

The Green StartUppers Project: Empowering VET Community to Foster Sustainable Entrepreneurial Mindsets as a Transition to a Circular Economy

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Activity 2

The Green StartUppers Manifesto

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Introduction

In the context of unprecedented environmental challenges and the urgent need for sustainable development, the Green StartUppers Manifesto emerges as a comprehensive guide designed to illuminate the path for educators seeking to bridge the gap between climate change mitigation and entrepreneurship education. Recognising that educators are at the forefront of shaping future leaders and innovators, this manifesto equips Vocational Education and Training (VET) providers and educators with the knowledge and tools necessary to inspire the next generation of green entrepreneurs.

This foundational document offers a comprehensive theoretical understanding of green entrepreneurship and its symbiotic relationship with the circular economy. By clearly outlining the principles and defining the advantages of sustainable business practices, it aims to demystify the field for educators, enabling them to effectively communicate these concepts to their students. The Manifesto emphasises the pivotal role that innovation plays in creating a resilient and eco-friendly business landscape. Moreover, it integrates successful case studies of green entrepreneurship that illustrate the practical applications of sustainable business models and highlight the real-world impact of such models on the environment and society.

In addition to its theoretical insights, the Green StartUppers Manifesto presents a collection of innovative practices and methodologies that VET providers can seamlessly incorporate into their curriculum. These teaching resources are carefully crafted to be comprehensible and adaptable, catering to instructors with varying degrees of experience in entrepreneurship education. The manifesto provides practical tips on teaching green entrepreneurship across

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different vocational specializations, ensuring that students receive well-rounded training regardless of their career path.

Ultimately, the Green StartUppers Manifesto is more than a theoretical guide; it is a strategic initiative that empowers educators to transform their teaching materials and methods, fostering an environment where green entrepreneurship can thrive. By incorporating this manifesto into their teaching, VET providers can cultivate a new generation of students who are well-versed in climate change mitigation and entrepreneurship, thereby accelerating the transition to a circular economy. The wider community will also benefit from this initiative, as enhanced awareness and competence among educators will create a ripple effect, contributing to a more sustainable and innovative future.

Target Group

The Green StartUppers Manifesto is specifically designed for VET educators and instructors who are passionate about integrating entrepreneurship education with climate change mitigation in their teaching curricula. These educators will benefit from a robust theoretical framework and innovative teaching methodologies presented in this manifesto, enabling them to refine their instructional approaches. Whether they are new to entrepreneurship education or have years of experience, this manifesto will provide them with practical insights and strategies to inspire students to develop an innovative and environmentally responsible mindset. Ultimately, this resource will empower VET educators to guide their students toward becoming responsible entrepreneurs, poised to tackle the challenges of sustainable development in a circular economy.

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Learning Objectives

The Green StartUppers Manifesto is built around several key learning objectives for VET educators and their students:

- **Understand Green Entrepreneurship Principles:** Gain a foundational understanding of green entrepreneurship, its principles, and its role in fostering sustainable business models within a circular economy.
- **Explore Innovative Teaching Practices:** Learn how to incorporate cutting-edge teaching methods and innovative practices that can seamlessly blend entrepreneurship education with climate change mitigation.
- **Analyse Case Studies:** Examine real-world case studies of successful green entrepreneurs to identify practical strategies and best practices that can be adapted for educational purposes.
- **Elevate Teaching Approaches:** Refine and enhance teaching approaches through comprehensive insights into sustainable business practices and climate-conscious entrepreneurship education.
- **Inspire Future Entrepreneurs:** Develop strategies to inspire students to embrace green entrepreneurship, ultimately preparing them to be responsible, innovative citizens of the future.

By focusing on these objectives, the Green StartUppers Manifesto will emerge as a transformative guide for educators, equipping them to deliver impactful lessons on green entrepreneurship and climate change mitigation while fostering a broader culture of sustainability and innovation in the educational landscape.

Principles of Green Entrepreneurship

Overview

This module presents the fundamental principles of entrepreneurship, emphasising its capacity to drive economic and social advancement while concurrently addressing environmental concerns. The module will examine entrepreneurship as both a social process and a set of structured actions that utilise resources in a creative manner to exploit opportunities. It will also investigate green entrepreneurship, which integrates traditional entrepreneurial traits, such as risk-taking, innovation and adaptability, with sustainability goals. The aim is to contribute to ecological preservation and social welfare. Green entrepreneurship serves as a powerful catalyst for sustainable transformation, encouraging businesses to adopt eco-friendly practices and reshape markets in both local and global contexts.

Learning Outcomes

- Explain core concepts and definitions of entrepreneurship and green entrepreneurship.
- Illustrate the role of entrepreneurship in economic, social, and environmental development.
- Highlight green entrepreneurship's potential to drive sustainable business practices.
- Discuss the characteristics of green entrepreneurs, including innovation, adaptability, and resilience.
- Explore the economic and environmental benefits of green entrepreneurship.

Definition and Core Concepts

Entrepreneurship has been identified as a significant contributor to economic and social development, offering a promising avenue for addressing various social and environmental challenges (Demirel & Parris, 2015). The concept of entrepreneurship can be defined from two distinct perspectives. Firstly, it can be regarded as a social process. Secondly, it can be defined as the totality of an enterprise's actions (Ireland, et al., 2001). Entrepreneurship can be defined as a context-dependent social process through which individuals create value by combining a distinctive set of resources in order to capitalise on an opportunity within the marketplace. Two key entrepreneurial skills are the ability to gain access to a variety of resources and the capacity to leverage them in a creative manner (Ireland, et al., 2001). However, the concept of entrepreneurship is also used to describe a company's propensity to assume calculated risks, demonstrate innovativeness, and exhibit proactive behaviours (Covin & Slevin, 1991). In essence, entrepreneurship can be defined as a series of actions that can facilitate a firm's ability to address natural environmental concerns. It seems reasonable to posit that a comprehensive, organisation-wide definition of entrepreneurship in a natural environmental context must take into equal account both of these two approaches (Menguc & Ozanne, 2005).

An additional range of opportunities can be created for entrepreneurs by adopting environmentally responsible business practices. Moving towards a sustainable economy offers many niches that individuals and businesses can identify and successfully exploit. This can be anything from developing a new product/service, to improving efficiency in an existing business, to marketing a new product/service, to redesigning an existing business model/practice. By

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fostering a culture of innovation, risk-taking, and flexibility, entrepreneurship can play a pivotal role in driving sustainable growth (Hoogendoorn, et al., 2015).

But green entrepreneurship is important not only because it offers new opportunities for agile innovators who recognise and exploit them. Green entrepreneurship has the potential to play an important role in the general transition to more sustainable business. Entrepreneurs play an important role in ensuring that green business practices are eventually adopted by wider business through their leadership. In the global economy, entrepreneurs are often hailed as role models and heroes: their achievements help to guide and motivate other entrepreneurs. By showing the economic benefits of going green, green entrepreneurs act as a "pull" factor motivating other businesses to go green, as opposed to the "push" factors of government rules, risk mitigation factors and lobbying groups (Schaper, 2010).

The concept of "green entrepreneurship" emerges from the conjunction of the fundamental attributes of entrepreneurship, including innovation, risk-taking, the introduction of novel business concepts, and a commitment to ecological and social responsibility. Consequently, within the academic literature, the term 'green' is frequently associated with the concept of 'social' in relation to ecological issues that are also social. Other authors have proposed an alternative explanation of 'green entrepreneurship' as 'sustainable entrepreneurship'. This can be understood as a form of entrepreneurship that actively contributes to sustainable development, representing an intersection between traditional, social and sustainable entrepreneurship.

In spite of the rapid growth that has been observed in the general field of green studies, green entrepreneurship as a field of study is still in its infancy

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(Muo & Azeez, 2019). A review of the literature reveals that, due to the nascent state of green entrepreneurship, there is no consensus among scholars on a universally accepted definition of the term (Demirel, et al., 2017).

Green entrepreneurship is an emerging category of entrepreneurship that emphasises environmental responsibility (Gupta & Dharwal, 2021). It is a combination of strong entrepreneurship and a recognition of sustainability and other environmental movements (Arabiun, et al., 2015). Although there are many policies aimed at promoting green growth, most are focused on finding environmentally friendly technologies and addressing environmental challenges such as climate change. Green entrepreneurship is becoming more and more widespread (Khanna, 2011). Accordingly, it can be argued that green entrepreneurship is an entirely new way of doing business to protect the environment. In this way, green entrepreneurship is transformed from a purely commercial venture into a community endeavour aimed at conservation and sustainability (Gupta & Dharwal, 2021).

O'Neill and Gibbs (2016) put forth the proposition that entrepreneurs do indeed encounter a dilemma in determining which undertakings can be classified as green entrepreneurship. In order to mitigate this dilemma, researchers have, on numerous occasions, endeavoured to define or describe green entrepreneurship in a manner that is readily comprehensible.

The Green Project (2012) offers a definition of green entrepreneurship that encompasses activities which are consciously addressing environmental and social issues through the implementation of entrepreneurial ideas, despite the inherent risks and the expectation of a net positive impact on the environment and financial sustainability. The authors further delineate the characteristics of a green entrepreneur, defining them as individuals who initiate and manage

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entrepreneurial ventures with a conscious focus on environmentally sustainable processes and products. Additionally, Sunny and Shu (2017) propose that the definition of green entrepreneurship should be based on the technological line of production or the activities of the firm in question.

However, in order to overcome the global environmental challenges facing humanity, Dale (2019) proposes a solution based on the concept of green creativity. From a green entrepreneurship perspective, he characterises this as an innovative response to the intertwined social, economic and environmental issues that currently plague our planet. Consequently, the term green entrepreneurship encompasses the harmonious integration of diverse skills, resources and expertise, unified towards the common purpose of resolving environmental and socioeconomic problems through the generation of income and personal fulfilment.

What is more, it could be argued that the concept of green entrepreneurship is comprised of six interrelated components, which can be defined as follows (Halдар, 2019):

- Innovation and green entrepreneurship will be linked to both the product and its production process. This differentiates green companies from those that do not prioritise environmental responsibility. In this context, organisations engaged in green entrepreneurship will develop environmentally friendly products and implement efficient manufacturing processes that minimise the use of resources.
- Sustainability is a core tenet of green entrepreneurship, which considers the long-term viability of products, markets and, most crucially, the resources used in their production.

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- Technological advancement is a key driver of green entrepreneurship, which emphasises the importance of using environmentally friendly technology. The utilisation of technology in a manner that minimises the impact of such usage on the natural world and society at large.
- Economic development: Green entrepreneurship will have an impact on economic development, primarily through the creation of new industries, thereby creating new employment opportunities and increasing purchasing power.
- Environmental quality: Green entrepreneurship will contribute to improvements in environmental quality through the implementation of environmentally friendly business practices. Such enterprises are always run with an environmentally friendly concept in mind, namely utilising the environment continuously, maintaining and caring for it, and seeking to regenerate it.
- The objective of green entrepreneurship is the advancement of social welfare. This can be achieved by fostering a balance between humanity and nature through the implementation of environmentally conscious business practices.

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Economic and Environmental Benefits

Entrepreneurs play a pivotal role in introducing novel concepts to the market and propelling economic transformation. This is especially evident in the domain of green entrepreneurship, where nascent enterprises have the capacity to challenge entrenched practices (Phan, et al., 2005).

The performance of the economy, and in particular the environmental economy, exerts a considerable influence on green entrepreneurship. In the European Union (EU), the environmental economy has been demonstrating growth at a rate exceeding that of the overall economy, thus indicating that EU Member States are adopting measures to advance a model of economic growth based on sustainability. Green entrepreneurship also constitutes a principal driver of job creation (OECD, 2022).

What is more, the promotion of the circular economy is contingent upon the development of green entrepreneurship, as novel business models can facilitate the integration of reverse supply chains and engender new commercial prospects with social benefits. The development of green products is of paramount importance for the growth and environmental sustainability of this new model (Confente, et al., 2020). In order to progress towards a zero-waste production and consumption model, it is necessary to facilitate innovation and the creation of new business models. Green entrepreneurship can be an important driver in this process. Large organisations may require assistance in applying circular economy principles, due to a lack of clear mandates, costs, logistical challenges and inertia. However, many large businesses are partnering with smaller enterprises in order to reduce waste and encourage product reuse. This is motivated by a range of factors, including commitments to sustainability, the pursuit of zero waste goals, compliance with

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regulations and the desire to enhance their public image. Additionally, many businesses are seeking to reduce their environmental impact by localising their supply chains (Veleva & Bodkin, 2018).

In their study, Mondal et al. (2023) emphasise the significance of green entrepreneurs in advancing resource efficiency and waste reduction within the economic system. The authors perceive green entrepreneurship as a strategy for achieving environmental sustainability, a core tenet of the circular economy. By adopting novel business models and practices, green entrepreneurs can make a significant contribution towards the reduction of environmental pollution and the conservation of natural resources. Similarly, Schaltegger and Wagner (2011) emphasise the potential for green entrepreneurship to facilitate transitions towards circular economic models. Their argument is that green entrepreneurs can drive the transformation of linear economic systems into circular ones through the exploitation of opportunities for sustainable innovation. York and Venkataraman (2010) posit that green entrepreneurs may harness their distinctive capabilities to generate value in a circular economy. This can be accomplished by discerning and capitalising upon opportunities to enhance resource efficiency and reduce waste, and by devising pioneering strategies that challenge established business models and sectors. In this manner, green entrepreneurs have the potential to persuade other companies to embrace the tenets of the circular economy by effectively illustrating the economic and environmental advantages inherent to such an approach (Stubbs & Cocklin, 2008). Green entrepreneurs, in particular, are uniquely suited to translate circular economy principles into tangible outcomes.

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Furthermore, the concept of green entrepreneurship has the potential to enhance the resilience of local economies by fostering the growth of small, decentralised, and locally-focused businesses. By concentrating production and supply chains within the local area, green businesses can diminish their reliance on international markets and insulate communities against economic turbulence (Porter & Kramer, 2011).

The pursuit of green entrepreneurship frequently yields favourable social consequences, as a considerable proportion of green businesses espouse fair labour practices, community development, and the equitable distribution of resources. By prioritising both social and environmental outcomes, green entrepreneurs facilitate not only economic growth but also social well-being and community resilience (Shrivastava & Kennelly, 2013).

An additional observation is that a considerable number of green entrepreneurs utilize digital technologies with the objective of reducing waste, enhancing the efficiency with which resources are managed, and providing consumers with greater transparency regarding the environmental impacts of their activities. Technologies such as the Internet of Things (IoT), blockchain for supply chain traceability, and artificial intelligence (AI) in resource optimisation have been demonstrated to be effective in enhancing the positive environmental impact (Geissdoerfer, et al., 2017).

In addition to their role in influencing businesses, green entrepreneurs frequently engage in activities aimed at educating and inspiring consumers to adopt more sustainable behaviours. They promote a shift in consumption patterns towards sustainable goods and services, which can result in a ripple effect, amplifying the impact of green initiatives (Elkington, 2004).

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Furthermore, green entrepreneurs frequently promote environmental policies and may collaborate with governments to influence the development of sustainable regulations and incentives. This advocacy can facilitate a supportive environment for other businesses to transition to sustainable models, thereby amplifying green entrepreneurship's impact on a larger scale (Bocken, et al., 2014).

Characteristics of a Green Entrepreneur

Generally speaking, there has been a growing emphasis on the importance of a conducive environment for biodiversity, which has given rise to a new field of study that draws on creative intelligence. To illustrate this, Demuth (2014) posits that green creative entrepreneurship can be defined as an entrepreneur's capacity to secure stakeholder approval for their ideas, assume control of value chains and receive recognition for their ingenuity in addressing environmental challenges. Furthermore, it can be argued that the capacity of an entrepreneur to attract investors for their creative ideas is indicative of the level of success they achieve through innovative efforts, revealing the innovative drive that is crucial in green entrepreneurship.

Meanwhile, according to Zhaojun et al. (2017), green entrepreneurs often display a unique proclivity for exploring diverse scenarios, a quality rooted in creativity, flexibility, and adaptability. This enables them to devise superior solutions to complex business and societal challenges. In a similar vein, Yousuf et al. (2017) view green entrepreneurs as agents of disruptive change capable of transforming social landscapes to address environmental issues. This capacity to innovate at any scale offers green entrepreneurs the opportunity

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to capitalize on green market openings that advance sustainability. Malvisi (2018) further suggests that green entrepreneurs are distinguished by their creative and innovative approaches, bringing new practices into the green economy.

In addition to creativity, green entrepreneurs frequently demonstrate remarkable resilience and tolerance for risk (Hockerts & Wüstenhagen, 2010). They often operate in uncharted markets with regulatory uncertainty and financial constraints. Their capacity to persevere in these demanding contexts distinguishes them from conventional entrepreneurs. Moreover, they frequently demonstrate robust systems thinking and a long-term perspective that prioritises sustainability and considers intricate, interlinked environmental and social concerns (Shepherd & Patzelt, 2011).

Individuals engaged in green entrepreneurship must navigate the inherent tension between their business activities, their environmental philosophies and the broader contexts pertaining to the green economy and the mainstream, growth-focused economy (O'Neill & Gibbs, 2016). It can be argued that the current iterations of the green economy give rise to tensions in relation to the identity of those engaged in green entrepreneurship, due to the fact that they focus on two distinct yet interrelated aspects: the pursuit of environmentally-friendly practices and the continued growth of the economy (Edenhofer & Stern, 2009).

Menguc and Ozanne (2005) identify two types of green entrepreneurs: those who proactively identify new market opportunities through environmentally-focused strategies, and those who integrate environmental concerns into the heart of their organizational management. Regardless of their approach, green entrepreneurs often serve as advocates within their communities, collaborating

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with local organizations and fostering awareness of green practices (Hall, et al., 2010). Unlike traditional entrepreneurs, they often prioritize partnerships that enhance environmental and social impact over competition (Tilley & Young, 2009).

Moreover, green entrepreneurs are often early adopters of eco-innovation and digital tools that allow them to streamline processes, enhance transparency, and improve environmental performance. Through the use of advanced technologies like blockchain for supply chain traceability, IoT for resource monitoring, or AI for waste reduction, they reinforce their commitment to sustainability (Geissdoerfer et al., 2017).

Green entrepreneurs are also distinguished by their strong ethical grounding and a commitment to making socially responsible choices. Often driven by a mission rather than pure profit, they are motivated by an ethical responsibility toward the environment and society, which helps them build authentic connections with stakeholders and foster trust (Shrivastava & Kennelly, 2013). Additionally, they possess a high degree of openness to learning and adaptability, responding swiftly to emerging environmental challenges and evolving customer preferences, which is essential in the dynamic green economy (Cohen & Winn, 2007).

Finally, green entrepreneurs are frequently motivated by ecological and social concerns rather than solely by financial goals, reinforcing their authenticity and building trust among stakeholders (Kirkwood & Walton, 2010). By leveraging a mix of creative, collaborative, and adaptive capabilities, green entrepreneurs are well-equipped to translate their vision into tangible outcomes that advance sustainability and positively impact society.

Sustainable Business Models

The development of sustainable business models constitutes a crucial aspect of the establishment of environmentally friendly and sustainable businesses. As posited by Teece (2010), business models elucidate the mechanisms through which value is created, goods or services are delivered, and business transactions are executed. In order to align with the principles of sustainability, green companies must prioritise the production of durable and repairable products. Osterwalder and Pigneur (2010) identify three core elements of a business model: value creation and delivery, value proposition and value capture. When considering sustainable business models, it is vital to consider the complete life cycle of the product, including its end stage. This holistic approach ensures that environmental considerations are integrated at every stage, contributing to the overall sustainability of the business.

It is imperative that organisations adopt a strategic approach that incorporates technology, expertise and business-corporate strategic alliances in order to reduce expenditure in a number of key areas, including financial, temporal, energetic, material and environmental costs. This will facilitate the development of sustainable business models (Veleva & Bodkin, 2018).

The incorporation of circular economy principles into sustainable business models confers significant benefits, with a particular focus on enhancing resource efficiency, reducing waste, and extending the lifespan of products. The design of products for reuse, refurbishment, or recycling allows companies to reduce resource consumption and environmental impact while potentially creating additional revenue streams (Lüdeke-Freund, 2010).

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Furthermore, sustainable business models flourish when stakeholders are engaged and involved in the co-creation process. Freudenreich et al. (2020) posit that the active involvement of stakeholders, including customers, suppliers, and even competitors, enhances value propositions by aligning products with stakeholders' environmental expectations, fostering loyalty and trust.

A significant number of sustainable business models adhere to a "triple bottom line" approach, which strives to achieve equilibrium between economic, environmental, and social objectives. This model prioritises not only financial performance but also environmental stewardship and social equity, thereby creating a more comprehensive measure of success (Elkington, 1998). Furthermore, the advent of emerging digital technologies has the potential to reinforce the viability of sustainable business models.

Technologies such as blockchain, the Internet of Things (IoT), and artificial intelligence (AI) facilitate enhanced transparency, optimise supply chain efficiency, and reduce waste. To illustrate, blockchain technology can be employed to trace the provenance of a product and assess its environmental impact, thereby enabling consumers to make more informed eco-friendly choices (Upadhyay et al., 2021).

In addition, sustainable business models frequently integrate sustainability metrics to evaluate and communicate environmental performance. These may encompass carbon footprint, water usage, and material sourcing. Frameworks such as the Global Reporting Initiative (GRI) offer structured methods for disseminating this information to stakeholders, thereby reinforcing accountability and transparency (Bocken et al., 2014).

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The aforementioned components illustrate that sustainable business models necessitate not merely a reconsideration of product life cycles but also a dedication to stakeholder involvement, the triple bottom line, and technological advancement. This holistic strategy enables businesses to integrate sustainability into their fundamental business strategies, aligning environmental accountability with long-term commercial expansion.

Green Entrepreneurship & Circular Economy

Overview

This module examines the fundamental principles of the circular economy, with particular emphasis on its origins in industrial ecology and its objective of restructuring industrial systems to emulate the closed-loop, regenerative processes observed in nature. In contrast to the conventional linear economy, which involves the extraction, utilisation and disposal of resources, the circular economy strives to prolong the lifespan of materials and products, thereby minimising waste and conserving finite resources. This approach necessitates a substantial redesign of the product lifecycle, with an emphasis on durability, repairability, and resource efficiency. The circular economy is underpinned by core principles, including eco-innovation, renewable energy integration, and the emergence of new business models that prioritise sustainability across various economic levels. Collectively, these strategies not only offer environmental benefits but also present opportunities for economic growth, social equity, and resilience.

Learning Outcomes

- Introduce the circular economy and its origins in industrial ecology.
- Explain the principles and goals of circular business models versus linear models.
- Highlight strategies for resource recovery, recycling, and circular supply chains.
- Guide educators in understanding how green entrepreneurship aligns with circular economy principles.

Circular Economy Fundamentals

The concept of a circular economy has its origins in industrial ecology, a theory initially proposed by environmental academics in the 1970s and still in use today. It entails the restructuring of industrial systems in a manner analogous to ecosystems, with an understanding of the efficacy of resource recycling in natural environments (Graedel & Allnby, 1995).

Today, we mine and extract natural resources, turn them into products, and discard them. Recycling and efficiency measures can help reduce the need for raw material extraction, but this is still an open, linear system that will likely harm the natural environment in the medium term. The circular economy seeks to redesign this model by maintaining the circulation of products, materials, and resources for an extended period. This approach fosters innovation in product design, emphasising durability, repairability, and modularity to facilitate the development of a regenerative and resilient economic system.

In a circular economy, the resource loop would be closed, thus enabling the capture of large volumes of finite resources (such as metals and minerals) for reuse. Additionally, plant-based materials that degrade into fertiliser at the end of their life-span can be utilised for the manufacture of other products (Huber, 2000). The extension of this logic across the entire economy would necessitate a significant alteration in the fundamental structure of industrial systems. With respect to energy, the redesigned industrial system would enable efficiency improvements that would far surpass the potential savings achievable through the enhanced energy efficiency of individual processes (Clift & Allwood, 2011). The remaining energy requirements for a circular economy would be met through renewable sources.

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A transition from the prevailing linear economic model to a circular one would not only result in substantial savings for the EU but would also significantly mitigate the adverse impact on the natural environment (Lewandowski, 2016). For these reasons, the circular economy (CE) has garnered increased attention as a potentially transformative approach to sustainability (Scott, 2015). The transition to the circular economy is predicated upon four fundamental tenets: materials and product design, new business models, global reverse supply chains, and enabling conditions (Planning, 2015).

In a recent publication, Kirchherr et al. (2017) offer a compelling definition of the circular economy. They posit that a circular economy is an economic system based on business models that replace the concept of "end-of-life" with a focus on reducing, reusing, recycling, and recovering materials in production and distribution. This encompasses consumption processes at the micro level (products, companies, consumers), the meso level (eco-industrial parks) and the macro level (city, region, nation and beyond). The objective is to achieve sustainable development, which entails creating environmental quality, economic prosperity and social equity, and thus benefiting current and future generations.



Figure 1. Circular economy cycle (Prieto-Sandoval, et al., 2018)

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Another definition, which is more simple to understand, is provided by Gregson et al. (2015). They state that the circular economy aims to extend the economic life of goods and materials by recovering them from post-production consumer phases. This approach also involves closing loops, but it does so by considering the end of an object during the design process and viewing the end of an object as a new beginning for another object.

Ma et al. (2014) define the circular economy as an economic development model that aims to preserve the environment and prevent pollution, thereby facilitating sustainable economic growth. Park et al. (2010) posit that the circular economy seeks to align economic growth with environmental sustainability, with one element relying on novel practices and technological developments, analogous to the implementation of environmental modernisation technology.

Moreover, the transition to a circular economy necessitates the implementation of eco-innovative measures to effectively close the product lifecycle loop, facilitate the transfer of valuable products from waste streams to other users, and address the challenges of environmental resilience, despite the prevailing inclination towards economic growth (Scheel, 2016). In the literature, the term eco-innovation is understood to mean the development and implementation of products, services, production processes, organisational structures, management techniques and business methods that are environmentally preferable and result in reduced environmental risks, lower pollution levels and fewer negative impacts on natural resources (including energy use) compared to existing alternatives (Kemp & Pearson, 2008). Carrillo-Hermosilla et al. (2010) build on this concept, explaining that this kind of innovation improves environmental performance regardless of whether there was an intention to

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reduce environmental impacts or not. Consequently, circular economy represents a paradigm shift, necessitating alterations to the manner in which society legislates, produces and consumes innovations, while also leveraging nature as a source of inspiration to address societal and environmental needs (Cohen-Rosenthal, 2000; Hofstra and Huisingsh, 2014).

Key Principles of Green Entrepreneurship in the Circular Economy

The past few decades have seen green entrepreneurship become the focus of considerable interest as an effective strategy for maintaining sustainability and for organisations in a circular economy to gain a competitive advantage. In an extensive research project conducted by Siedschlag et al. (2022), the objective was to identify and verify the key factors that facilitate green innovations and startups in a circular economy. Through a comprehensive review of existing literature, the researchers identified six fundamental principles that emerged as crucial for enabling sustainable growth in this field. These can be summarised as follows:

- **Health and Environmental Regulations and Policies:** The establishment of criteria that encourage corporate adoption of sustainable practices can serve as a catalyst for the advancement of green technologies and startups within a circular economy. Stringent environmental legislation may facilitate this process. Additionally, the necessity for compliance with regulations gives rise to the creation of new technologies and procedures, thereby creating opportunities for entrepreneurs to develop solutions that satisfy the requisite specifications (Mura et al., 2019).

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- **Innovation:** In order for green businesses and innovations to flourish, it is essential that they have access to a range of resources, including capital investment, research and development facilities, strategic education and skilled labour. These inputs play a pivotal role in enabling a transition towards more sustainable practices by providing the foundation for entrepreneurs to develop and expand their circular economy solutions.
- **Sector-and industry-specific Factors:** The propensity for green startups and breakthroughs to flourish varies across sectors and industries. Those that generate substantial waste or consume significant resources may be more inclined to adopt the principles of the circular economy, which could prove advantageous for startups offering solutions in this domain.
- **Global Competition:** By encouraging businesses to adopt sustainable practices and produce environmentally-friendly products, global market competition may facilitate innovative solutions. Firms utilising the principles of the circular economy may gain a competitive advantage in the global marketplace by appealing to customers who prioritise environmental stewardship.
- **The influence of other green innovators:** The collaboration and exchange of ideas between green innovators may facilitate the transition to a circular economy. Start-ups can benefit from the knowledge transfer and best practices gained from other innovative businesses, fostering a positive ecosystem that encourages further innovation and growth.

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- **Public Funding:** Government assistance to environmentally-focused entrepreneurs may be facilitated through the provision of crucial financial resources via public funding initiatives. This may serve to enhance the confidence and stability of such individuals, allowing for the pursuit of innovative solutions with reduced impediments to participation, when grants, subsidies, and incentives are made available with the objective of encouraging activities conducive to sustainability and circular economies (Demirel & Danisman, 2019).

Opportunities and Challenges

The numerous advantages associated with green entrepreneurship in the circular economy, when considered alongside the various factors that facilitate the creation of an enabling ecosystem and the acceleration of business growth, present entrepreneurs and innovators with a multitude of potential areas for exploitation, including the possibility of transforming these opportunities into medium and large-scale businesses. Some of these potential avenues for growth include:

- **Product Lifecycle Management:** The term "Product Lifecycle Management" is used to describe the processes involved in the development and commercialisation of a product. In the context of a green and circular economy, startups may not be required to develop a product that is entirely distinct from existing offerings. The challenge of gaining entrance into an already well-established and/or saturated market can be daunting and overwhelming. A significant avenue for achieving both assured and reliable access to substantial profits is the

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development of novel approaches to prolonging the operational lifespan of established products. This may be accomplished through repair, refurbishment, and remanufacturing, thereby generating value and new sources of revenue for startups. Services based on product-as-a-service models and sharing platforms can effectively leverage circular economy tenets pertaining to resource conservation and waste minimization (Van Opstal & Borms, 2024).

- The recovery and recycling of resources represents a significant challenge in the context of global sustainability. The topic of recycling has been discussed and promoted for some time as a means of reducing the amount of waste produced. However, global recycling rates remain relatively modest, with Europe achieving the highest rate at approximately 30%. For those pursuing green entrepreneurship, the recovery and repurposing of materials from waste streams represents a valuable opportunity. Startups have the potential to develop advanced technologies in the fields of waste sorting, material recovery, and upcycling, transforming waste into high-value products and addressing the market gaps that exist for sustainable alternatives. These developments can contribute to the creation of a circular economy by creating products that are more easily recyclable and generate less waste than conventional counterparts (Stahel, 2016; Kirchherr et al., 2017).
- Circular Supply Chain: The concept of a circular supply chain is one that is becoming increasingly prevalent in the field of logistics and supply chain management. The potential exists for green entrepreneurs to

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disrupt traditional linear supply chains through the introduction of solutions that facilitate resource efficiency, reduce waste, and encourage circularity. Start-ups may choose to focus on specific aspects of circular economic theory, including the management of supply chains, the optimisation of resources and the optimisation of flows within these resources, which are all fundamental to the functioning of the circular economy (Geissdoerfer et al., 2017). One example of a promising technology which has the potential to address some of the challenges faced by sectors affected by volatility in the oil industry is clean hydrogen technology (Ghisellini et al., 2016).

- **Renewable Energy and Clean Technologies:** The field of renewable energy and clean technologies is a rapidly evolving area of research and development. The transition to clean technologies and renewable energy sources represents a fundamental aspect of the circular economy. Start-ups have the potential to innovate in the fields of renewable energy generation, energy storage, and efficiency, thereby providing alternatives to conventional energy sources. To illustrate, enterprises concentrating on solar, wind, and hydropower are decentralising energy production, reducing reliance on fossil fuel-based power plants, and enhancing energy security. Advancements in energy storage solutions, including batteries and hydrogen systems, enhance the usability of renewable energy by stabilising supply and supporting a resilient energy infrastructure (Mathews & Tan, 2011; Ellen MacArthur Foundation, 2013).

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- **Digital Technologies:** The advent of digital technologies, including big data, blockchain, AI, and IoT, has brought about a transformation in the circular economy, facilitating the emergence of novel business models and operational efficiencies. Such technologies facilitate the development of digital platforms by startups, which in turn foster collaboration, resource sharing and transparency, all of which are crucial elements for the implementation of sustainable practices. Innovations such as the use of blockchain technology to ensure transparency in supply chains, digital marketplaces and the optimisation of resources through data analytics, provide businesses with the tools to adopt circular practices, thus enhancing sustainability and efficiency (Chauhan et al., 2022; Ellen MacArthur Foundation, 2019).
- **Consumer Engagement and Education:** Start-ups are of pivotal importance in the dissemination of knowledge and the fostering of engagement with consumers on the principles of the circular economy. The pervasiveness of social media and online content creation provides startups with a multitude of avenues to disseminate information and inspire consumers. Creative labeling, packaging, transparency initiatives, and consumer awareness campaigns facilitate the development of more informed and sustainable decision-making abilities. By offering educational resources, certification programs, and e-learning platforms, startups can empower individuals and organizations to adopt circular practices and drive demand for sustainable goods (Kjaer et al., 2018).
- **Circular Design and Innovation:** The value of consulting services focused on sustainable design has increased in recent times as businesses have

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sought to align themselves with environmental and social objectives. Start-ups can offer specialised consultancy in areas such as eco-design, materials selection and lifecycle analysis, guiding companies to create products with minimal environmental impact and maximum circularity. These services enable businesses to incorporate circular principles from the design stage, enhancing their overall sustainability and market appeal (Bocken et al., 2016; Moreno et al., 2016).

The circular economy presents a plethora of prospects for green entrepreneurship. However, to successfully implement circular principles and compete within traditional markets, it is imperative to address the myriad challenges that arise. A few challenges are listed below:

- **High Initial Costs and Investment Needs:** The transition to a circular business model frequently necessitates substantial initial investments in new technologies, materials, and infrastructure. This can present a significant challenge for small startups, particularly in securing funding and justifying these expenses to investors who anticipate rapid returns. These high initial costs can act as a barrier to entry for entrepreneurs seeking to introduce circular economy solutions (Stahel, 2016; Kirchherr et al., 2018).
- **Regulatory and Policy Complexity:** The intricate and frequently contradictory regulatory frameworks that surround circular practices present a significant challenge to entrepreneurs seeking to expand their operations. Policies governing waste management, recycling, and resource recovery exhibit considerable variation across regions, creating obstacles for those aiming to scale circular initiatives or enter new

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markets. The legal and compliance costs associated with navigating these complexities can be substantial (Ghisellini et al., 2016; Bocken et al., 2016).

- **Consumer Awareness and Demand:** Despite an increase in awareness of sustainability, many consumers lack familiarity with the concept of the circular economy or may be resistant to change. Educating consumers about circular products and practices, such as repairable or upcycled goods, requires time and resources. In the absence of adequate demand, it can be challenging for green businesses to flourish (Kjaer et al., 2018).
- **Supply Chain Challenges:** The establishment of circular supply chains necessitates the involvement of numerous stakeholders, with the objective of ensuring the reuse, recycling, or return of materials. This interdependence on a multitude of actors can render the supply chain susceptible to disruptions, particularly when engaging with third-party suppliers or logistics companies that may not be fully aligned with the principles of a circular economy (Moreno et al., 2016).
- **Technological and Expertise Gaps:** The creation and implementation of circular technologies, including advanced recycling techniques, digital platforms for monitoring materials, and eco-design capabilities, often necessitates the acquisition of specific knowledge and skills. Many startups may encounter a dearth of proficient professionals in these domains or may be constrained by a lack of access to state-of-the-art technology, which impedes their capacity to innovate effectively (Chauhan et al., 2022).

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- Competition in the Marketplace: Circular business models frequently encounter competition from conventional, linear models that operate with reduced costs due to established, scalable processes. Competing with these linear businesses, which do not prioritize sustainability, can present a challenge for green entrepreneurs attempting to offer products and services at comparable prices while maintaining circular principles (Kirchherr et al., 2017).

Circular Business Models

In their definition, Linder and Williander (2015) characterise a circular business model as a business model that is based on a conceptual logic for value creation which utilises the economic value retained in products after use in the production of new offerings. Mentink (2014, p.35) defines CE as 'an economic system with closed material loops', and a circular business model as 'the rationale by which an organisation creates value in a closed material loop, delivers it, and captures it within the loop'. He posits that circular business models do not necessarily aim to balance ecological, social and economic needs in a manner that is consistent with traditional business models. However, they can, in fact, serve sustainability goals. Nevertheless, an alternative perspective is also endorsed in the academic literature.

In a recent contribution to the literature, Scott (2015) provided a useful conceptualisation of circular economy in relation to sustainability. The author advances the view that the circular economy is best conceived of as "a concept used to describe a zero-waste industrial economy that profits from two types

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of material inputs". Biological materials are defined as substances that are reintroduced back into the biosphere in a restorative manner without causing harm or generating waste. This is because they naturally break down. Technical materials can also be continuously re-used without causing harm or waste. In turn, the term 'sustainability' is defined as the capacity to continue into the long term. It also functions as a mechanism that enables the circular economy to function effectively.

Both circular business models and sustainable business models have the objective of reducing the environmental impact of business activities. However, there are differences in their respective foci and scopes. The objective of circular business models is to close resource loops by designing products and systems that minimise waste and maximise resource retention. This is achieved through the implementation of strategies such as recycling, remanufacturing and reuse. The principal objective is to establish closed-loop systems in which materials are continuously circulated, thereby emulating the processes observed in natural ecosystems. In contrast, sustainable business models encompass a broader range of practices aimed at balancing economic, environmental, and social sustainability goals. While they may incorporate circularity, they also focus on reducing overall environmental impact through practices such as lowering emissions, conserving water, and ensuring fair labour practices. It is evident that circularity is a part of sustainable business strategies; however, sustainable business models prioritise long-term resilience across multiple dimensions, including ethical, economic, and ecological aspects, rather than solely focusing on resource loops.

The Importance of Green Entrepreneurship in VET

Overview

The global movement towards sustainability has created new opportunities and challenges for businesses, governments, and educational institutions. As the world confronts the realities of climate change, resource depletion, and environmental degradation, the need for innovative solutions becomes increasingly urgent. Green entrepreneurship, which focuses on the creation of businesses that are environmentally sustainable and socially responsible, plays a crucial role in this context. In particular, Vocational Education and Training (VET) programs have the potential to nurture the next generation of green entrepreneurs, equipping them with the skills and knowledge needed to drive sustainable economic growth. (Chopra , et al., 2024; Hoffman, 2018)

This module explores the importance of green entrepreneurship within VET programs, outlining the benefits, strategies, and stakeholder engagement necessary for integrating these concepts into educational curricula. By the end of this module, learners will have a comprehensive understanding of the critical role that VET can play in fostering green entrepreneurship, the advantages of green entrepreneurship education, and practical strategies for implementation.

Learning Outcomes

- Define green entrepreneurship and explain its significance in the context of sustainable development.
- Identify the key components of VET programs that can support the development of green entrepreneurs.

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- Understand the benefits of integrating green entrepreneurship into VET programs for students, educators, and the wider community.
- Develop strategies for incorporating green entrepreneurship concepts into existing VET curricula.
- Engage with stakeholders effectively to support the implementation of green entrepreneurship initiatives in VET settings.

Role of VET in Developing Future Entrepreneurs

Vocational Education and Training (VET) plays a crucial role in preparing individuals for the entrepreneurial landscape by offering hands-on, practical experience that bridges the gap between theory and application. As innovation and adaptability become increasingly valued in the global economy, VET programs provide essential skill development tailored to industry needs, such as management, finance, and marketing. This practical approach not only enhances employability but also fosters entrepreneurial thinking, equipping individuals with the confidence and expertise required to start and sustain successful businesses. (TVET Journal, 2023; Peters, 2024)

VET's emphasis on accessibility and real-world exposure further amplifies its impact on entrepreneurship. By offering affordable and inclusive education, VET ensures that individuals from diverse socio-economic backgrounds can acquire entrepreneurial skills, contributing to economic growth and job creation. Moreover, partnerships with businesses provide students with valuable networking opportunities and insights into market dynamics. As economies continue to evolve, VET's role in nurturing future entrepreneurs

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through relevant, practical training will be increasingly vital in driving sustainable economic development. (Beddie & Simon, 2017; Cedefop, 2019; Kibrit, et al., 2022)

A changing world of work brings the importance of VET to the forefront, as it has the ability to develop the skills that are needed in today's labour markets and societies. At the same time, structural changes highlight the need to re-engineer parts of VET systems in some countries to make them more resilient and capitalize on opportunities from the twin transition. Responsiveness is key for ensuring that the offer and content of VET programmes is aligned with the needs of learners and employers. This necessitates actively involving social partners in designing VET programs and providing work-based learning opportunities, such as apprenticeships. It also calls for flexibility in programme design. Modular programmes, for example, can be updated more easily and are more accessible to adult learners looking to upskill or reskill. (OECD, n.d.)

Moreover, non-profit organizations (NGOs) play an important role in organizing entrepreneurship education in VET schools, especially by offering programmes based on practical experience and working on projects. They usually have close links with the business world, and often receive some form of support from public authorities. In particular, European networks such as Junior Achievement-Young Enterprise (JA-YE) and European-Pen widely promote mini-company or practice firm programmes where students have to work on their real or virtual firm. These programmes are wide-spread and they are present in all European countries (for instance, JA-YE reports that 80% of VET schools in Denmark and 66% of VET schools in Norway offer students the possibility to create their mini-company). (European Commission, 2009)

A Case Study

The case study of Barnana, developed by Jeremy Dann for USC Marshall's "Green Entrepreneurship" course, highlights how the company successfully transformed a sustainability challenge into a thriving business. Founded by Cauê Suplicy, Barnana upcycles bananas that would otherwise be wasted, working with organic farms in South America. The case explores how Barnana, a certified Benefit Corporation since 2019, not only reduces food waste but also supports local economies and promotes regenerative agriculture. (USC Marshall School of Business, 2021)

This success story emphasizes the importance of aligning business practices with environmental and social goals. The Barnana case demonstrates how a commitment to the "triple bottom line"—financial viability, environmental sustainability, and social responsibility—can create a resilient and adaptable business. Aspiring entrepreneurs can learn from Barnana's approach to building a diverse team, prioritizing sustainability, and remaining flexible in the face of challenges. The case serves as a powerful example of how green entrepreneurship can drive both economic and environmental benefits. (USC Marshall School of Business, 2021)

Benefits of Green Entrepreneurship Education

Integrating green entrepreneurship education into Vocational Education and Training (VET) programs offers substantial benefits across environmental, economic, and social dimensions. By fostering awareness of environmental issues and encouraging sustainable business practices, VET programs help mitigate climate change, conserve natural resources, and promote biodiversity.

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This education equips students with the knowledge and skills needed to innovate in emerging green markets, driving economic growth and creating jobs in sectors like renewable energy, organic agriculture, and eco-friendly technologies. (Ansar, Asif, & Mahale, 2024)

Green entrepreneurship education programs vary widely in format and focus. Formal degree programs offer structured curricula on sustainability and business, while certificate programs provide targeted training in specific green entrepreneurship areas. Workshops, seminars, and competitions offer practical, short-term learning and opportunities to pitch ideas. Incubators and accelerators support startups with resources and mentorship, while online courses and MOOCs offer flexible learning. Experiential learning and cross-disciplinary initiatives promote hands-on experience and collaboration across different fields to foster innovation and address sustainability challenges. (MIT Professional Education, 2024; Rashid, 2019)

Green entrepreneurship education is essential for tackling environmental challenges through increased awareness of critical issues such as climate change, pollution, resource depletion, and biodiversity loss. By educating students on the environmental impacts of business activities and the importance of sustainable practices, it equips them with the knowledge and motivation to tackle these challenges through entrepreneurial ventures. This education also fosters innovation by encouraging students to think creatively and develop solutions to environmental problems, promoting a culture of sustainability and risk-taking that leads to the creation of new green technologies, products, and services. Moreover, green entrepreneurship education is crucial for promoting sustainable development, as it educates future entrepreneurs on sustainable business models, ethical practices, and

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social responsibility. This contributes to the achievement of sustainable development goals, including poverty alleviation, environmental conservation, and social equity. With the growing market demand for environmentally friendly products and services, this education provides students with the skills to launch sustainable businesses that cater to eco-conscious consumers and support a greener economy. Ultimately, it empowers future leaders to make a positive impact on the world by preparing them to address complex environmental and social challenges through innovative entrepreneurship. (Ansar, Asif, & Mahale, 2024; Patricia, 2024; Reimers, 2024)

A Case study

The case study conducted at FPT University Da Nang investigated the factors influencing green entrepreneurial behavior among students. The researchers focused on understanding how the university's support for entrepreneurship impacts students' intentions to engage in environmentally sustainable business practices. Through surveys and analysis, the study revealed that strong institutional support, including resources, mentoring, and a supportive environment, significantly enhances students' green entrepreneurial intentions. This leads to a greater likelihood of students pursuing green entrepreneurship, thus contributing to sustainable economic development. (Nguyen, Le, & Vo, 2022)

Strategies for Integrating Green Entrepreneurship in VET Programs

Integrating green entrepreneurship into VET programs requires careful planning and the implementation of effective strategies. These strategies can help ensure that students receive comprehensive training that prepares them for the challenges and opportunities of green entrepreneurship.

Curriculum Development

One of the most important steps in integrating green entrepreneurship into VET programs is curriculum development. This involves designing courses and modules that focus on sustainable business practices, environmental science, and social responsibility. Educators should work with industry experts and environmental organizations to ensure that the curriculum is up-to-date and relevant to current market trends. Additionally, the curriculum should include case studies and examples of successful green businesses to inspire students and provide practical insights.

Cross-Disciplinary Approaches

Green entrepreneurship is inherently interdisciplinary, requiring knowledge of business management, environmental science, engineering, and social sciences. VET programs can adopt a cross-disciplinary approach by incorporating elements from these different fields into their curricula. For example, a course on sustainable agriculture could include lessons on business planning, soil science, and community engagement. By providing students with a holistic understanding of green entrepreneurship, VET programs can better prepare them for the complex challenges they will face in the real world.

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Experiential Learning Opportunities

Experiential learning is a cornerstone of effective VET programs, and it is particularly important for green entrepreneurship education. Students should have the opportunity to participate in internships, apprenticeships, and real-world projects that allow them to apply their knowledge in practical settings. These experiences can help students develop the technical skills and entrepreneurial mindset needed to succeed in the green economy. Additionally, partnerships with local businesses and environmental organizations can provide valuable networking opportunities and exposure to industry practices.

Incorporation of Technology

Technology plays a critical role in modern entrepreneurship, and it is especially important for green businesses. VET programs should incorporate technology into their curricula by teaching students about the latest tools and platforms used in sustainable business practices. This could include software for energy management, online marketing for eco-friendly products, or apps that track carbon footprints. By staying up-to-date with technological trends, VET programs can ensure that their students are prepared for the digital aspects of green entrepreneurship.

A Case study

The GRETA initiative, launched by the European Training Foundation in collaboration with the Danish Technological Institute, focused on integrating sustainability into vocational education and training (VET) systems across Europe. The project aimed to equip VET providers with the tools and strategies

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necessary to contribute to the green transition, essential for addressing climate change. By forming a network of 17 Centres of Vocational Excellence from eight countries, GRETA facilitated the exchange of best practices, allowing these institutions to co-develop green strategies, curricula, and teacher training programs. This collaborative effort emphasized the importance of embedding sustainability into all aspects of VET. GRETA's strategy involved not only updating educational content to include green skills but also fostering partnerships between VET institutions, industries, and policymakers. These partnerships helped to align training programs with the needs of a green economy, ensuring that students are well-prepared to enter the workforce with the skills needed to support sustainable development. As a result, the initiative successfully demonstrated how VET can be a powerful driver of environmental change and innovation. (The European Training Foundation, 2021)

Stakeholder Engagement in VET Initiatives

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Stakeholder Engagement in VET Initiatives

Stakeholder engagement is essential for the successful integration of green entrepreneurship into VET programs. This involves collaboration between educational institutions, businesses, government agencies, and community organizations. By engaging stakeholders, VET programs can ensure that their curricula are relevant, up-to-date, and aligned with the needs of the green economy.

Collaboration with Industry

Collaboration with industry is crucial for developing a VET curriculum that meets the needs of the labor market. Industry partners can provide insights into current trends, skills gaps, and employment opportunities in the green economy. They can also offer internships, apprenticeships, and job placements for students, providing them with valuable real-world experience. By working closely with industry partners, VET programs can create a pipeline of skilled workers who are ready to meet the demands of green businesses.

Government Support

Government support is another key factor in the successful integration of green entrepreneurship into VET programs. Governments can provide funding for curriculum development, infrastructure, and research related to green entrepreneurship. They can also create policies that encourage the adoption of sustainable practices in education and business. By working with government agencies, VET programs can access the resources and support needed to implement their green entrepreneurship initiatives effectively.

Community Involvement

Community involvement is essential for ensuring that VET programs are responsive to local needs and challenges. Community organizations can provide valuable input on the environmental and social issues that are most pressing in their area. They can also collaborate with VET programs to develop projects and initiatives that address these issues. By involving the community, VET programs can create a sense of ownership and commitment to sustainability, both within the educational institution and in the wider community.

International Collaboration

International collaboration can also enhance the effectiveness of green entrepreneurship education in VET programs. By partnering with educational institutions and organizations from other countries, VET programs can share the best practices, resources, and knowledge. International collaboration can also provide students with a global perspective on sustainability and entrepreneurship, preparing them for careers in the increasingly interconnected global economy.

A Case study

The case study examines a comprehensive effort in Poland to enhance vocational education and training (VET) by strengthening the collaboration between schools and employers, particularly in the area of practical training. Led by the Polish Agency for Enterprise Development (PARP) and supported by ESF funding, the initiative established Sector Skills Councils (SSCs) across various industries. These councils played a crucial role in collecting labor

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market data, recommending educational reforms, and facilitating cooperation between VET providers and employers. As part of the initiative, regional VET coordinators were appointed to support schools and businesses in developing collaborative training programs. The project led to the creation of quality frameworks for practical training, updated curricula, and new organizational solutions for over 100 professions. By 2022, 17 SSCs had been established, and their ongoing activities have significantly enhanced the relevance of VET in Poland, ensuring that students are better prepared to meet the evolving demands of the labor market. (Cedefor, n.d.)

Conclusion

The integration of green entrepreneurship into Vocational Education and Training (VET) programs is not only a response to the global demand for sustainable development but also a strategic move to equip future generations with the skills needed to thrive in a green economy. As environmental concerns such as climate change and resource depletion intensify, the role of VET in fostering green entrepreneurship becomes increasingly critical. By incorporating sustainability principles into the curriculum, VET programs prepare students to create innovative solutions that address environmental challenges while contributing to economic growth.

Moreover, the collaborative efforts between educational institutions, industry partners, government bodies, and communities play a pivotal role in the successful implementation of green entrepreneurship in VET. These partnerships ensure that the training provided is relevant to current market needs and that students gain practical experience through internships,

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apprenticeships, and real-world projects. As a result, VET programs not only enhance students' employability but also empower them to launch and sustain businesses that prioritize environmental and social responsibility. This holistic approach to education is essential for building a resilient and sustainable future, where economic development aligns with ecological stewardship and social equity.

In conclusion, the integration of green entrepreneurship into VET is a forward-thinking approach that addresses the interconnected challenges of environmental sustainability and economic development. By preparing students to be responsible entrepreneurs, VET programs contribute to a greener economy and a more sustainable world. As the global market increasingly demands eco-friendly products and services, the importance of green entrepreneurship education within VET cannot be overstated. It is an investment in the future, fostering a generation of leaders who are equipped to drive positive changes through innovative and sustainable business practices.

Role of Innovation

Overview

This module emphasises the critical role of innovation in driving green business practices, highlighting how advances in eco-innovation, technology and social innovation support sustainable development. Green innovation encompasses new approaches to products, processes and management practices that reduce environmental impact and resource use, in line with the goals of reducing greenhouse gas emissions, minimising waste and increasing resource efficiency. Technological innovation, such as blockchain, IoT, AI and biotechnology, enables green entrepreneurs to develop solutions that transform traditional business practices and advance the circular and low-carbon economy. Social innovation complements these advances by engaging communities in sustainable development through partnerships, educational initiatives, and community-driven solutions. By fostering innovation, green entrepreneurship is well positioned to address environmental and social challenges and create a more resilient and sustainable economy.

Learning Outcomes

- Define green innovation and explain its role in sustainable business practices.
- Illustrate how technological advancements support green entrepreneurship and a low-carbon economy.
- Explore social innovation as a tool for involving communities in sustainable solutions.
- Explore strategies that foster an innovative mindset, enabling students to develop sustainable solutions.

Innovation in Green Business Practices

Innovation in green business practices, also referred to as eco-innovation or green innovation, represents a significant area of interest within the broader field of business and environmental studies. The concept of green innovation has undergone a significant shift in the priorities of numerous firms, moving from an emphasis on efficient production to a focus on the development of eco-friendly materials and the reduction of pollutants generated during the production process (Ma et al., 2018). Another definition of green innovation, as outlined by Kemp and Pontoglio (2007, p. 10), is "a product, production process, service or management or business method that is novel to the firm implementing it and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use (including energy) compared to relevant alternatives." Eiadat et al. (2008) define green innovations as innovations that prevent pollution, reduce waste and implement environmental management systems in organisations.

While the term 'eco-innovation' has been defined as any innovation that contributes to the objective of sustainable development by reducing the impact on the natural environment, increasing resilience to environmental pressures, or utilising natural resources in a more efficient and responsible manner (European Commission, 2011). However, eco-innovation has evolved considerably in recent times, extending beyond its original remit to encompass the creation of ingenious solutions that facilitate a reduction in the emission of greenhouse gases (GHGs) throughout the entire life cycle of a given product, service or system (Mohamedaly, et al., 2022).

Despite minor differences among these three concepts, they are often used interchangeably as synonyms in current literature, as evidenced by Leal-Millán

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et al. (2017). For the aforementioned reasons and practical considerations, we are going to use the concept of green innovation. Ultimately, all of these concepts imply that organisations must be willing and able to adopt new approaches, including exploring new markets, technologies, legislation, and environmental circumstances, while also eliminating outdated operational practices (Seebode, et al., 2012).

Technological Innovations in Green Entrepreneurship

Innovation is a pivotal factor in the advancement of green entrepreneurship, facilitating the development of sustainable solutions that address environmental challenges. The incorporation of cutting-edge technologies is enabling green entrepreneurs to transform traditional business practices and pave the way for a circular, low-carbon economy.

For example, blockchain-based technologies present a plethora of opportunities for the advent of novel business models in the energy sector. These include the potential for customers to procure power from either a microgrid or local producers, the formation of an energy-backed currency, and the creation of platforms such as a flexible marketplace for the purpose of balancing power supply and demand (Bürer et al., 2019), thereby promoting more optimal utilisation of energy. On top of that, blockchain can also be used to set up peer-to-peer (P2P) energy trading systems. This is where people in the same community generate, share and trade surplus renewable energy with each other. This helps to make the energy grid more distributed and resilient. The decentralised approach can also help to make energy more accessible, especially in remote or underserved areas, by creating locally-focused energy

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solutions. However, it should be noted that many blockchain-based technologies exhibit considerable energy consumption, which represents a significant challenge to the creation of energy efficiency value. Additionally, high costs are associated with blockchain data management (Bürer et al., 2019). Therefore, while the potential of private or permissioned blockchains with the capacity for centralised control mechanisms is acknowledged by researchers, the feasibility of a decentralised public blockchain energy market is currently limited by considerations of efficiency and environmental impact (Teufel et al., 2019).

It is not just blockchain that is changing the game for green entrepreneurship. The Internet of Things (IoT) and Artificial Intelligence (AI) are also making big waves. IoT tech lets smart devices and sensors keep an eye on how much resource they're using, control their energy consumption and cut down on water waste. For instance, IoT-powered smart grids make sure energy is distributed efficiently, spot inefficiencies, and manage electricity demands in real-time. This helps urban areas cut down on energy waste and emissions (Vermesan & Friess, 2011). Meanwhile, AI processes big data from IoT sensors to predict energy needs, spot patterns in resource use, and make suggestions. In agriculture, AI-powered precision farming boosts crop yields, cuts down on pesticides, and conserves water. This is done by analysing things like soil and weather data, which helps promote greener agricultural practices.

The latest in energy storage tech, including next-generation battery systems and hydrogen storage, is changing the green energy scene. Advancements in energy storage, like lithium-sulphur batteries, solid-state batteries and scalable hydrogen storage, are essential for making renewable energy sources reliable.

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They help store and release renewable energy, cutting our reliance on fossil fuels during peak periods and making the grid more stable (Manthiram, 2020).

3D printing, also known as additive manufacturing, has made it easier to create custom products in a more sustainable way. By using materials like recycled plastic and biodegradable compounds, 3D printing allows companies to produce items that are eco-friendly with a smaller carbon footprint. It also eliminates the need for large inventories and reduces transportation emissions, as products can be printed on-site or closer to the point of sale (Ngo et al., 2018).

Biotechnology is helping to drive innovation in areas such as bio-based materials, biofuels, and eco-friendly chemicals. The latest biotech advances are making it possible to produce biodegradable packaging, plant-based materials, and renewable bioenergy sources. These solutions are replacing traditional petroleum-based products with sustainable alternatives, which helps to reduce the environmental impact and support the transition to a bioeconomy. Biotech innovations are particularly impactful in industries like food, agriculture, and waste management, where they are enabling new approaches to sustainable production and recycling (Nath, 2024).

Another area that's being transformed by technology is nanotech. This is helping to make green products more effective and last longer. Nanomaterials are already being used in solar panels to improve energy conversion rates, in batteries to boost storage capacities, and in water purification systems to filter out contaminants more efficiently. The net result is that nanotech helps reduce waste and energy consumption, supporting the principles of the circular economy (Roco & Bainbridge, 2005).

Social Innovation for Sustainable Solutions

The advancement of sustainable solutions is contingent upon the incorporation of social innovation, which prioritises collaborative, community-centred approaches that address complex social and environmental issues. In contrast to conventional business innovation, which frequently prioritises economic gains, social innovation endeavors to generate shared value for society and the environment, thereby developing solutions that are both sustainable and equitable (Mulgan et al., 2007). Social innovation in sustainability integrates social, environmental, and economic objectives, resulting in approaches that emphasise societal well-being while promoting long-term ecological balance (Poll & Ville, 2009).

A pivotal element of social innovation in sustainable development is community engagement and empowerment. By engaging local communities in the identification of challenges and the co-creation of solutions, social innovators are able to harness local knowledge and foster a sense of ownership and responsibility towards environmental goals. For example, community-led waste management initiatives have been demonstrated to be effective in increasing recycling rates and reducing waste through the involvement of local communities (Medina, 2000). Furthermore, these initiatives have been shown to create job opportunities and enhance local skills, particularly in communities with limited economic opportunities, thereby supporting both environmental and social outcomes (Frantzeskaki et al., 2014).

Collaborative networks and partnerships are a fundamental aspect of social innovation, enabling a diverse range of stakeholders, including governments, non-profit organisations, private enterprises and academic institutions, to combine their resources and expertise in order to address sustainability from

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multiple perspectives. These partnerships encourage a holistic approach, ensuring that solutions are integrated across social, economic, and environmental dimensions. For example, urban agriculture initiatives, which often involve collaborations between social enterprises, municipalities, and community organisations, repurpose vacant urban spaces for local food production, thereby reducing food insecurity and decreasing the carbon emissions associated with transportation (Cabannes, 2012).

A further crucial aspect of social innovation is the field of education and behavioural change. In order to achieve sustainability, shifts are required not only in technology but also in social norms and consumption habits. Social innovators frequently establish educational initiatives and community workshops with the objective of encouraging sustainable behaviours, such as the reduction of single-use plastics and the conservation of energy (Brown & Vergragt, 2008). By promoting these modifications in consumer conduct and societal values, social innovation contributes to long-term societal transitions towards sustainability. The emphasis on education and behavioural change facilitates a gradual but transformative adoption of sustainable practices, thereby enhancing the overall impact of green entrepreneurship (Vergragt & Brown, 2007).

In the context of green entrepreneurship, social innovation enables the development of sustainable business models that prioritise social impact in addition to financial performance. Social enterprises, in particular, design business models that address social and environmental issues, often reinvesting profits into community projects or conservation efforts, thus multiplying their positive impact (Nichollis & Murdock, 2012). By integrating social and ecological priorities into their core operations, these businesses

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support a more resilient and adaptable economy that values environmental stewardship alongside economic success (Perrini & Vurro, 2006).

Strategies for Fostering Innovation in Students

The fostering of innovation in the context of vocational education and training (VET) equips students with the essential skills required to effectively address real-world challenges and adapt to the rapidly evolving demands of the contemporary workforce. By integrating strategies that emphasise experiential learning, collaboration, and problem-solving, educators can cultivate an innovative mindset in students, thereby preparing them to drive sustainable development and green entrepreneurship. Innovation-oriented teaching approaches not only encourage creativity but also empower students to think critically and develop practical solutions to environmental and societal issues (Kirby, 2004).

Project-Based Learning represents one of the most efficacious strategies for fostering innovation in the context of VET. In project-based learning, students engage in authentic, real-world projects that challenge them to identify and address specific problems in creative ways, thereby encouraging them to apply technical skills in novel and innovative ways. For example, projects focused on waste reduction or renewable energy encourage students to design and implement their own solutions, thereby deepening their understanding of sustainability while enhancing their problem-solving abilities (Bell, 2010). This hands-on approach to learning mirrors the practicalities of the workplace, where students must assess needs, plan solutions, and collaborate to achieve goals.

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Design Thinking represents a further efficacious instrument for the cultivation of innovative thinking in students engaged in VET. This human-centred approach encourages students to adopt an empathic stance towards end users, to define the problems they seek to address, to ideate potential solutions, to prototype their designs, and to test their ideas. Educators can facilitate students' engagement with design-thinking activities that address environmental or social challenges, such as the design of products that reduce waste or the development of community programmes for energy conservation. Design thinking cultivates adaptability and resilience, equipping students with the capacity to approach challenges with curiosity and openness (Razzouk & Shute, 2012).

Collaboration and cross-disciplinary learning are fundamental for the cultivation of innovative mindsets, as students gain access to diverse perspectives and skill sets. The formation of multidisciplinary teams allows students from disparate vocational areas, such as engineering, agriculture, and business, to engage in collaborative problem-solving. This emulates the dynamics of real-world professional settings. Educators can facilitate cross-disciplinary projects, such as sustainable urban agriculture systems, which enable students to integrate competencies in design, sustainability, and technical implementation (Schleicher, 2012).

Another strategy for promoting innovation is the encouragement of entrepreneurial mindsets. The integration of entrepreneurship education into vocational training enables educators to inspire students to adopt a creative approach to market opportunities, risk management and value creation. Activities such as business model development, pitch presentations and small-scale enterprise projects facilitate students' ability to envisage themselves as

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entrepreneurs capable of identifying and responding to environmental and social needs. This not only builds confidence but also prepares students to bring innovative ideas to the marketplace (Gibb, 2003).

Lastly, the incorporation of digital tools and technology in the classroom environment facilitates innovation by providing students with access to advanced resources and platforms that enhance creativity. Educators can introduce students to tools such as CAD software for product design, simulation software for testing renewable energy systems, or digital platforms for collaborative projects. Furthermore, digital tools can also support sustainable practices, allowing students to prototype designs with minimal resources or develop digital solutions to track and reduce environmental impact (Selwyn, 2007).

Sustainable Business Practices

Overview

In recent years, sustainable business practices have become a cornerstone of corporate strategy and operations. With the increasing awareness of environmental issues and the impact of business activities on the planet, organizations are now recognizing the need to incorporate sustainability into their core business processes. Sustainable business practices involve not only minimizing environmental impact but also creating long-term value for both the company and society. This module explores the various aspects of sustainable business practices, focusing on key areas such as sustainable supply chain management, energy efficiency, resource optimization, corporate social responsibility, and the measurement and reporting of environmental impact. (Blackhurst, Cantor, & O'Donnell, 2015; Losada-Agudelo & Souyri, 2024; Siems, Seuring, & Schilling, 2022)

This module is divided into four main sections, each covering a critical area of sustainable business practices. We begin with Sustainable Supply Chain Management, focusing on how businesses can improve the sustainability of their supply chains. Next, we shift to Energy Efficiency and Resource Optimization, highlighting strategies to reduce energy consumption and optimize resource use. The third section, Corporate Social Responsibility and Ethics, examines the role of ethical considerations and social responsibility in sustainable business. Finally, we cover Measuring and Reporting Environmental Impact, providing insights into how companies can assess and communicate their environmental performance.

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Learning Outcomes

- Understand the key principles of sustainable business practices and their importance in modern business.
- Analyse the components of a sustainable supply chain and identify strategies to enhance sustainability in supply chain management.
- Develop strategies for improving energy efficiency and optimizing resource use within an organization.
- Evaluate the role of corporate social responsibility (CSR) and ethics in sustainable business practices.
- Assess various methods for measuring and reporting the environmental impact of business activities.

Sustainable Supply Chain Management

Sustainable supply chain management (SSCM) refers to the integration of environmental and social considerations into supply chain operations. It involves managing the flow of goods and services from suppliers to customers in a way that minimizes environmental impact and promotes social responsibility. SSCM goes beyond traditional supply chain management by incorporating practices that reduce carbon footprints, minimize waste, and ensure fair labour practices throughout the supply chain.

Key Components of a Sustainable Supply Chain

Environmental Responsibility: It involves protecting the environment from potential harm caused by supply chain activities such as production, storage, packaging, transportation, and other detailed operations. (GEP, 2024)

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Financial Responsibility: It addresses the financial needs of the organization. Financial markets include shareholders, employers/employees, customers, clients, business partners, domestic institutions and financial institutions. (GEP, 2024)

Social Responsibility: It involves the principles, ethics, morals and philanthropic expectations of the society from a business. This component covers the principle that every person in a sustainable supply chain should be treated fairly, equally and in line with human rights requirements. (GEP, 2024)

Sustainable supply chain practices offer significant benefits, including reduced energy costs, enhanced customer perceptions, increased regulatory compliance, and a better workplace environment. By lowering energy usage, companies can cut costs and reduce emissions, while also appealing to the growing number of consumers who prioritize sustainability. These practices not only help meet regulatory standards, such as those set by the UN's Sustainable Development Agenda, but also attract environmentally conscious employees, fostering a more motivated and productive workforce. (TrueCommerce, 2023)

Sustainable supply chain management focuses on reducing environmental impact, fostering ethical supplier relationships, and improving efficiency. Companies can achieve these goals by selecting suppliers that share their sustainability goals, reducing carbon footprints through efficient logistics and renewable energy, and minimizing waste by adopting circular economy practices. Enhancing supply chain visibility and transparency helps monitor and share environmental and social impacts, while collaboration and training ensure that all stakeholders work together towards shared sustainability goals. (McGrath & Jonker, 2024)

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To achieve a sustainable supply chain, companies can implement best practices such as establishing a Supplier Code of Conduct, adopting green packaging and sustainable transportation methods, and ensuring ethical sourcing. Reducing waste, conducting life cycle assessments, and integrating sustainability into product design are also essential. Engaging stakeholders and maintaining transparency through regular reporting further reinforce these practices, driving long-term sustainability throughout the supply chain. (GEP, 2024)

Energy Efficiency and Resource Optimization

Energy efficiency is a critical component of sustainable business practices. By reducing energy consumption, companies can lower their operational costs, reduce greenhouse gas emissions, and contribute to global efforts to combat climate change. Energy efficiency also enhances business resilience by reducing dependency on non-renewable energy sources and mitigating the risks associated with energy price volatility.

A research article titled "Enhancing energy efficiency techniques and strategies" in "Carbon – Science and Technology" journal introduces the following strategies for maximizing energy efficiencies:

To attain top-tier energy performance, companies must acquire detailed insights into potential savings and meticulously track the effects of energy efficiency measures. This strategy ensures optimal returns on energy efficiency and security investments through a comprehensive approach across the entire energy management lifecycle, encompassing diagnostics, metering, monitoring, implementation, tracking, reporting, and verification.

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Energy Audits: Conduct detailed energy audits of facilities to identify efficiency opportunities and develop business cases. (Matani, 2016)

Energy Management Assessments: Perform comprehensive assessments of metering and monitoring infrastructure, recommending an integrated energy management approach for facilities, data centers, and manufacturing plants. (Matani, 2016)

Integrated Energy Management Platform: Design and deploy an integrated energy management platform that covers all types of facilities and energy sources across enterprise operations. (Matani, 2016)

Green Data Center Audits and Power Usage Effectiveness (PUE) Management: Support includes supply-side energy management, real-time power dashboards, IT infrastructure optimization, and energy-efficient building infrastructure management. (Matani, 2016)

Renewable and Low-CO2 Energy Sourcing: Assist organizations in identifying an optimal energy mix, including conventional, captive, and renewable energy sources. (Matani, 2016)

A Case study

The case study titled "Energy Optimization and Alignment: How a Pharmaceutical Leader Trimmed Energy Expenses by 20%" (ENGIE Impact, 2024) from ENGIE Impact explores how a leading pharmaceutical company achieved significant cost savings and environmental benefits through a comprehensive energy optimization strategy. The company partnered with ENGIE Impact to analyse its energy use across multiple sites, identifying inefficiencies and opportunities for improvement. Through a combination of

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advanced analytics, process optimization, and alignment of energy management practices with sustainability goals, the pharmaceutical company was able to reduce its energy expenses by 20%. This was achieved without compromising operational performance, demonstrating the potential for businesses to simultaneously cut costs and enhance sustainability.

Corporate Social Responsibility and Ethics

Corporate social responsibility (CSR) is the practice of integrating social and environmental concerns into business operations and decision-making processes. CSR goes beyond philanthropy and involves taking proactive steps to ensure that a company's activities have a positive impact on society and the environment. CSR is closely linked to sustainability, as it addresses the social and ethical dimensions of business practices.

Types of CSR:

Environmental Responsibility: Focuses on minimizing environmental impact by reducing pollution, recycling, and promoting sustainability. (Fernando, 2024)

Ethical Responsibility: Involves fair and ethical treatment of all stakeholders, ensuring transparency and equity. (Fernando, 2024)

Philanthropic Responsibility: Encourages companies to contribute to society through charitable donations, supporting employee initiatives, and aligning with like-minded vendors. (Fernando, 2024)

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Financial Responsibility: Ensures that CSR initiatives are backed by financial investments in sustainable practices, diverse workforces, and social awareness programs. (Fernando, 2024)

Corporate social responsibility (CSR) offers numerous benefits for businesses. It enhances employee satisfaction by fostering a sense of value and purpose, which in turn boosts motivation and productivity. Additionally, CSR aligns companies with customer values, fostering loyalty and brand preference. Engaged employees, driven by a strong sense of purpose, contribute to increased productivity and profitability. CSR also helps attract and retain top talent, particularly among millennials who prioritize working for socially responsible companies. Moreover, CSR strengthens brand positioning, differentiating companies in the marketplace and enhancing their public image. Financially, CSR initiatives can lead to increased revenue and market value, while also generating positive publicity. Strong CSR practices improve investor relations as they are viewed favourably by stakeholders. Furthermore, CSR supports local and global communities, allowing businesses to make meaningful impacts. Lastly, CSR helps mitigate risks by promoting ethical practices, reducing the likelihood of legal and reputational issues. (ITA Group Technology, 2024)

Company Examples

In its 2022 Environmental and Social Impact Report, Starbucks (SBUX) emphasized its commitment to both its employees and environmental sustainability. The company prioritized workforce well-being through initiatives such as stock grants and enhanced medical, family, and educational benefits. Starbucks also set ambitious environmental goals, aiming to reduce

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greenhouse gas emissions, water usage, and waste by 50% by 2030. (Starbucks, 2022)

Home Depot (HD) dedicates over 1 million hours annually to training front-line employees to support their career growth. The company is also committed to sourcing or generating 100% renewable energy for its operations by 2030 and plans to invest \$5 billion annually with diverse suppliers by 2025. (The Home Depot, 2022)

Measuring and Reporting Environmental Impact

Measuring and reporting environmental impact is a critical aspect of sustainable business practices. It allows companies to assess their environmental performance, identify areas for improvement, and communicate their sustainability efforts to stakeholders. Transparent reporting also enhances accountability and builds trust with customers, investors, and the public.

Methods for Measuring Environmental Impact

Carbon Footprint Analysis: Measuring the total greenhouse gas emissions produced by a company's operations. (Bureau of Compliance Support & Pollution, n.d.)

Water Footprint Assessment: Evaluating the amount of water used and the impact of water usage on the environment. (Water Footprint Network, n.d.)

Waste Audits: Analysing the amount and types of waste generated by a company and identifying opportunities for waste reduction. (Keter, 2023)

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ESG (Environmental, Social, and Governance) reporting frameworks are crucial tools that enable businesses to measure, track, and communicate their sustainability efforts. These frameworks help companies manage climate-related risks and align their operations with stakeholder expectations. By implementing an effective ESG reporting strategy, companies can ensure regulatory compliance, enhance transparency, and reinforce their reputation as responsible corporate citizens. (Global Reporting, n.d.; IFRS Foundation, n.d.)

Choosing the appropriate ESG framework is key to achieving these goals. Frameworks such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) offer structured approaches to reporting, tailored to different industries and objectives. These standards help companies create detailed reports that highlight their sustainability initiatives, progress, and impacts. This not only builds trust with investors, customers, and employees but also drives long-term value creation by demonstrating a strong commitment to sustainability and ethical governance. (Tanwar, 2024)

A Case study

Suncor Energy Inc., a leading integrated energy company, has been committed to environmental stewardship since 1995, consistently tracking and reporting its impacts on water, land, emissions, and energy use. In 2009, recognizing the need to go beyond compliance and meet the growing expectations of the stakeholders, Suncor set four ambitious environmental performance goals. These goals were to reduce water intake by 12%, double the land area reclaimed, improve energy efficiency by 10%, and decrease air emissions by

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10%, all by 2015. The development of these goals was led by Suncor's sustainability team, who ensured that the targets were challenging yet realistic, gaining buy-in from employees and management. A key focus was on land reclamation, particularly in their oil sands operations, where the goal was to significantly increase reclaimed land by 2015. Despite the challenges posed by the 2009 merger with Petro-Canada, which required the application of these goals across newly acquired assets, Suncor successfully integrated environmental considerations into its long-term planning and decision-making processes. This shift from strictly financial goals to incorporating environmental ones marked a significant evolution in Suncor's approach to sustainability, aligning capital investments with broader environmental objectives. (Network for Business Sustainability, n.d.)

Conclusion

Sustainable business practices have become a crucial element in modern corporate strategy, driven by the growing awareness of environmental issues and the need for long-term value creation. Companies are increasingly integrating sustainability into their core operations, recognizing that this not only minimizes environmental impact but also enhances financial performance, strengthens stakeholder trust, and ensures regulatory compliance. By adopting practices like sustainable supply chain management, energy efficiency, and corporate social responsibility (CSR), businesses are positioning themselves as responsible corporate citizens. The shift towards sustainability also reflects a broader commitment to ethical governance and social responsibility, essential for maintaining competitiveness in a rapidly evolving global market.

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The case of Suncor Energy Inc. illustrates the challenges and benefits of implementing sustainability goals. By setting ambitious environmental targets and integrating them into their long-term planning, Suncor demonstrated how companies can align operational decisions with broader environmental objectives. Despite the complexities involved, such as merging with Petro-Canada, Suncor's commitment to sustainability allowed them to make significant progress in areas like land reclamation and energy efficiency, setting a benchmark for other companies to follow.

Successful Case Studies

Overview

Green start-ups represent a dynamic and innovative sector dedicated to addressing environmental challenges through sustainable business practices. By combining ecological responsibility with economic viability, these ventures have the potential to create meaningful environmental and social impact while contributing to economic growth. Case studies from Bulgaria and beyond illustrate the success of green start-ups in diverse sectors such as renewable energy, waste management, urban sustainability, and sustainable agriculture. These examples highlight the transformative role of green start-ups in promoting environmental stewardship and community well-being.

Despite their potential, green start-ups face unique challenges, including high initial costs, limited consumer awareness, and difficulties in securing investment. Overcoming these obstacles requires innovative strategies such as leveraging partnerships, promoting sustainability through education, and engaging communities. The green start-up ecosystem thrives on regional and industry-specific innovation, with contributions spanning renewable energy, circular economy, sustainable agriculture, and green fashion. These ventures demonstrate the possibilities for entrepreneurship to drive both environmental sustainability and economic opportunity.

Learning Outcomes

- Define green start-ups and their role in promoting sustainability and environmental responsibility.

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- Analyse case studies of successful green start-ups to identify key factors contributing to their success.
- Examine common challenges faced by green start-ups and explore strategies to overcome them.
- Identify regional and industry-specific trends in green entrepreneurship, including renewable energy, circular economy, and sustainable agriculture.
- Discuss the broader impact of green start-ups on local communities, economic growth, and environmental sustainability.

Case Studies: Green Start-Up Success Stories

Green start-ups are businesses that focus on sustainable practices, environmentally friendly products, or services that contribute to the well-being of the planet. Over the past decade, many green start-ups have not only contributed to environmental solutions but have also become successful business ventures. Below are several inspiring green start-up success stories.

Bulgaria, like many other countries in Eastern Europe, has seen a significant shift towards sustainability and environmental responsibility in recent years. A growing number of green start-ups are emerging, not only contributing to environmental protection but also to the country's economic development. Below are several successful green start-ups that have made an impact in Bulgaria's burgeoning eco-friendly sector.

1. Solvay Solar Solutions

Sector: Renewable Energy (Sofia) Solvay Solar Solutions is a renewable energy start-up focused on developing innovative solar energy products. Their

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business model centres on reducing the carbon footprint of buildings and promoting sustainable energy solutions.

2. WasteLess

Sector: Waste Management & Recycling

Founded: 2018

Location: Plovdiv, Bulgaria. WasteLess is a start-up focused on sustainable waste management practices. They provide innovative solutions for waste sorting, recycling, and upcycling, especially targeting businesses and municipalities in Bulgaria. The company offers a combination of technology-driven solutions and educational services to encourage more sustainable consumption patterns. WasteLess is a start-up focused on sustainable waste management practices. They provide innovative solutions for waste sorting, recycling, and upcycling, especially targeting businesses and municipalities in Bulgaria. The company offers a combination of technology-driven solutions and educational services to encourage more sustainable consumption patterns.

3. Greencity

Sector: Urban Sustainability & Green Spaces

Founded: 2016

Location: Sofia. Greencity is an urban sustainability start-up that focuses on improving green spaces and promoting biodiversity in Bulgarian cities. The company designs and implements green infrastructure projects such as green rooftops, vertical gardens, and urban forests. Greencity works closely with municipalities and private developers to create more sustainable and livable

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cities. Greencity has helped transform Bulgarian cities by enhancing their natural beauty, improving air quality, and promoting environmental sustainability. They also contribute to better mental health and social cohesion by creating spaces where people can engage with nature.

4. BioSofia

Sector: Sustainable Agriculture

Founded: 2017

Location: Sofia. BioSofia uses regenerative farming practices that focus on soil health, biodiversity, and water conservation.

Community impact: The company collaborates with small farmers, providing them with the knowledge and resources to adopt organic farming methods. The company collaborates with small farmers, providing them with the knowledge and resources to adopt organic farming methods.

Market demand: There has been increasing demand for organic products in Bulgaria, driven by consumers' growing.

Overcoming Common Challenges

Environmental education plays a key role in the effectiveness of implementation in practice the principles of sustainable development and the European Green Pact. In terms of content, environmental education covers different areas ranging from practical advice on environmental protection and the efficient use of natural resources, to information about the local natural

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ecosystems and their protection. The program is aimed at supporting schools and teachers implementing innovative activities through the creation of an innovative learning environment in the classroom room, innovative teaching methods as well as to schools with innovative practices and those with the potential to develop innovations in the field of financial literacy, ecology and green energy, integrated knowledge, personal development of students, positive education etc.

The program creates professional learning thematic communities between innovative schools in the country in which teachers from the thematic area of knowledge unite efforts and time to achieve common goals, multiply the good ones innovation practices, sharing results in which they learn from each other and generate new ones ideas and products.

Starting a green business — focused on sustainability, environmental responsibility, or green products and services — can be an exciting and impactful venture, especially among teenagers. However, like any startup, it comes with unique challenges. Here are some of the most common obstacles faced by green startups and strategies to overcome them:

High initial costs

Green businesses often face higher upfront costs than traditional businesses. Green materials, renewable energy sources and sustainable manufacturing processes can be more expensive. Partnering with established companies or nonprofits that support environmental causes can offer funding, resources, or marketing support.

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Building consumer awareness

The market for green products or services can be relatively small, especially in areas where sustainability is not a top priority for consumers. Getting your message out and educating people about the importance of sustainability can be challenging. Use social media platforms to promote green initiatives.

Finding Investors

Green startups can find it difficult to attract investors, especially if they're seen as high-risk due to the initial costs or uncertain financial return associated with green businesses.

While starting a green business comes with its own set of challenges, it also offers numerous opportunities to make a meaningful impact on the environment and society. By addressing the financial, operational, and market-related hurdles effectively, green startups can build a strong foundation for success while contributing to a more sustainable future.

Regional and Industry-Specific Examples

Renewable Energy & Clean Tech: Wind, solar, energy storage, and electric vehicle startups are playing a critical role in reducing carbon footprints.

Circular Economy & Waste Management: Companies focused on recycling, waste collection, and plastic waste reduction are helping close the loop on materials and reduce waste.

Sustainable Agriculture & Food Tech: Innovations like lab-grown meat and vertical farming are transforming how food is produced and consumed.

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Green Fashion & Eco-Friendly Products: Sustainable materials, ethical production practices, and a focus on reducing waste are key trends in the fashion industry.

Water & Environmental Restoration: Water-conservation technologies and efforts to restore biodiversity are crucial for sustainability.

The range of green startups across various industries highlights the diverse approaches to solving environmental challenges, from renewable energy and sustainable fashion to clean water and waste management. Many of these startups are not only addressing the global environmental crisis but also creating new business opportunities and improving local communities.

Collection of Innovative Practices and Methodologies

Overview

Green entrepreneurship education combines the principles of sustainable development with entrepreneurial practices to cultivate a mindset that fosters innovation in the green economy. This pedagogical approach integrates environmental values with business concepts, preparing students to balance economic viability with environmental responsibility. The curriculum focuses on equipping students with skills such as sustainable thinking, systems analysis and stakeholder mapping. Through the use of real-world scenarios and interdisciplinary collaboration, green entrepreneurship education fosters critical thinking, teamwork and the practical application of theoretical knowledge.

Innovative teaching methods such as project-based learning and challenge-based methodologies are key to fostering green entrepreneurship. These methods provide students with hands-on experience in solving real-world sustainability challenges, often in collaboration with businesses, NGOs and communities. Integrating technology into this education further enriches the learning process, enabling students to explore sustainable business models through tools such as virtual reality, simulation software and online collaboration platforms. Such approaches not only enhance entrepreneurial skills, but also inspire innovative solutions to environmental challenges.

Learning Outcomes

- Identify key competencies required for developing green businesses, including systems thinking, stakeholder analysis, and strategic decision-making.

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- Illustrate the role of project-based learning and collaborative methodologies in fostering green entrepreneurial skills.
- Explore the integration of technological tools such as virtual reality, AI, and simulation software in supporting sustainable business models.
- Examine strategies for inspiring innovation and turning sustainable business ideas into actionable ventures.

Innovative Teaching Practices in Green Entrepreneurship

In a general context, promoting a sustainable mindset in students so that they are able to develop new green business ideas that are feasible and economically viable is one of the main objectives of entrepreneurship education in the light of the EU Strategy for Sustainable and Green Entrepreneurship (Adom̄ent, et al., 2014). In this context, there are the following competences needed in entrepreneurship curricula: sustainable thinking, systems analysis, identifying consumer needs, initiating commitment to change, analysing and mapping stakeholders, strategic and business decision making, building openness and trust, sharing goals and balancing interests (Wesselink, et al., 2015). There is a common set of competences needed to start a business and, more specifically, to develop a green business. Environmental concern and knowledge play a major role in shaping the green business mentality. The reader can study Figure 2, which provides an overview of the training aimed at developing the green entrepreneurial mindset.

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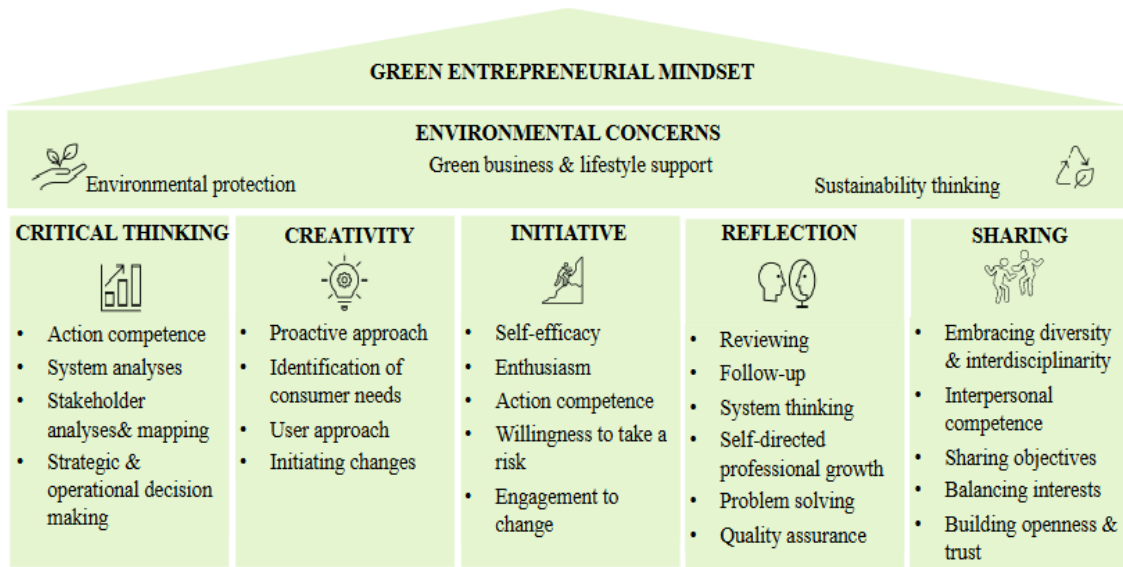


Figure 2. Green Entrepreneurial Mindset (Uvarova, et al., 2021)

Hence, green entrepreneurship education is considered to be a distinct field within entrepreneurship education that prioritises environmental sustainability in the context of business operations and management decisions, integrating ecological and economic principles to foster sustainable development (Salinas & Barroso, 2016). Its pedagogical approach is characterised by the integration of conventional business education values and environmental values to instil a holistic understanding of entrepreneurship that encompasses both commercial viability and environmental responsibility. Consequently, the objectives of green entrepreneurship education are multifaceted, including the provision of a cohesive curriculum encompassing the "green" and business sectors, thereby facilitating a comprehensive learning environment for students. This pedagogical approach fosters engagement with and inspiration from nature as a wellspring of life, while concurrently cultivating new competencies and the skills demanded by green entrepreneurship and associated job development (Schumpeter, 1943).

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Faludi and Gilbert (2019) explored the best practices for teaching environmental responsibility to inventors and innovators in the context of entrepreneurship education. There, they found that project-based learning and interdisciplinary teams (students and/or faculty) should be the main methods for implementing sustainable invention and innovation in entrepreneurship education. This practice seems to be one of the most successful and can have an impact on students to develop knowledge and skills related to green entrepreneurship. Other high quality implementation methods include competitions and awards, studio experiences, research mentoring and coaching, faculty workshops, case studies and standardised readings/media. Teaching is particularly valued when it is based on the work of interdisciplinary teams. These teams work with companies, NGOs, government agencies or local communities on real products or projects. In this way, these innovative practices teach the complexity of real-world sustainability in products and businesses in addition to the traditional curriculum. They also develop teamwork skills (especially across disciplines), which is particularly important in the context of green entrepreneurship. Building on what has been said, we will focus in depth on project-based learning and collaborative projects so that the reader can discover the potential of these successful practices for green entrepreneurship education.

Project-Based Learning and Collaborative Projects

Project-based learning (PBL) may be defined as an educational approach that is centred around the student, founded on three key constructivist principles. Firstly, learning is considered to be context-specific, secondly, students are actively engaged in the learning process, and thirdly, they realise their learning

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goals through social interactions and the sharing of knowledge and understanding (Cocco, 2006). It is regarded as a distinct form of inquiry-based learning, wherein the context for learning is furnished through authentic questions and problems in the context of real-world practices (Al-Balushi & Al-Aamri, 2014) that result in meaningful learning experiences (Wurdinger, Haar, Hugg, & Bezon, 2007).

As articulated by Blumenfeld et al. (2000), the procedural framework of project-based science is delineated as such: It is posited that students require opportunities to construct knowledge by solving real-world problems through the formulation and refinement of questions; the conceptualisation and execution of investigations; the aggregation, analysis, and interpretation of information and data; the deriving of conclusions; and the presentation of findings.

Project-based learning encourages students to become independent learners, able to work in teams. Students have opportunities to complete complex and consecutive project assignments. As there are projects in which students work with their peers and teachers act as facilitators, the implementation of project-based learning allows students to share the management of the classroom (Kean & Kwe, 2014). Furthermore, project-based learning enables students to improve their skills in communicating, managing, investigating, reflecting, participating, leading and critical thinking. These skills are based on the characteristics of the project-based learning model, e.g. the presentation of concrete issues, the process of solving problems, and the collaborative process in which students are directly involved (Pambudi & Harjanto, 2020).

According to Sasson, project-based learning can promote product or service creation through project activities (Sasson, et al., 2018). The products or

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services that are created through project-based learning have the potential to become products or services that are of benefit to the society. This makes project-based learning an opportunity for creating processes for buying and selling goods or services in line with entrepreneurial principles. In developing this learning model, project-based learning is one of the solutions for green entrepreneurship education.

Based on the above, it is obvious that working with project-based learning activities is a step-by-step process (Brudnik, et al., 2000):

- Familiarise the students with the method and give them the topic of the assignment.
- Development of project instructions - objectives, tasks and deadlines for their implementation, responsible persons.
- Implementation of the project - collection and analysis of information.
- Implementation of sub-tasks and preparation of the report.
- Presentation of the project.
- Evaluation of the project.

Furthermore, Haq et al (2024) focused on the entrepreneurial learning model referred to as the project-based entrepreneurial learning (PBEL) model. Combining entrepreneurial learning with project-based learning, this model is an excellent innovation.

Its main orientation is that the students have to come up with a business proposal and then have to turn it into a reality (Priyono, et al., 2023). PBEL is designed to include a variety of content, including knowledge and motivation (Smit & Pretorius, 2021). There are stages devoted to business and entrepreneurship skills (Smit & Pretorius, 2021). Priyono et al. (2023)

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categorises PBEL activities as education and training, experience and mentoring. Following a similar orientation, entrepreneurial learning activities can start with self-awareness, knowing the environment and opportunities, generating ideas and mobilising resources. All entrepreneurial activity combines results of interactions and integration of results of motivation and knowledge of learners, social groups and mentoring (Van Burg, et al., 2022).

Some or all of these motivational factors will influence the process of the formation of the individual entrepreneurial spirit from one step to the next (Davidsson, 2004). These motivational factors affect entrepreneurship. These motivational factors are combined with cognitive factors to influence individual entrepreneurship.

Entrepreneurship education is organised in stages, starting with introducing business opportunities (idea development), feasibility assessment, market-based product/service development, financing, organising and targeting markets (Ferreira, et al., 2019). Appropriate and innovative teaching materials and activities are needed for each stage.

The model shown in Figure 3 incorporates PBEL and efficiency theory. It starts with the basic steps of PBL, which include formulating a meaningful question, planning, scheduling, monitoring, evaluating and finally assessing a project. These steps flow seamlessly into the entrepreneurship model, encouraging learners to engage in real-world applications such as researching market demand and acquiring basic project design skills. This process is further aligned with the principles of effectiveness theory, emphasising attention, retention, production and motivation. The arrows between modules highlight the dynamic interaction and show how the structure supports learning at multiple levels, from conceptual understanding to practical application. This holistic approach

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not only promotes critical thinking and innovation, but also ensures sustained engagement and skill development, making it a compelling roadmap for transformative education.

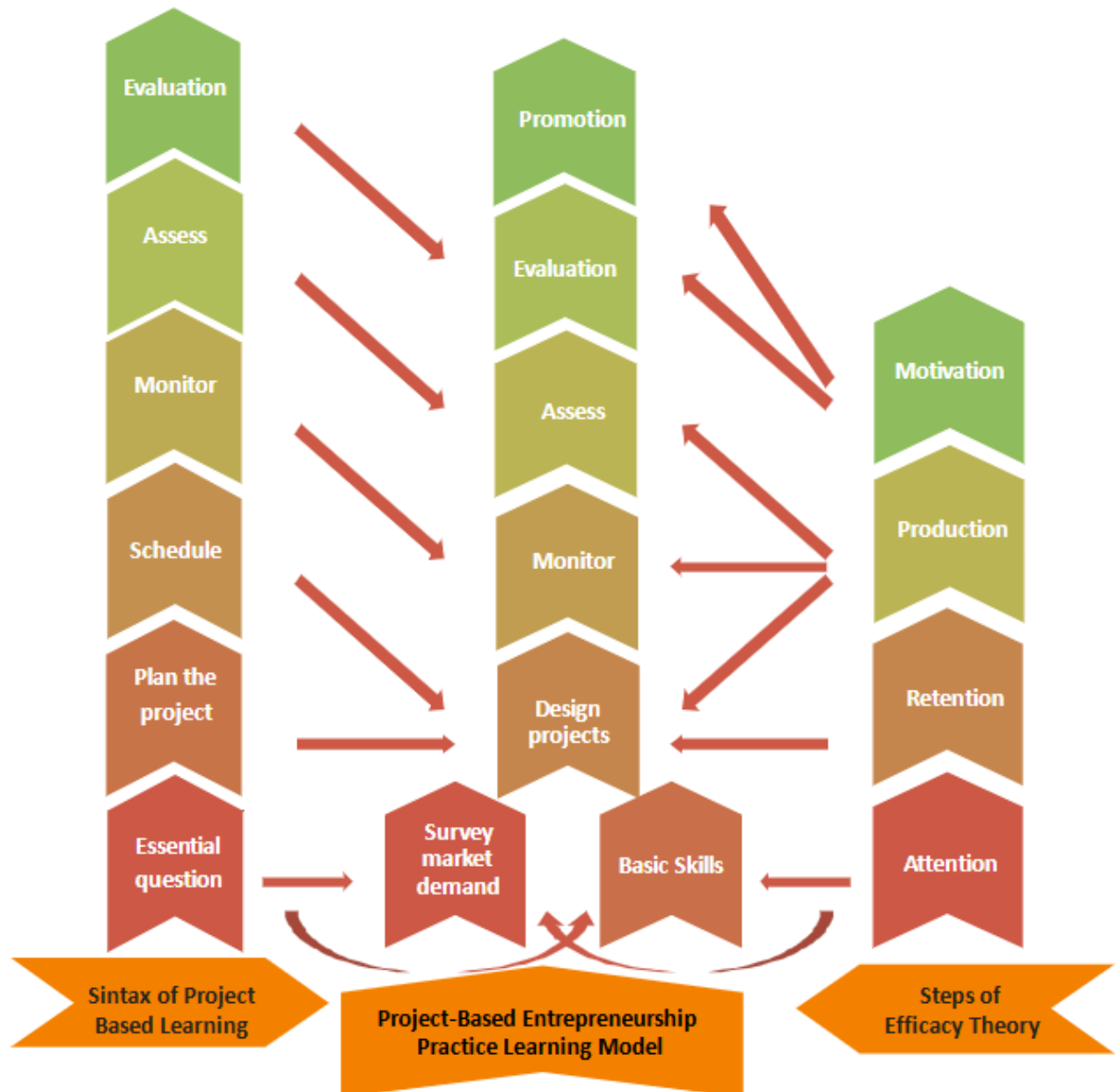


Figure 3. Figure 1. Syntax transformation of entrepreneurship project-based practical learning model (Haq et al., 2024)

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Librado-Gonzalez et al (2024) used challenge-based methodology as a learning model to promote green entrepreneurship, a practice very similar to project-based learning. It could be said to be an offshoot of project-based learning, except that its focus is on the solution of critical challenges. In particular, it provides real-life scenarios where students can apply the knowledge gained in education to solve global challenges. In addition, as students tackle real-world problems and collaborate with key stakeholders, it promotes the development of cognitive, critical and professional skills (Apple, 2010). The use of challenge-based methodology and problem-based learning formats can lead to student-centred educational innovations, especially when teaching topics related to sustainability and the circular economy (Cörvers et al., 2016; Rodríguez-Chueca et al., 2020; Steinemann, 2003). In this context, to enhance learning through these learning approaches, students can engage with social enterprises, business actors, government representatives, members of academia and civil society where they apply their knowledge in practice. Thus, problem-based learning enables them to combine their professional skills as they tackle and propose solutions to different difficult situations (Librado-Gonzalez, et al., 2024).

Incorporating Technology into Green Entrepreneurship Education

In the contemporary era, characterised by rapid advancements in technology, there is an increasing imperative for educational institutions to integrate technology into their curriculum. This integration is pivotal in equipping students with the requisite skills and knowledge to thrive in the digital age. The integration of Virtual Reality (VR), Artificial Intelligence (AI), Augmented Reality (AR), and robotics in educational settings can empower entrepreneurs

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in various ways (Ramli, et al., 2024; Weking, et al., 2023). AI, for instance, has the capacity to facilitate the discernment and exploitation of business prospects, enable informed decision-making processes, and enhance overall performance. Additionally, it has the potential to bolster educational and research initiatives in entrepreneurship. Moreover, in the context of green entrepreneurship education, integrating technology allows for students to familiarise themselves with a range of digital devices and platforms, thereby enabling them to explore sustainable business models and solutions.

Technological advances have profoundly impacted the realm of green entrepreneurship education, providing educators with an array of resources and digital platforms for instruction and knowledge transfer (Rath, et al., 2019). The following technologies have been instrumental in this transformation (Al-Gindy, et al., 2022):

- virtual reality, which facilitates students' immersion in realistic environmental scenarios,
- online learning platforms, which offer flexible access to educational resources and collaborative activities.
- mobile phone applications, which facilitate learning in transit,
- simulation software, which allows students to practise business decision-making in a virtual environment, and
- online collaboration tools that encourage teamwork and the sharing of knowledge.

The integration of technology in education for entrepreneurship in the green sector has been shown to foster innovation by exposing students to digital devices and platforms, and thus conditions and patterns that, in the absence of technology, would not have been possible for them to experience.

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Consequently, they are able to explore and develop sustainable business models and solutions that can contribute to the overall green economy (Setyani, et al., 2022). Furthermore, technology enables students to access a wealth of information and resources relating to entrepreneurship in the green sector. In this digital age, social media and websites offer a readily accessible repository of case studies and success stories drawn from real-world examples, providing a rich source of inspiration for students and a means to broaden their understanding of green business practices. This, in turn, can serve as a catalyst, encouraging them to explore and develop entrepreneurial ventures in the green sector.

Assessment Methods

In the context of entrepreneurship education, assessment plays a pivotal role in guiding students and instructors through the process of acquiring skills and applying knowledge. In the ever-evolving field of entrepreneurship, where adaptability, creativity and problem-solving are of the essence, conventional assessment methods are insufficient. Instead, effective assessment techniques need to evaluate both the theoretical grasp of fundamental concepts and the practical application of these principles in real-world scenarios. Through the implementation of diverse assessment techniques, educators are able to assess students' entrepreneurial aptitude, mindset, and their level of preparedness to navigate the multifaceted challenges inherent in the business world. Furthermore, assessments serve as potent instruments for fostering self-awareness, promoting continuous enhancement, and shaping the entrepreneurial mindset by emphasising resilience, critical thinking, and effective communication. In essence, the strategic utilisation of assessments

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is congruent with the comprehensive objectives of entrepreneurship education, thereby equipping students with the competencies deemed essential for success in their future entrepreneurial pursuits.

The following list gives some useful ways to assess students' progress:

Formative Assessments

- **Classroom Observations:** It is good to regularly watch students while they work together in groups on projects, to check their teamwork, communication, and problem-solving skills. Note how they lead the group, how well they speak, and what they do to help the group.
- **Peer Reviews:** Get students to give each other constructive feedback. This encourages students to understand themselves and take responsibility for their individual and team performance.
- **Reflection Journals:** Students should keep reflection journals about their entrepreneurial journey. Then we will assess how well they can critically analyse challenges, propose creative solutions and connect their experience to theoretical concepts.

Summative Assessments

- **Business Plans:** Students will be assessed on how well they understand entrepreneurial concepts by the development and presentation of a business plan. This shows how well they understand entrepreneurial ideas, how much they know about the market, and how good they are at making a plan.

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- **Pitch Presentations:** Students present their business ideas to a panel. This shows how good their communication and persuasion skills are. It also shows how well they can explain the value proposition, answer questions, and show confidence and passion.
- **Exams:** These are traditional exams that focus on theory. This means students have to show that they understand the basic ideas of entrepreneurship. It also means showing that they know the key concepts, frameworks, and theories.

Performance Tasks

- These role-playing exercises are designed to create situations where students can try out different roles, such as a founder, investor or customer. The exercises test how well students can adapt, negotiate, and make decisions in situations that are changing and seem real.
- **Simulations:** Use business simulations and real-life examples to test students' understanding of the challenges that entrepreneurs face. Assess how well they can use their knowledge to solve real problems.

Project-Based Assessments

- **Venture Projects:** Assign projects where students create and manage a small business. Evaluate their ability to turn ideas into a business, make decisions and deal with problems.

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- Market research projects: These projects will test the students' analytical and research skills. Students will be asked to do market research, look at data, and come up with business ideas based on what they find.

Rubrics and Checklists

- Skills Rubrics: Develop a list of specific skills needed for entrepreneurship (e.g. creativity, critical thinking, risk-taking). Provide a detailed way of assessing students' performance that is clear to them.
- Checklists can be used to assess tasks or criteria within a project, providing students with a clear way to demonstrate their progress and meeting predefined standards.

Interviews and presentations

- Exit interviews: Carry out exit interviews where students think about the whole learning process. Evaluate their ability to express the impact of the entrepreneurship curriculum on their skills, attitudes and future ambitions.
- Pitch competitions: Organise pitch competitions as a form of summative assessment. Assess students based on their ability to articulate ideas, respond to questions, and demonstrate a broad understanding of business concepts.

Tips for Implementation in Curriculum

Overview

The integration of green entrepreneurship into Vocational Education and Training (VET) curricula is essential in preparing students to meet the challenges of a sustainable economy. The "Green StartUppers Manifesto" provides a structured approach to help educators incorporate sustainability concepts into their teaching. This module offers practical strategies for aligning green entrepreneurship with curriculum standards, customizing instructional approaches for diverse learners, creating interdisciplinary frameworks, and engaging local industry and community resources to enhance student learning.

The goal of this document is to serve as a comprehensive guide for educators, enabling them to seamlessly embed green entrepreneurship principles into their curricula. By doing so, educators can empower students with the knowledge and skills necessary to become leaders in sustainable business practices. The module will cover several key areas, including aligning green entrepreneurship with educational standards, adapting teaching methods to suit diverse learners, fostering interdisciplinary collaboration, and leveraging local industry partnerships to provide real-world learning opportunities.

Learning Outcomes

- Understand how to integrate green entrepreneurship concepts into existing curriculum frameworks and standards.
- Learn how to tailor teaching methods to accommodate various learning styles and backgrounds.
- Develop strategies for incorporating green entrepreneurship across multiple subjects and disciplines.

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- Discover ways to connect with local businesses and community organizations to enhance practical learning experiences.

Aligning Green Entrepreneurship with Curriculum Standards

To successfully integrate green entrepreneurship into VET curricula, it is critical to align these concepts with established educational standards. This alignment ensures that sustainability education is not an add-on but a core component of the learning experience, thereby preparing students for a future where environmental considerations are central to business operations.

With the recommendations of the Oslo Agenda for Entrepreneurship Education in Europe, since 2006 there is general consensus to embed elements of entrepreneurial behaviour in schools and higher education that are already prevalent in primary school. It is widely accepted that experiential learning or 'learning by doing' with practical projects and activities and integrating real world experience of entrepreneurship is more effective than traditional methods, such as lectures, for developing entrepreneurship skills and attitudes. (United Nations, 2023)

Educational platforms

Introducing learners to global online educational platforms like UNCC: Learn, Coursera, and EdX can provide access to high-quality study programs that foster self-learning and skill development in a flexible, cost-effective manner. This exposure is especially valuable for aspiring green entrepreneurs, enabling them to network with experts and peers, and equipping them with the knowledge needed to address environmental challenges through innovative

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business solutions. To effectively promote these virtual learning platforms, it's crucial to provide necessary resources, including technology access, language support, and mentoring. Incorporating green entrepreneurship into educational curricula through tailored programs, and utilizing virtual knowledge hubs, can further enhance the skills of young entrepreneurs and educators alike, fostering a generation committed to sustainable business practices. (International Labour Organization, 2023)

Entrepreneurship education and green business development should go beyond theory, incorporating practical experiences that connect students with existing green businesses and research in new product development. This hands-on approach allows students to gain essential skills for the green economy. By linking educators, trainers, and students with experts in green entrepreneurship, we can foster collaboration and a deeper understanding of sustainable business practices. To promote green entrepreneurship, it is crucial to shift public perception from viewing green business solely as a social responsibility to recognizing it as a profitable and sustainable model. This involves creating platforms that demonstrate how circular economy principles apply to both global and local contexts. (University of Cambridge, n.d.) (Ellen MacArthur Foundation, n.d.)

Customizing Instructional Approaches for Diverse Learners

Diverse classrooms require instructional strategies that cater to different learning styles, abilities, and backgrounds. In the context of green entrepreneurship, this diversity presents an opportunity to engage students

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with varied interests and strengths, making sustainability a relatively tangible concept for all.

One effective strategy is to differentiate instruction across four key areas: content, process, product, and learning environment. By adjusting the content, teachers can offer students materials that match their readiness levels, ensuring that every learner is engaged with appropriately challenging tasks. Differentiating the process involves varying the activities through which students explore the content, allowing for multiple ways to understand and interact with the material. For example, some students might benefit from hands-on activities, while others may prefer working with visual aids or group discussions. (Learning A-Z, n.d.)

In addition to content and process, teachers can customize the product by allowing students to demonstrate their understanding in different ways, such as through written reports, presentations, or creative projects. This flexibility ensures that assessments are not one-size-fits-all but instead reflect the diverse talents and learning styles of the students. Finally, adjusting the learning environment, such as the classroom setup or the use of technology, can further support differentiated instruction. Creating spaces that cater to both collaborative and independent work, as well as incorporating tools like learning management systems, allows for a more personalized and effective educational experience. By applying these strategies, educators can better address the individual needs of their students, leading to more meaningful and inclusive learning outcomes. (Learning A-Z, n.d.)

Inclusive Education

In addition to differentiating instruction, it is important to adopt an inclusive approach that considers the needs of students with disabilities or those from diverse cultural backgrounds. This might involve providing materials in multiple formats (e.g., text, audio, video) and ensuring that content is accessible to students with varying levels of ability.

For students from different cultural backgrounds, educators should strive to incorporate examples and case studies that reflect diverse perspectives on sustainability. This not only makes the content more relatable but also enriches the learning experience by exposing students to a range of approaches to green entrepreneurship.

Creating an Interdisciplinary Framework

Green entrepreneurship is inherently interdisciplinary, touching on fields as varied as business, science, technology, and social studies. To fully integrate these concepts into the curriculum, educators should develop frameworks that encourage collaboration across different subjects, providing students with a holistic understanding of sustainability.

Creating an interdisciplinary framework for education requires aligning strategies across various levels of the system to support the green transition and sustainable development. This involves close cooperation with stakeholders to ensure that curricula, assessments, and educator training are geared toward these goals. To create effective learning environments, investment in sustainable infrastructure and resources is crucial. Additionally,

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raising awareness about the importance of sustainability in both formal and non-formal education is essential. This fosters a culture where learners are actively engaged in addressing climate change and environmental protection in their daily lives. (European Commission, 2023)

To further this interdisciplinary approach, it's vital to develop learners' knowledge and skills for sustainable living, promoting healthier, environmentally-conscious lifestyles. This can be achieved by providing the necessary digital tools and resources while enhancing educators' digital competencies. Encouraging learner participation in decision-making processes and co-creating educational approaches ensures that sustainability becomes a central part of the educational experience. Collaborating with local communities and stakeholders, such as environmental education centers and NGOs, can strengthen the connections between different learning contexts, making sustainability education more relevant and impactful for all learners. (European Commission, 2023)

Creating an interdisciplinary framework in green education involves aligning educational strategies with sustainable development goals and investing in green infrastructure and resources. By integrating sustainability into curricula and assessments, and enhancing educator training, learners are better equipped to understand and address environmental issues. This approach not only raises awareness but also actively engages students in sustainable practices, encouraging them to adopt environmentally conscious lifestyles.

Effective collaboration among educators plays a vital role in this framework. When teachers work together, they model collaborative skills for their students and take collective responsibility for all learners' progress. This collaborative environment allows teachers to learn from one another, share best practices,

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and enhance their professional growth. Such teamwork fosters innovation and problem-solving, leading to more effective teaching strategies and a stronger focus on sustainability. By capitalizing on each other's strengths, educators can create a more cohesive and impactful approach to green education, ultimately benefiting the entire learning community. (Te Kete Ipurangi, n.d.)

Experiential learning in environmental education offers several benefits for learners, including developing a connection to nature, promoting critical thinking and problem-solving skills, and promoting environmental stewardship and citizenship. By integrating experiential learning into the environmental education curriculum, learners can engage with the natural world, apply their knowledge and skills to address environmental issues and develop a sense of responsibility towards the environment. Therefore, educators should incorporate experiential learning into the environmental education curriculum to promote a more sustainable future. (Shutaleva, 2023)

Engaging Local Industry and Community Resources

Real-world experience is a key component of effective green entrepreneurship education. By engaging with local industries and community resources, educators can provide students with opportunities to apply their learning in practical settings, thereby deepening their understanding of sustainability and its relevance in the business world.

Industry partnerships are essential for providing students with practical learning experiences, particularly in fields related to sustainability. These collaborations often involve internships and apprenticeships with businesses that prioritize green practices, offering students hands-on opportunities to

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apply their knowledge in real-world settings. Additionally, guest lectures from industry professionals and collaborative projects address challenges like waste reduction and energy efficiency further enhance student learning. Such partnerships not only enrich educational experience but also help build a supportive network for green entrepreneurship within the community, benefiting both students and local businesses by fostering innovation and leadership in sustainability. (Boston Consulting Group, 2022)

Community engagement complements these industry partnerships by involving students in local environmental initiatives. Projects like sustainability workshops, collaborations with non-profits on community gardens, and research addressing local environmental challenges enable students to apply their skills in meaningful ways that benefit their communities. These activities not only emphasize the importance of green entrepreneurship but also instill a sense of social responsibility and civic engagement in students. By contributing to their communities, students gain a tangible understanding of the impact of their learning, which can motivate them to pursue careers in sustainability. (Da Vinci Schools, 2024)

Conclusion

Integrating green entrepreneurship into Vocational Education and Training (VET) curricula is essential for preparing students to navigate and lead in a sustainable economy. The "Green StartUppers Manifesto" offers a practical framework for educators, guiding them in embedding sustainability principles into their teaching. By aligning green entrepreneurship with curriculum standards, educators ensure that sustainability becomes a core component of

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the learning experience, equipping students with the skills and knowledge necessary to succeed in a green economy.

A key aspect of this integration is the emphasis on differentiated instruction and inclusivity, recognizing the diverse backgrounds and learning styles of students. By customizing content, processes, and assessments, educators can engage all students, making sustainability education accessible and relevant. This inclusive approach ensures that every learner, regardless of their starting point, can understand and appreciate the importance of green entrepreneurship.

Additionally, the module highlights the value of real-world experiences through partnerships with local industries and communities. These collaborations provide students with hands-on opportunities to apply their learning in practical settings, deepening their understanding of sustainability in business. By connecting theory with practice, educators can help shift the perception of green business from a social responsibility to a profitable and sustainable model, fostering a new generation of entrepreneurs committed to sustainable practices.

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