ploum, L et al.	2018	Toward a Validated Competence Framework for Sustainable Entrepreneurship	10.1177/1086026617697039
32	Rădulescu, C.V. et al.	2020	Entrepreneurial Education in the Context of the Imperative Development of Sustainable Business	10.14207/ejsd.2020.v9n4p93
33	Sidiropoulos, E	2014	Education for sustainability in business education programs: a question of value	10.1016/j.jclepro.2013.10.040
34	Storey, M et al.	2017	Responsible management education: Mapping the field in the context of the SDGs	10.1016/j.ijme.2017.02.009
35	Tobon, S and Luna Nemecio, J	2021	Proposal for a new talent concept based on socioformation	10.1080/00131857.2020.1725885
36	Tu, J.J. and Akhter, S.	2023	Exploring the role of Entrepreneurial Education, Technology and Teachers' Creativity in excelling Sustainable Business Competencies	10.1080/1331677X.2022.2119429
37	Wagner, M et al.	2021	University-linked programmes for sustainable entrepreneurship and regional development: how and with what impact?	10.1007/s11187-019-00280-4

Appendix B

1	Ahlström, H., Williams, A., Vildåsen, S.S.	2020	Enhancing systems thinking in corporate sustainability through a transdisciplinary research process.	https://doi.org/10.1016/j.jclepro.2020.120691
2	Das, A., Bocken, N.	2024	Regenerative business strategies: A database and typology to inspire business experimentation towards sustainability.	https://doi.org/10.1016/j.spc.2024.06.024
3	Duarte Dias, B.	2018	Regenerative development - Building evolutive capacity for healthy living systems.	https://doi.org/10.2495/DNE-V13-N3-315-323
4	Edwards, M.G.	2021	The growth paradox, sustainable development, and business strategy.	https://doi.org/10.1002/bse.2790
5	Ellis, N.R.	2018	Beyond Mechanism: An Organicist Business Education for the Anthropocene.	https://doi.org/10.1007/978-3-319-71449-3_2
6	Gerke, M., Adams, M., Ooi, C.-S., Dahles, H.	2024	Entrepreneuring for regenerative tourism. Doing business differently in Tasmania's regional hospitality industry.	https://doi.org/10.1080/09669582.2023.2273757
7	Hahn, T., Tampe, M.	2021	Strategies for regenerative business.	https://doi.org/10.1177/1476127020979228
8	Hofstra, N.	2015	Entrepreneurship inspired by nature.	https://doi.org/10.1007/978-3-319-11677-8_13

9	Muñoz, P., Branzei, O.	2021	Regenerative Organizations: Introduction to the Special Issue.	https://doi.org/10.1177/10860266211055740
10	Slawinski, N., Winsor, B., Mazutis, D., Schouten, J.W., Smith, W.K.	2021	A Systematic Literature Review of the Concept of Circular Economic Readiness and a Proposed Circular Economy Readiness Scale.	https://doi.org/10.1177/10860266198371131
11	Waring, C., Liyanage, K.	2022	A Systematic Literature Review of the Concept of Circular Economic Readiness and a Proposed Circular Economy Readiness Scale.	https://doi.org/10.3233/ATDE220598

Appendix C

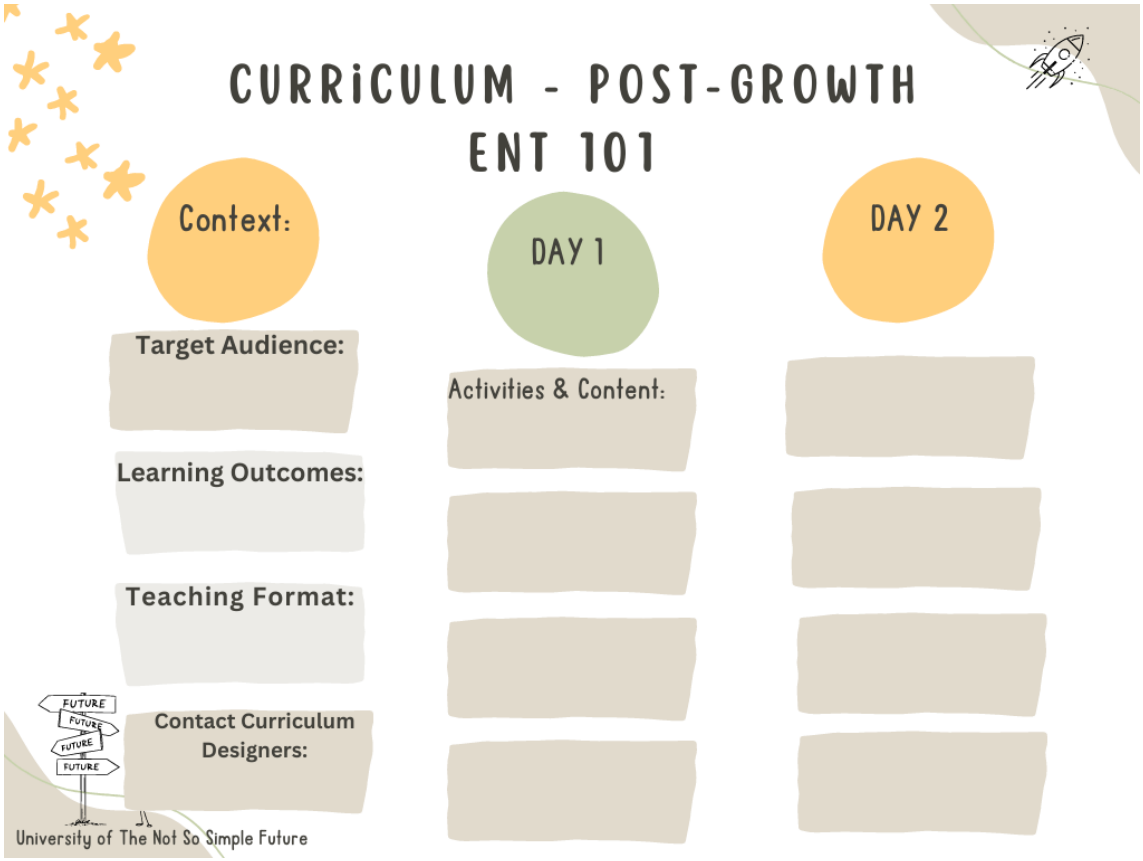
1	Ahmed, M.M., Roholt, R.V.L., Catalano, J.M.	2024	An Upside-Down Approach to Social Innovation at Institutions of Higher Education.	
2	Banerjee, S.B., Jermier, J.M., Peredo, A.M., Perey, R., ...	2021	Theoretical perspectives on organizations and organizing in a post-growth era.	https://doi.org/10.1177/13505084209736 29
3	Brentnall, C., Higgins, D.	2024	Entrepreneurship Educators in an Age of Climate and Ecological Breakdown.	https://doi.org/10.1177/25151274241277828
4	Brentnall, C., Lever, J.	2023	Thinking with the doughnut-introducing planetary boundaries to enterprise education.	
5	Buckton, S.J., Fazey, I., Sharpe, B., Om, E.S., Doherty, B., ...	2023	The Regenerative Lens: A conceptual framework for regenerative social-ecological systems.	
6	Cloud, J.	2016	Education for a sustainable future: Benchmarks for individual and social learning.	
7	Guzmán, C., Potter, T., Aguirre, A.A., Astle, B., ...	2021	The planetary health education framework. The Planetary Health.	

8	Hodgson, A., Spours, K.	2016	The evolution of social ecosystem thinking: its relevance for education, economic development and localities. Discovery.	
9	Kuenkel, P.,	2019	Stewarding sustainability transformations.	https://doi.org/10.1007/978-3-030-03691-1
10	Macintyre, T.	2019	The transgressive gardener: Cultivating learning-based transformations towards regenerative futures.	
11	Manring, S.L.	2017	The role of management education in transdisciplinary collaborations for sustainable social-economic-ecological systems.	
12	Williams, A.	2018	Make Our Planet Great Again: a Systems Perspective of Corporate Sustainability.	

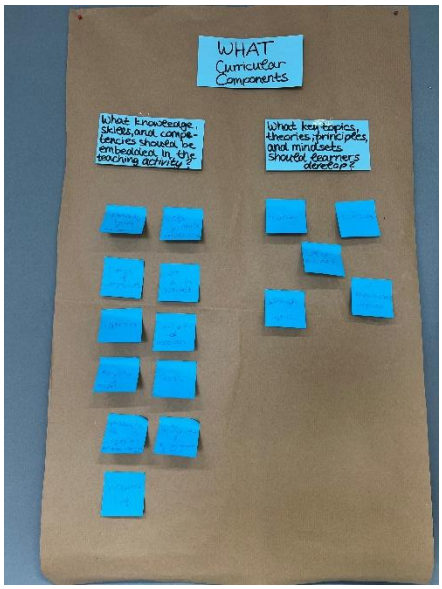
Appendix D

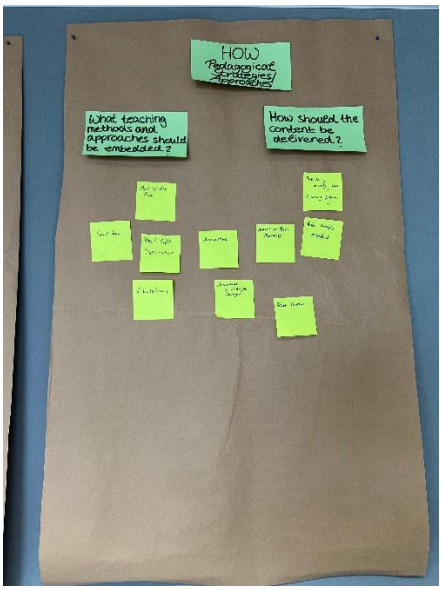
Code 1: WHAT - Curricular Components; Code 2: HOW - Pedagogical Strategies/Approaches; Code 3: WHO - Roles and Responsibilities; Code 4: WHERE - Learning Environment and Contexts; Code 5: WHY – Purpose; Code 6: WHEN - Timing, Duration, and Sequence; Code 7: WHOM - Audience and Community Context; Code 8: HOW WELL - Evaluation and Impact Metrics; Code 9: Call for business to change their behaviour; Code 10: Global Challenges and ecological crises; Code 11: Reason for current behaviour/unsustainable action; Code 12: Shortcoming of sustainability vs. regeneration; Code 13: Research gaps in EE/business education; Code 14: Underlying theories; Code 15: Theory on regeneration; Code 16: Theory/Research on regeneration in business context; Code 17: Examples of regenerative businesses.

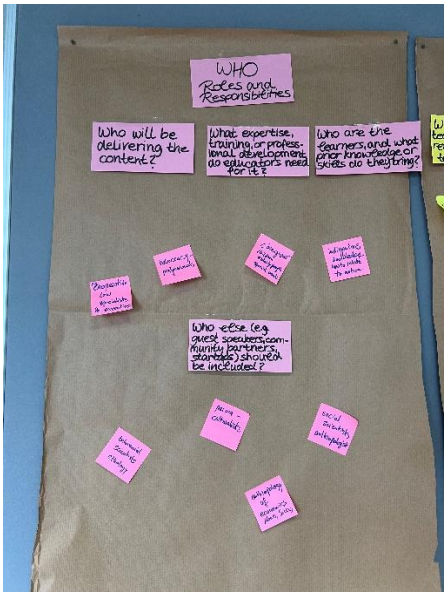
Appendix E

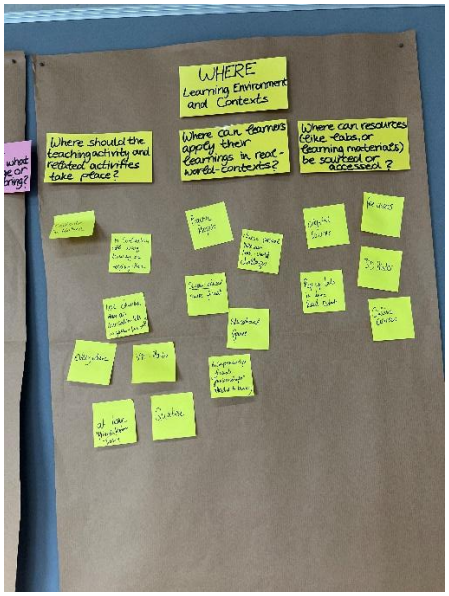

CURRICULUM - POST-GROWTH
ENT 101
Context:
DAY 1
DAY 2
Target Audience:
Activities & Content:
Learning Outcomes:
Teaching Format:
Contact Curriculum Designers:
FUTURE
FUTURE
FUTURE
FUTURE
University of The Not So Simple Future

Appendix F


WHAT
Curricular Components
What knowledge, skills, and competencies should be embedded in the teaching activity?
What key topics, theories, principles, and mindsets should learners develop?


HOW
Pedagogical Strategies/Approaches
What teaching methods and approaches should be embedded?
How should the content be delivered?


WHO
Roles and Responsibilities
Who will be delivering the content?
What expertise, training, or professional development do educators need for it?
Who are the learners, and what prior knowledge or skills do they bring?
Who else (e.g. guest speakers, community partners, alumni) should be included?


WHERE
Learning Environment and Contexts
Where should the teaching activity and related activities take place?
Where can learners apply their learnings in real-world contexts?
Where can resources (like e-labs, or learning materials) be sourced or accessed?

Appendix G

Template Evaluation questions for the Dandelion Collection for Regenerative Approaches in Entrepreneurship Education

1. Understanding and Clarity

- How clearly do you understand the different components of the framework (WHAT, HOW, WHO, WHERE, WHAT FOR)?
- Is the visual representation intuitive and easy to grasp? If not, what could be improved?
- Do the key concepts and dimensions align with your understanding of regenerative entrepreneurship education?

2. Relevance and Applicability

- How relevant do you find the framework for designing educational activities in regenerative entrepreneurship?
- In what ways do you see this framework being applied in your teaching or learning context?
- Which parts of the framework feel most applicable to your work, and which seem less relevant?

3. Comprehensiveness and Missing Elements

- Does the framework cover all necessary aspects of regenerative entrepreneurship education? If not, what is missing?
- Are there any additional pedagogical approaches, roles, or competencies that should be included?
- Do the dimensions (Societal, Economic, Ecological, Reflective) accurately represent the systemic nature of entrepreneurship education?

4. Practical Implementation

- How easy or challenging do you think it would be to integrate this framework into existing curricula?
- What support or resources would be needed to make implementation feasible?

- Are there specific barriers or constraints that could hinder the adoption of this framework in educational settings?

5. Engagement and Improvement

- What aspects of the framework resonate most with you? Why?
- If you could change or refine one aspect of the framework, what would it be and why?
- What additional tools or guidelines would make the framework more actionable for educators?

6. Personal and Institutional Impact

- How might this framework influence the way you (or your institution) approach entrepreneurship education?
- What challenges do you foresee in shifting towards a more regenerative approach?
- Would you be interested in piloting or co-developing educational materials based on this framework?

7. Any other thoughts or ideas you like to share