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Entrepreneurship Education for Climate Action: The Role of Universities in Developing NetZero Startups

Abstract

Purpose – As climate imperatives escalate, HEIs are expected to mobilise entrepreneurship education for SDG delivery. This study examines how entrepreneurship education shapes graduates' creation of NetZero-oriented ventures and explains the institutional conditions that enable or inhibit this pathway.

Design/methodology/approach – Using an interpretivist qualitative design, study conducted 32 semi-structured interviews with graduates (undergraduate n=14; postgraduate n=18) from four UK universities (graduation 2020–2023) engaged in NetZero ventures. Data were analysed using the Gioia method; demographic identifiers were used to contextualise quotations.

Findings – Five cross-institutional challenges constrain the translation of sustainability awareness into entrepreneurial action: (1) limited embedding of NetZero content in core curricula; (2) inconsistent sustainability terminology; (3) insufficient implementation guidance and venture-building support; (4) over-reliance on classroom-based instruction relative to experiential learning; and (5) fragmented, weakly coordinated support across units. Study explains how these patterns arise from curriculum design choices, capability gaps in NetZero pedagogy, and siloed governance that dissipate resources.

Research limitations/implications – The qualitative, UK-based sample limits generalisability; future research should test these mechanisms in other contexts using mixed methods and multi-stakeholder data.

Practical implications – Recommendations include embedding NetZero across entrepreneurship teaching, establishing shared terminology, providing tailored implementation support (incubation/mentoring), extending experiential learning, and coordinating cross-unit ecosystems aligned with policy partners.

Social implications – Stronger university ecosystems can accelerate graduate-led NetZero innovation, advancing SDG 4 and SDG 13.

Originality/value – The study offers one of the first empirically grounded accounts linking entrepreneurship education to NetZero venture creation, integrating institutional and graduate perspectives.

Keywords

NetZero Entrepreneurship, Sustainability in Higher Education, Entrepreneurship, Education, Climate Action, University-Based Innovation, sustainable future

1. Introduction

The increasing urgency of climate change has prompted global commitments to decarbonisation, with many nations aiming for NetZero emissions by 2050 (HM Government, 2021). As emphasised by the IPCC (2022), the "brief and rapidly closing window of opportunity" to secure a liveable planet necessitates immediate, coordinated action across all sectors of society. Businesses, which contribute significantly to global greenhouse gas emissions, are central to this transformation (ONS, 2022). While many existing firms are transitioning to more sustainable practices, it is equally critical to support the formation of new businesses that are founded on NetZero principles from inception.

Universities are crucial drivers of economic development and social change (Guerrero et al., 2016), especially as global problems reshape socioeconomic landscapes and demand sustainable returns from universities (GraddyReed, Lanahan and D'Agostino, 2021). The appetite for finding ways through which entrepreneurship education in universities can play a role in addressing societal challenges around climate change has never been stronger. Addressing the challenge of climate change, the present study aims to explore how universities may gain ground in the race for climate action by assisting in developing new businesses built with climate action in mind. Higher education institutions (HEIs) are increasingly recognised as catalysts for sustainable development through their roles in teaching, research, and societal engagement (Cross and Congreve, 2020). Entrepreneurship education within universities plays a pivotal role in this ecosystem by shaping the attitudes, intentions, and capacities of students to become agents of change. Recent scholarship underscores the potential of entrepreneurial ecosystems fostered by universities to address societal challenges, including those posed by climate change (Guerrero et al., 2016; Meek and Gianiodis, 2022; Wurth et al., 2021). However, there remains limited empirical understanding of how entrepreneurship education specifically supports the development of NetZero-focused ventures.

Addressing this gap, the present study investigates the extent to which entrepreneurship education and associated institutional support systems influence graduates in founding NetZero-aligned businesses. Focusing on four UK universities known for their entrepreneurship ecosystems and sustainability agendas, this research explores how these educational environments shape graduate entrepreneurial intent and enable sustainable start-up formation. By examining the lived experiences of 32 recent graduates who have launched NetZero ventures, the study seeks to identify critical enablers and barriers within university settings.

This research adopts a qualitative methodology underpinned by the Gioia method, allowing for a rigorous and transparent interpretation of complex experiential data. The findings contribute to the literature on sustainability in higher education and entrepreneurship by highlighting five thematic challenges that constrain NetZero-oriented entrepreneurial activity: limited curriculum integration, terminological inconsistency, weak practical implementation, over-reliance on classroom teaching, and fragmented institutional support.

In doing so, the study addresses Sustainable Development Goals (SDG) SDG 4 (Quality Education) and SDG 13 (Climate Action), providing actionable insights for policy, pedagogy, and institutional design. It advances understanding of how HEIs can align entrepreneurship education with the imperatives of climate action, equipping graduates to become proactive contributors to a sustainable and resilient economy.

2. Literature Review

The escalating climate crisis has underscored the urgency for businesses to transition towards environmentally responsible models. Within this broader transformation, entrepreneurship is increasingly viewed not just as an economic driver, but as a mechanism for social and ecological innovation. As a result, a growing body of literature has emerged around sustainable entrepreneurship—defined by its dual focus on value creation and environmental stewardship. Central to this discourse is the role of higher education institutions (HEIs), which have the potential to shape entrepreneurial intent and capabilities through curricula, mentorship, and institutional ecosystems. This review critically examines three interrelated strands: the concept of sustainable entrepreneurship and its alignment with climate action; the influence of entrepreneurship education on sustainable entrepreneurial intention; and the role of universities in fostering institutional ecosystems that support NetZero-aligned ventures.

2.1 Sustainable Entrepreneurship and Climate-Oriented Innovation

Traditionally, entrepreneurship has been framed through the lens of economic utility and market efficiency, often guided by profit-maximisation logic (Friedman, 2007). However, this orientation has come under scrutiny in light of complex global challenges, particularly climate change, biodiversity loss, and inequality. In response, an alternative model of sustainable entrepreneurship has emerged, emphasizing ventures that simultaneously deliver economic, social, and ecological value (Laukkanen and Tura, 2020; Lüdeke-Freund et al., 2020).

Sustainable entrepreneurs distinguish themselves by incorporating environmental priorities—such as carbon neutrality, renewable energy, and circular economy principles—into the very design of their business models. Peng et al. (2021) define sustainable entrepreneurship as a process where ventures are formed with intentional strategies to balance ecological, social, and financial objectives. This contrasts with the traditional post hoc integration of corporate social responsibility (CSR) in business, wherein sustainability is often treated as an add-on rather than a foundational principle.

Entrepreneurs with high environmental values are more likely to pursue businesses that explicitly tackle environmental degradation (Yasir et al., 2021; Qazi et al., 2021). Such ventures are not only driven by market opportunities but also by a sense of environmental responsibility, often characterised by a “people–planet–profit” orientation. These value systems are increasingly shaped during

formative experiences, including education. Thus, universities—by integrating sustainability into entrepreneurial training—can act as catalysts for NetZero-aligned innovation.

Despite this potential, a persistent gap remains in the translation of sustainability ideals into entrepreneurial practice. Few empirical studies explore how sustainable entrepreneurship specifically relates to climate mitigation goals, such as the formation of NetZero ventures. The current study contributes to closing this gap by examining how educational systems influence the entrepreneurial pathways of graduates seeking to build climate-aligned businesses.

2.2 Entrepreneurship Education and Sustainable Entrepreneurial Intention

2.2 Entrepreneurship Education and Sustainable Entrepreneurial Intention

Entrepreneurship education has emerged as a central mechanism for fostering sustainable entrepreneurial intention (SEI), equipping students with the knowledge, skills, and values necessary to engage in sustainability-oriented venture creation. While early research on entrepreneurial intention drew heavily from Ajzen's (1991) Theory of Planned Behaviour (TPB), more recent scholarship has extended this framework to incorporate environmental attitudes, social norms, and institutional contexts as critical antecedents of SEI (Arru, 2020; Yasir et al., 2021; Sharma et al., 2024). This shift underscores a growing recognition that entrepreneurship education is not merely a vehicle for imparting technical skills, but also a transformative platform for cultivating sustainability-oriented mindsets and competencies (Islam & Mehdi, 2024; Ramos-Rodríguez et al., 2024).

A central theme in recent studies is the role of curriculum design and assessment in embedding sustainability within entrepreneurship education. Educator perspectives emphasize that sustainability integration must extend beyond elective modules or isolated case studies to become a core element of entrepreneurial training (Kotla & Bosman, 2023). Curriculum assessments reveal that programs emphasizing experiential learning, sustainability-infused case studies, and interdisciplinary collaboration significantly enhance students' SEI (Bridgman et al., 2024; Zherdeva et al., 2025). For example, Zherdeva et al. (2025) argue that embedding contextual critical thinking and ecological problem framing within assessment design cultivates sustainability literacy while enabling students to link entrepreneurial processes to real-world environmental and societal challenges.

Educators also highlight the importance of transformative learning approaches pedagogies that integrate reflection, action, and value-driven inquiry. Bridgman et al. (2024) demonstrate that entrepreneurship curricula employing third-order critical reflection enable students to interrogate unsustainable business norms and envision entrepreneurial models aligned with long-term societal value creation. Such reflective practices, when coupled with experiential learning (e.g., living labs, green incubators, and community-based projects), help translate sustainability theory into

entrepreneurial practice, reinforcing students' belief in their capacity to address ecological and social issues through venture creation (Qazi et al., 2021).

From an educator standpoint, psychological capital (PsyCap)is increasingly viewed as a critical target of entrepreneurship education, mediating the relationship between pedagogy and SEI (Cui, 2021). Courses incorporating safe-failure environments, iterative feedback, and resilience training help students build self-efficacy, optimism, and perseverance traits essential for navigating the high uncertainty inherent in sustainability-oriented entrepreneurship (Zhao & Wibowo, 2021). Educators thus argue that curriculum assessment must account not only for knowledge acquisition but also for students' development of entrepreneurial resilience and sustainability-oriented self-efficacy, which are predictors of their entrepreneurial intentions and post-graduation behaviour.

Furthermore, educators stress the necessity of aligning entrepreneurship curricula with the Sustainable Development Goals (SDGs) and institutional sustainability agendas. Kotla and Bosman (2023) contend that embedding SDG frameworks within course design provides students with a clear normative orientation, encouraging them to view entrepreneurship as a tool for systemic change. Such alignment also facilitates cross-disciplinary collaboration, allowing students to draw on expertise from fields such as environmental science, engineering, and social policy, thereby broadening their opportunity recognition capabilities for sustainability-driven ventures (Ramos-Rodríguez et al., 2024).

Curriculum evaluations also point to the pivotal role of institutional support and educator agency in fostering SEI. Islam and Mehdi (2024) emphasize that universities which integrate climate awareness campaigns, sustainability-focused competitions, and incubation support within entrepreneurship programs not only increase students' sustainability knowledge but also strengthen their perceived behavioral control—a key TPB variable influencing entrepreneurial intention. Educators further argue for the value of co-curricular initiatives, such as mentorship programs with sustainability entrepreneurs, partnerships with local green businesses, and stakeholder engagement projects, which contextualize sustainability challenges and provide role models who reinforce pro-environmental entrepreneurial norms (Lüdeke-Freund et al., 2020; Demirel et al., 2019).

Importantly, assessment-driven insights from educators reveal that fostering SEI requires a dual focus: (1) technical entrepreneurial competencies (e.g., business modeling, resource mobilization, and opportunity recognition) and (2) sustainability literacy and values formation. For instance, Ramos-Rodríguez et al. (2024) demonstrate that intellectual capital (knowledge and skills) and social capital (networks and partnerships) cultivated through entrepreneurship education directly enhance students' capacity to identify sustainability-oriented opportunities. Similarly, Peng et al. (2021) find that normative beliefs around environmental responsibility, reinforced through structured curricular and co-curricular experiences, are essential drivers of SEI.

Collectively, these findings suggest that educator-led curriculum innovation is central to advancing SEI. By integrating sustainability across teaching content, pedagogical methods, and assessment design, educators not only influence students' entrepreneurial knowledge but also reshape their attitudes, self-efficacy, and normative commitments toward sustainability (Anjum et al., 2024; Islam & Mehdi, 2024). However, as several scholars note, intention alone is insufficient without enabling institutional ecosystems. Demirel et al. (2019) and Qazi et al. (2021) highlight that even when SEI is strengthened through education, the absence of incubation resources, mentorship, and funding opportunities often prevents these intentions from translating into tangible ventures.

Thus, future research and practice should focus on how curriculum reform, educator engagement, and institutional support systems interact to convert sustainability-oriented entrepreneurial intentions into viable business creation. By positioning educators as both designers and facilitators of transformative entrepreneurship curricula, higher education institutions can play a pivotal role in shaping a generation of entrepreneurs capable of addressing pressing global sustainability challenges.

However, there is a growing recognition that intent alone is insufficient. Without the necessary infrastructure and institutional backing, many sustainability-oriented entrepreneurial intentions fail to materialise. This leads to a broader question: how can universities provide environments that enable sustainable business creation?

2.3 The Role of University-Based Ecosystems in Fostering NetZero Ventures

Entrepreneurial intention theory, grounded in frameworks such as Ajzen's Theory of Planned Behavior (TPB), positions entrepreneurial action as the product of intention shaped by attitudes, perceived behavioral control, and social norms (Ajzen, 1991; Krueger et al., 2000). Within sustainability entrepreneurship research, this perspective has been extended to argue that education can enhance sustainable entrepreneurial intention by shaping pro-environmental attitudes, knowledge, and efficacy beliefs (Vuorio et al., 2018). However, while entrepreneurship education is necessary to cultivate intention, the translation of intention into venture creation requires supportive institutional environments (Fayolle & Liñán, 2014). Universities thus play a pivotal role in bridging this gap: beyond delivering entrepreneurship curricula, they function as ecosystem builders that provide the structural, cultural, and networked supports essential for transforming sustainability-oriented intention into NetZero-aligned ventures (Guerrero et al., 2016).

The entrepreneurial ecosystem framework offers a useful lens for understanding this expanded role. Audretsch and Belitski (2017) define such ecosystems as dynamic networks of interdependent actors, including entrepreneurs, mentors, investors, universities, and government agencies, embedded within enabling socio-cultural and institutional contexts. For sustainability-focused entrepreneurship, these

ecosystems must be explicitly aligned with green innovation imperatives and climate governance frameworks, thereby linking entrepreneurial development to broader NetZero and sustainability agendas (Isenberg, 2010; Volkmann et al., 2021).

Integrating Sustainability into Curricula and Venture Development Pathways

A growing body of research underscores the role of curricular design in shaping NetZero entrepreneurship. Embedding sustainability challenges, practical learning, and venture prototyping into entrepreneurship programs has been shown to enhance student engagement and increase the likelihood of sustainability-oriented venture creation (Fichter et al., 2024). This aligns with Cai and Ahmad's (2021) conceptualization of the "sustainable entrepreneurial university," where incubators evolve from generic start-up support mechanisms into platforms that scaffold mission-driven ventures aligned with the Sustainable Development Goals (SDGs) especially SDG 4 (Quality Education) and SDG 13 (Climate Action), through structured pedagogy and venture development programming (Millette et al., 2020).

In addition to curricular reform, universities are investing in physical and institutional infrastructure that bridges academic learning with entrepreneurial practice. Dedicated innovation spaces—including co-working hubs, laboratories, and prototyping facilities—equip students with the technical resources needed to develop climate-impact solutions. Complementary initiatives such as Green Offices and sustainability governance hubs further embed sustainability into campus culture, engaging students in co-creating institutional sustainability strategies while linking these experiences directly to entrepreneurship pathways (Gosse et al., 2022; Bazan et al., 2020).

Addressing Fragmentation through Systems Thinking and Interdisciplinary Collaboration

Despite these developments, research cautions that many university ecosystems remain fragmented, with sustainability initiatives siloed across disparate offices, student clubs, and business incubators (Marteau et al., 2021). Such fragmentation limits their systemic impact and perpetuates a narrow focus on economic performance metrics, such as revenue growth and scalability, at the expense of environmental and social value creation. A systems-thinking perspective is increasingly advocated to counteract this, embedding sustainability holistically across curricula, research agendas, mentoring schemes, and external engagement activities (Volkmann et al., 2021).

Interdisciplinary collaboration is particularly critical in this regard. Integrating expertise from technical disciplines such as engineering or environmental sciences with entrepreneurial training in business faculties fosters the cross-pollination of knowledge necessary to identify and develop NetZero-oriented ventures. Such integration also reflects Marteau et al.'s (2021) call for universities to design ecosystems that transcend organizational silos and cultivate innovation capacity through coordinated, institution-wide sustainability agendas.

Leveraging External Partnerships

University-based NetZero ecosystems are further strengthened by robust external partnerships, consistent with the Triple Helix model of innovation (Etzkowitz & Leydesdorff, 2000). Collaborations with industry, government agencies, NGOs, and investors not only provide students with access to critical resources but also confer legitimacy and exposure to climate policy and financing mechanisms. For example, the Green Future Investment Fund and Cranfield University's partnerships with SMEs, climate experts, and investors illustrate how universities can prepare student ventures for participation in emerging climate finance frameworks and NetZero scaling opportunities (Bettany Centre for Entrepreneurship, 2025).

Similarly, Cornell University's Center for Sustainable Global Enterprise embeds performance-based learning into its programs by engaging students in industry-sponsored sustainability projects with partners such as GE, IBM, and Shell Hydrogen, thereby combining experiential learning with access to professional sustainability networks (Cornell University, 2023). Programs such as UCSD's BlueStart and NSF I-Corps also demonstrate how ecosystem models can leverage regional cultural and historical contexts to nurture entrepreneurial mindsets that prioritize sustainable innovation (Ly-Baro et al., 2024).

Visibility of NetZero Ventures

The visibility of successful NetZero student ventures also plays an important cultural role within university ecosystems. As Volkmann et al. (2021) argue, showcasing these ventures through accelerators, competitions, and targeted communication campaigns both inspires subsequent cohorts and signals institutional commitment to sustainability entrepreneurship. Visibility thus functions both as a motivational tool and a means of normalizing sustainability-aligned entrepreneurial behaviour within university contexts.

Toward Integrated Ecosystem Design

Despite notable progress, the literature continues to emphasize the persistence of fragmentation in university ecosystems (Marteau et al., 2021). To address this, scholars call for more integrated ecosystem design that embeds sustainability across teaching, research, incubation, mentoring, funding networks, and evaluation metrics, explicitly measuring ecological as well as economic value. Such approaches position universities not simply as sites of education but as generative institutional ecosystems that actively enable, accelerate, and legitimize NetZero entrepreneurial activity (Volkmann et al., 2021; Cai & Ahmad, 2021).

By aligning curricula, infrastructure, partnerships, and cultural norms with global sustainability imperatives, universities can transcend their traditional educational role to become critical nodes in

regional and global NetZero innovation ecosystems, thereby bridging the gap between sustainable entrepreneurial intention and real-world venture creation.

2.4 Summary and Emerging Research Gap

In summary, existing literature points to a growing convergence between sustainability, entrepreneurship, and higher education. Sustainable entrepreneurship provides a promising vehicle for addressing global environmental challenges. Entrepreneurship education influences students' intention to launch sustainable ventures, while university ecosystems provide the contextual infrastructure necessary for implementation.

Yet, a specific research gap persists: How do entrepreneurship education ecosystems within universities enable the formation of NetZero-focused businesses? While general links between sustainability and entrepreneurship are well-documented, there is limited empirical evidence connecting entrepreneurship education to climate-specific business outcomes. Moreover, few studies explore this question through the lived experiences of recent graduates who have attempted to build climate-aligned start-ups.

This study addresses that gap by empirically exploring how entrepreneurship education across four leading UK universities supports (or hinders) the creation of NetZero ventures. The findings contribute to theory by extending entrepreneurial intention models into the climate innovation domain and to practice by offering actionable recommendations for university policymakers and educators. The next section introduces a conceptual framework that synthesises these theoretical foundations and guides the empirical investigation.

3. Methodology

3.1 Research Design and Philosophical Position

This study adopts an interpretivist philosophical stance and a qualitative research design to explore how university-based entrepreneurship education influences the creation of NetZero-oriented ventures. An interpretivist approach is appropriate given the focus on understanding the subjective experiences, perceptions, and contextual factors that shape the entrepreneurial pathways of graduates (Bell, Bryman and Harley, 2022, p. 696).

Qualitative methods are particularly suited to uncovering the nuanced and often tacit ways in which institutional ecosystems, curricula, and cultural contexts influence graduates' sustainability-oriented business formation. The Gioia method was selected for its ability to provide a systematic yet inductive framework for analysing complex, experience-driven narratives while preserving participants' voices (Gioia, Corley, & Hamilton, 2012). The qualitative design enables the exploration of meanings constructed by individuals in relation to sustainability and innovation, allowing the researchers to uncover the nuanced ways in which institutional ecosystems influence entrepreneurial outcomes.

Figure 1 presents the sequence of steps that guided the study from its conceptual starting point to the

development of practical recommendations. The process began with an examination of the literature to identify a gap in understanding about how entrepreneurship education can support the creation of NetZero-oriented ventures. This gap was informed by the absence of detailed empirical evidence connecting university-based teaching and support with the establishment of climate-focused businesses.

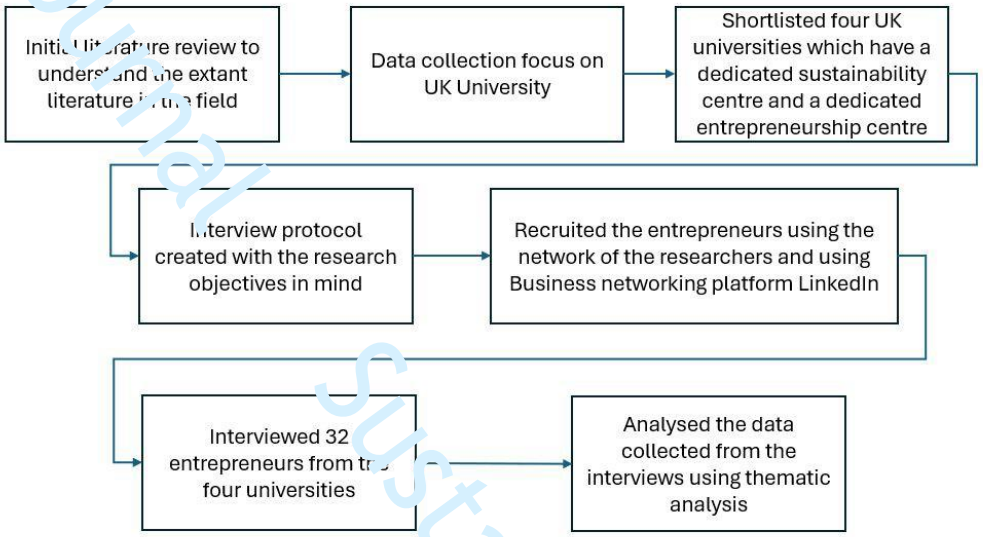

Figure 1. Research Framework.

3.2 Sampling Strategy and Participant Criteria

The study adopted a purposive sampling strategy to identify participants whose experiences aligned with the research objectives. Thirty-two recent graduates from UK universities were interviewed, each of whom had established a NetZero oriented business after engaging in entrepreneurship education during their academic studies. Participants were required to have graduated from a UK higher education institution between 2020 and 2023, to have completed at least one entrepreneurship focused module, programme or co-curricular activity during their studies, and to have founded or co-founded a business that explicitly embedded NetZero principles such as carbon neutrality, renewable energy adoption or circular economy practices within its mission or operations.

Theoretical sampling technique (Glaser & Strauss, 2017) is adopted to select the sample for this research. The sampling frame comprised graduates from four UK universities recognised for the maturity of their entrepreneurship education. These institutions were selected to reflect both geographic and institutional diversity, encompassing research intensive universities as well as those with practice-oriented entrepreneurship programmes. They also varied in pedagogical approaches, institutional sustainability agendas and the configuration of support infrastructures available to students. A geographically stratified approach was employed to ensure representation across different

institutional contexts, student demographics and the sectoral domains of the participating start-ups.

The final sample size was deemed sufficient to achieve thematic saturation, defined as the point at which no new themes emerged during the latter stages of data collection (Ritchie et al., 2013).

Participants varied in academic background, gender, and entrepreneurial sector focus. The cohort included both undergraduate (n=14) and postgraduate (n=18) alumni, spanning disciplines such as business, engineering, environmental science, and social innovation.

A summary of the participants and the profiles of the universities is provided in appendix 1. The universities (coded A, C, W, D) were selected for their mature entrepreneurship ecosystems and explicit sustainability agendas. Each offers distinctive combinations of entrepreneurship support and climate-focused initiatives, ranging from incubators and accelerators to climate leadership programmes and zero-carbon campus strategies. For anonymity, each participant was assigned a code. The first letter of the code (A, C, W, D) corresponds to the anonymised university from which the participant graduated, while the number denotes the order in which participants from that institution were interviewed (e.g., A2 refers to the second participant interviewed from University A). This system allowed us to preserve confidentiality while still distinguishing between participants and linking their responses to institutional contexts.

3.3 Data Collection

Data were collected via semi-structured interviews, chosen for their flexibility and ability to elicit in-depth, context-rich insights (Saunders, Lewis and Thornhill, 2019). This format allowed participants to share detailed accounts of their experiences while enabling the researchers to explore emerging areas of interest during the conversation.

Each interview lasted approximately 40 to 60 minutes and was conducted via a secure video conferencing platform. Interviews were recorded with consent and subsequently transcribed verbatim. The interview protocol was designed around four key focus areas: (i) awareness and understanding of NetZero principles, (ii) perceived influence of entrepreneurship education, (iii) access to institutional support, and (iv) perceived gaps or limitations in university resources and guidance. All participants were informed of their rights, and ethical protocols were followed to ensure confidentiality and voluntary participation.

3.4 Data Analysis Process

The Gioia method technique (Gioia, Corley and Hamilton, 2012) was used for qualitative data analysis. This structured approach is particularly effective for inductive research and allows the voices of participants to be preserved while distilling higher-order conceptual themes.

The analysis followed four stages as shown in figure 2 below:

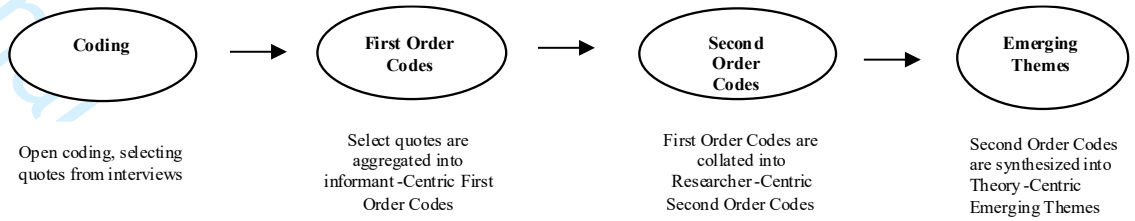

Figure 2. Data analysis

First, open coding involved extracting raw quotes "as-is" from transcripts to preserve the language of participants. Second, these extracts were organised into first-order codes, reflecting participants' lived experiences. Third, the research team grouped these into second-order themes, informed by the literature on entrepreneurial intention, ecosystems, and sustainability education. Finally, the themes were synthesised into aggregate dimensions representing the systemic challenges and opportunities in entrepreneurship education for NetZero.

The analysis was iterative and comparative. Data were examined within and across institutional clusters (C, W, A, D) to capture both university-specific nuances and cross-case patterns. Reflexivity was maintained throughout, with memos documenting coding decisions, and peer debriefing used to challenge emerging interpretations. The use of Gioia's data structure ensured methodological rigour, transparency, and alignment between empirical evidence and conceptual insights.

3.5 Research Boundaries and Constraints

As with all qualitative research, several factors were beyond the researchers' control and may have shaped the data. The study was conducted in the aftermath of the COVID-19 pandemic, during which universities were still transitioning back to in-person teaching. This limited students' access to some resources and shaped how they experienced entrepreneurship education. Institutional differences across the four universities — in funding, sustainability commitments, and ecosystem maturity — also created uneven experiences that could not be standardised. While these factors were acknowledged and recorded during analysis, they reflect contextual realities rather than variables the research could influence.

Beyond these contextual realities, the research is also bounded by several methodological constraints. First, self-selection bias is possible, since participants were graduates who had voluntarily engaged in sustainability entrepreneurship; their perspectives may over-represent individuals with strong pro-environmental values. Second, the study's temporal scope (graduates from 2020–2023) coincides with the post-COVID disruption of higher education,

where hybrid teaching, reduced campus access, and altered resource availability may have influenced how students engaged with entrepreneurship education. Third, the reliance on self-reported narratives raises the possibility of recall bias or social desirability bias. While the Gioia method mitigates this through systematic coding, triangulation with educator or institutional perspectives would further enhance validity.

These constraints do not undermine the study's contributions but rather delimit its scope. The findings should therefore be interpreted as reflective of student-led perspectives in specific institutional contexts, rather than generalised to all higher education settings.

4. Findings

The findings from interviews with 32 university graduates reveal five thematic insights into how entrepreneurship education in UK universities influences the formation of NetZero-oriented start-ups. These themes shed light on systemic gaps, institutional challenges, and opportunities for universities to realign their entrepreneurship ecosystems with climate goals.

In an effort to reach NetZero, UK businesses have a crucial role to play. While existing businesses are moving from orthodox business models to become sustainable, it is equally important to encourage the birth of new businesses that are founded on the principles of NetZero. Without such new businesses, the journey towards becoming environmentally friendly will be a constant catch-up game. In the UK alone, more than two-thousand businesses are founded every day, highlighting the importance of developing NetZero entrepreneurship. Prior research has shown that entrepreneurship education can influence the entrepreneurial intentions of new businesses, but how it influences the intentions of entrepreneurs to start NetZero businesses has not been explored yet. But how entrepreneurship education influences the entrepreneurial intentions of entrepreneurs to start NetZero business has not been explored in the extant research yet. To address this gap in the literature, and to inform practice, we conducted interpretive research by interviewing entrepreneurs who pursued university education before starting their businesses. Based on the thematic analysis of the interviews, visually represented in Figure 2, we identified five emerging themes presented as follows.

4.1 Theme 1: Teaching NetZero as a business opportunity

The first emerging theme from the research reveals that universities are overlooking the importance of incorporating the concept of Net-Zero emissions in their curricula. There appears to be a lack of awareness among university students about the concept of NetZero and sustainability goals. This is evidenced by the fact that many participants expressed confusion about what NetZero means and how it relates to their daily lives. There seems to be a need for universities to prioritize educational initiatives that focus on raising awareness and educating students about NetZero and sustainability goals. The interviews highlighted that NetZero is seldom positioned within curricula as a viable

business opportunity. Instead, it is generally framed in terms of social responsibility or climate awareness, leaving students struggling to connect sustainability knowledge with entrepreneurial practice. Participants repeatedly pointed out that while they understood the importance of NetZero in theory, they were not encouraged to view it as a driver of value creation or a strategic advantage. One participant, A5 (female, 28, MSc, graduated 2020, founder of a circular economy retail venture), observed:

"Sustainability was taught to us as something important to society, but it was never shown how it could be built into a profitable start-up. That disconnect makes it difficult to take the next step."

Her reflections suggest that even when students are motivated to pursue entrepreneurial careers, they may lack the framing necessary to translate climate commitments into commercially viable models. Another participant, C4 (male, 30, MSc, graduated 2021, working on a sustainable urban mobility venture), reinforced this point:

"We learn about climate change and NetZero in general terms, but not how this can translate into a real opportunity for a start-up. Without that connection, it feels like two separate conversations."

His perspective demonstrates that sustainability knowledge is often siloed from entrepreneurship modules, which prevents students from seeing the full potential of climate action as a business opportunity. This concern was echoed by W2 (female, 27, BSc, graduated 2022, founder of a sustainable fashion venture), who stated:

"The business side of NetZero is missing. We need to see where the opportunities are — otherwise it feels like sustainability is just another lecture topic."

Her reflection illustrates how a lack of integration leads students to view NetZero as an abstract agenda, rather than a practical basis for entrepreneurial innovation.

Taken together, these accounts show that while awareness of NetZero is embedded in the student experience, its entrepreneurial potential remains underdeveloped. Students want to see NetZero embedded in value creation, opportunity recognition, and venture design — the core logics of entrepreneurship education. Without this alignment, sustainability risks being seen as a side note, rather than a catalyst for innovation. The participants emphasized the need for more examples of start-ups that have successfully implemented NetZero strategies in teaching material, enabling students to understand how they can apply NetZero principles to their entrepreneurial ventures, irrespective of the size or stage of development of the ventures. Therefore, there seems to be a need for universities to broaden their focus and provide more comprehensive teaching material that covers not just large corporations but also start-ups, to foster entrepreneurship in the field of NetZero emissions. The visual representation of the theme is shown in Figure 2.

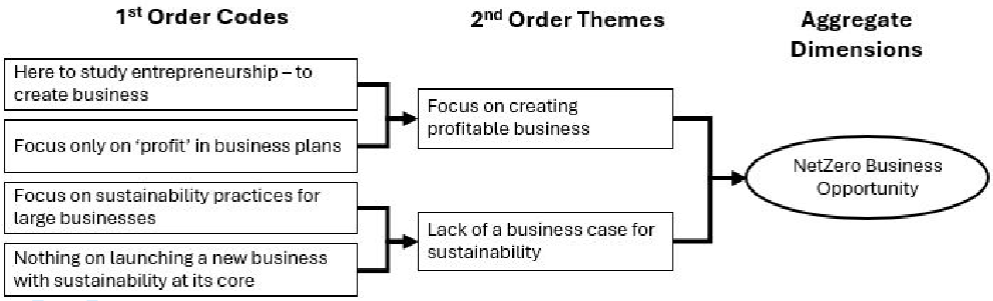

Figure 2. NetZero Business Opportunity.

4.2 Theme 2: Lack of use of appropriate terminology

The second theme emerging from our research highlights the lack of appropriate terminology being used in universities to teach NetZero. The study reveals that the use of a wide range of overlapping terminologies leads to confusion among students, making it difficult for them to fully understand the concept of NetZero. Terms such as CSR, triple bottom line, sustainability, green business, B Corp, UN SDG, organizational purpose, social purpose, and others are often used interchangeably with NetZero, creating confusion. For example, W2 (female, 27, BSc, graduated 2022, sustainable fashion entrepreneur) explained:

"Sometimes lecturers would say sustainability, then sometimes NetZero, and other times CSR or SDGs. It makes it harder to know what exactly we are working towards, or how it connects to starting a business."

Her reflections highlight how the overlap and inconsistency of terminology risks confusing students at a stage when conceptual clarity is critical for building entrepreneurial intentions. Similarly, D3 (male, 29, MSc, graduated 2021, renewable energy solutions start-up founder) observed:

"It is like every part of the university uses a different word for the same thing. You go to one event and they say it's about NetZero, another says SDGs, another calls it CSR. In the end, it feels fragmented, and as students we are left to decide what it really means for us."

His perspective points to the consequences of inconsistency at the institutional level, where different units communicate sustainability in disconnected ways, which in turn makes it difficult for students to anchor their entrepreneurial projects to a coherent framework.

The lack of terminological alignment was also seen as a barrier to recognising NetZero as a distinct business opportunity, as highlighted in Theme 1. Students felt that if NetZero continues to be conflated with CSR or other broad agendas, its entrepreneurial potential will remain obscured. This creates uncertainty about whether NetZero represents a specific pathway for innovation or just another term in the sustainability lexicon.

Overall, this theme demonstrates that inconsistent terminology weakens students' ability to view sustainability as a structured and strategic entrepreneurial field. When sustainability-related concepts are used without alignment, students struggle to internalise them as normative expectations or actionable venture frameworks. Clearer and more consistent terminology is therefore essential if universities wish to foster strong entrepreneurial intentions aligned with NetZero objectives. The visual representation of the theme is shown in Figure 3.

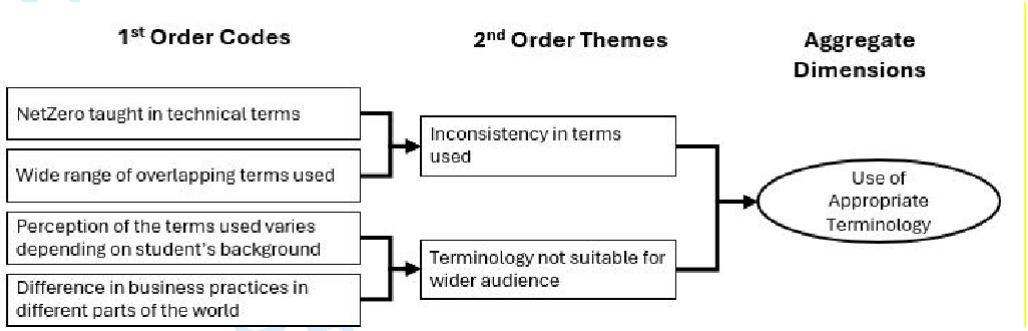

Figure 3. Use of Appropriate Terminology.

4.3 Theme 3: Teaching implementation and not just importance

The third emerging theme suggests that although universities are including NetZero and its significance in their teaching, they are not sufficiently preparing students to implement the principles of NetZero in creating new businesses. This lack of practical implementation instruction could pose a significant challenge for future business leaders who will need to integrate NetZero principles into their business models and contribute to efforts to combat climate change. One participant, W3 (female, 26, MSc, graduated 2023, founder of a carbon accounting venture), described her struggle:

"We learned about why sustainability is urgent, but not about how to integrate it into a start-up model. I had to look for tools outside the university to actually make sense of how NetZero works in practice." Her account illustrates how entrepreneurial intention may be formed but left unsupported, forcing students to seek knowledge independently.

Another participant, C3 (male, 27, MSc, graduated 2021, co-founder of a renewable energy consultancy), made a similar point:

"It was more about awareness than implementation. I was motivated to start something, but there was no practical direction on things like partnerships or technical know-how."

This perspective reflects the shortcomings of programmes that stress values without embedding them in actionable venture pathways.

The same theme was raised by D3 (male, 29, MSc, graduated 2021, renewable energy solutions start-up founder), who explained:

"There is enthusiasm, but the 'how' part is missing. You leave the class with an idea, but you don't know what the steps are to make it happen."

His remarks point directly to the structural barriers in higher education that leave students with strong sustainability intentions but few resources for execution.

Finally, W2 (female, 27, BSc, graduated 2022, sustainable fashion entrepreneur) added:

"They told us sustainability matters, but not what to do when designing a product or launching a brand. For me, it was trial and error."

Her experience shows how students often depend on personal experimentation rather than structured guidance, widening the gap between climate awareness and entrepreneurial application.

Taken together, these accounts reveal that while NetZero education succeeds in building awareness, it falls short in teaching students how to operationalise climate-conscious entrepreneurship. Without access to tools, mentors, and clear institutional support, students risk remaining aspirational without becoming active contributors to the NetZero transition. The visual representation of the theme is shown in Figure 4.

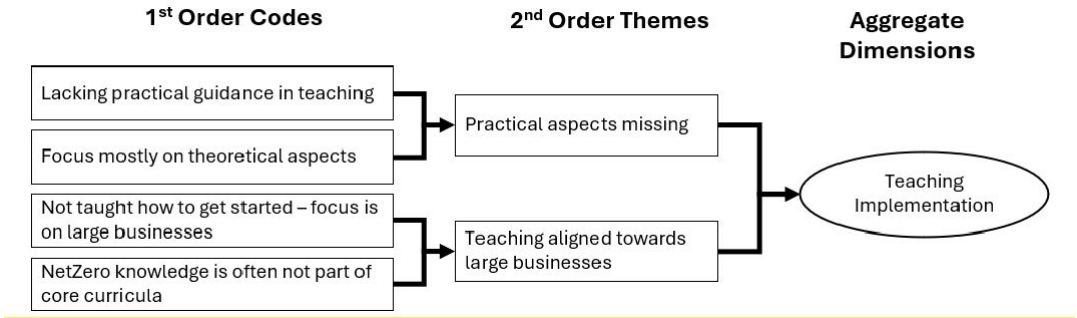

Figure 4. Teaching Implementation.

4.4 Theme 4: Beyond classroom training

The fourth emerging theme suggests that universities rely heavily on classroom teaching materials to educate students about NetZero, but there is significant potential to broaden the learning experience beyond the classroom. Participants in this study highlighted the need for additional activities such as guest lectures by alumni who have started NetZero businesses, networking events, and field trips to climate-focused enterprises in the local economy. For instance, participant A8 (male graduate student, age 25, founder of a Sustainable tourism platform observed:

"I think they (university) need to move beyond merely teaching about climate change and rather sharing real-life examples of successful businesses which have done something significant about it, which can be shown to them (students) to show a way of how businesses can actually do it."

As someone engaged in the sustainable tourism sector, A8's perspective reflects the necessity of linking classroom theory with the practical realities of venture building. His comment illustrates that

classroom-based case studies may not carry the same motivational or instructional value as direct interaction with entrepreneurs tackling NetZero challenges in the field.

Similarly, participant W2 (female undergraduate student, age 27, founder of a sustainable fashion venture) emphasised the importance of hands-on exposure:

"Ventures which are already working for sustainability development would help the students to know how it goes, like showing us hands-on how we can actually create a venture keeping in mind an idea of NetZero emissions."

Her call for "hands-on" experiences highlights the limitations of static classroom learning for students in creative, design-driven sectors such as fashion. For such fields, where market entry is tied to consumer-facing sustainability narratives, opportunities to observe and engage with sustainable enterprises can reinforce how NetZero practices can be embedded across the value chain.

The value of external engagement was further reinforced by participant D2 (female undergraduate student, age 26, founder of an electric mobility venture):

"We have never had somebody saying consider the carbon footprint of your business. We have an entrepreneur in residence, we have had a lot of sorts of investors come in, we've had a lot of business owners come in, and they've tackled multiple topics, but nobody talking in terms of carbon responsibility."

Operating in the electric mobility sector, where carbon accountability is integral, participant's remarks underscore the gap between the types of expertise universities expose students to and the expertise needed to advance NetZero entrepreneurship. Although many institutions host entrepreneurs-in-residence and investor panels, sustainability considerations often remain peripheral, suggesting that NetZero is not yet seen as a mainstream business concern within entrepreneurship ecosystems.

Finally, participant W3 (female postgraduate student, age 26, founder of a carbon accounting services venture) expressed disappointment at the lack of expert interaction on this topic:

"I do not know of any guest lectures or interaction with industry experts on the topic."

This absence of structured opportunities for student–expert engagement illustrates that universities may still undervalue the motivational and practical benefits of integrating external voices into NetZero education. It also suggests a broader structural issue: despite commitments to sustainability agendas, institutional silos between entrepreneurship centres and sustainability offices may prevent meaningful guest contributions from being embedded into entrepreneurship modules.

Taken together, these findings demonstrate that while entrepreneurship education provides essential business foundations, it often fails to deliver the experiential learning, networking, and industry engagement needed to prepare graduates to apply NetZero principles in practice.

Universities could strengthen this area by embedding experiential components into curricula, such as NetZero hackathons, alumni-led venture showcases, and industry immersion weeks. Partnerships with local businesses pursuing NetZero transitions could be leveraged to provide site visits or consultancy projects, enabling students to apply classroom knowledge to real-world contexts. Guest lecture series that prioritise founders of sustainable enterprises, rather than generic business leaders, could also serve to normalise climate-conscious entrepreneurship as a viable and aspirational career path. This highlights the current lack of such opportunities and the potential for universities to enhance the NetZero education experience for their students. The visual representation of the theme is shown in Figure 5.

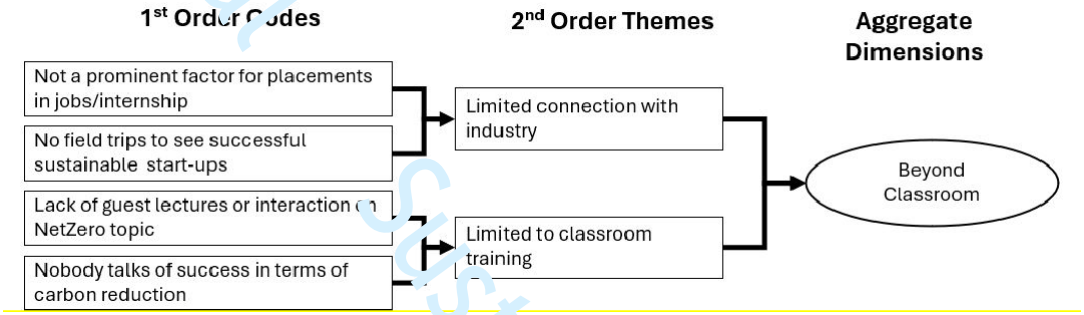

Figure 5. Beyond Classroom

4.5 Theme 5: Working in silos

The phenomenon of "working in silos" refers to different individuals or groups within an organisation working independently without adequate communication or coordination. In the context of university education on NetZero, this means that student resources are not integrated or aligned, resulting in a fragmented approach to achieving climate-related goals. Many participants noted that while their universities provide resources such as environmental clubs, research centres, and entrepreneurship accelerators, these often operate in isolation rather than as part of a coherent ecosystem.

Participant C2 (male postgraduate student, age 31, founder of a green FinTech venture) remarked: *"Socializing is not good enough because (we are) divided into three cohorts. It'll be good for us if we change cohorts, more socializing can happen, more networking can happen, and we can learn from each other as to what is happening in other cohorts."*

His reflection illustrates that fragmentation exists not only between sustainability-focused resources but also within student cohorts themselves, reducing opportunities for collaboration and peer-to-peer learning that could strengthen NetZero venture creation.

The lack of integrated communication was also highlighted by participant W3 (female postgraduate student, age 26, founder of a carbon accounting services venture):

"There are some parts of the university, accelerator that are organizing entrepreneurship and climate-related events, they haven't reached out. See, you are organizing all these helpful events about how to create a new business while thinking about sustainability and climate, but if you don't communicate this properly across all students, how do you think it is going to make a full impact?"

W3's observation suggests that although institutions may host relevant events, poor cross-campus communication limits their visibility and therefore their effectiveness. This reflects a wider challenge where entrepreneurship centres and sustainability offices often operate as parallel initiatives without strong mechanisms for collaboration.

Similarly, participant D4 (female undergraduate student, age 25, founder of a water purification systems venture) pointed to the difficulty of accessing information about sustainability initiatives:

"I know that something would be available if I asked, but it was never part of the information provided beforehand... kind of curriculum or the university system itself that every student is communicated with, kind of making everyone aware of it..."

For D4, whose venture depends on specialised technical knowledge and resources, the absence of proactive communication created additional barriers to aligning her business with NetZero principles.

Taken together, these perspectives show that even when universities provide multiple opportunities and resources to support sustainability, the lack of integration and proactive communication creates fragmentation. This can undermine institutional goals of advancing NetZero entrepreneurship, leaving students without clear pathways to access or combine the resources available to them. To overcome these silos, institutions need to improve collaboration and coordination across entrepreneurship, sustainability, and academic units, ensuring that students receive timely and comprehensive information on NetZero-related opportunities. The visual representation of the theme is shown in Figure 6.

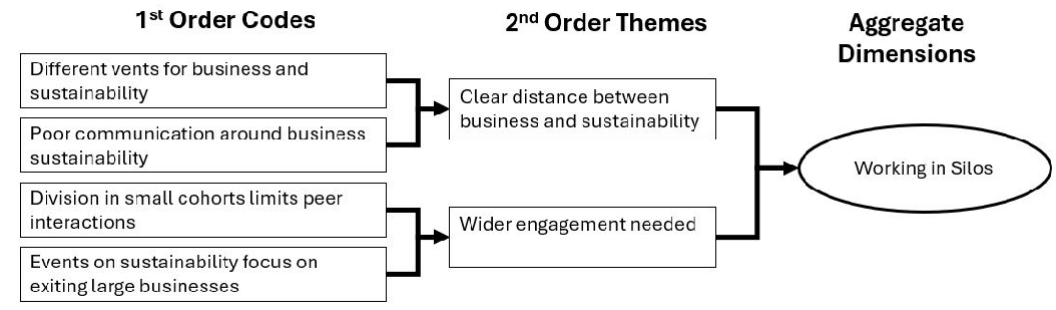

Figure 6. Working in Silos

The findings reveal a comprehensive picture of how entrepreneurship education shapes and at times constrains the potential for NetZero start-up creation. Across the five themes, participants consistently emphasised gaps in awareness, clarity of language, practical implementation, experiential opportunities, and cross-campus coordination. Despite rising interest in climate innovation, current university ecosystems often fall short in bridging values and entrepreneurial action. At the same time, the findings highlight clear opportunities for improvement, suggesting that with more integrated and practice-oriented approaches, universities could play a transformative role in enabling a new generation of climate-conscious entrepreneurs. The following Discussion section interprets these five themes in light of established theories and existing literature.

5. Discussion

This study explored how entrepreneurship education in UK universities shapes the creation of NetZero-oriented start-ups. The findings revealed systemic gaps in awareness, terminology, practical implementation, experiential learning, and ecosystem integration. In this section, these findings are interpreted through the lens of established theories and prior research to highlight areas of agreement, divergence, and contribution.

5.1 Teaching NetZero as a Business Opportunity

The finding that NetZero is rarely presented as a business opportunity in entrepreneurship curricula highlights a structural gap in how sustainability is framed in higher education. Participants repeatedly stressed that while they valued knowledge about climate change, they did not see how this could be transformed into viable entrepreneurial ventures. This aligns with Muñoz and Dimov (2015), who argue that sustainability often remains a peripheral concern in entrepreneurship education, treated as an ethical or technical issue rather than a driver of competitive advantage. Bischoff and Volkmann (2018) similarly caution that entrepreneurship courses risk reducing sustainability to an "add-on," rather than embedding it in opportunity recognition and venture design.

From the perspective of the Theory of Planned Behaviour (TPB) (Ajzen, 1991), this finding illustrates a weakness in cultivating attitudes toward NetZero entrepreneurship. While students acknowledge the urgency of climate change, they do not perceive NetZero as an attractive entrepreneurial goal unless it is framed in terms of opportunity creation. In line with Fayolle and Liñán (2014), the gap reflects the importance of aligning pedagogical content with students' entrepreneurial value systems: if NetZero is presented merely as compliance or moral obligation, it is less likely to motivate entrepreneurial intention. Our findings contribute by showing how framing NetZero as a business opportunity could strengthen positive attitudes and therefore increase the likelihood of sustainability-oriented start-up creation.

This gap also connects with Theme 2 (terminology). When NetZero is conflated with CSR, triple bottom line, or SDGs, it becomes difficult for students to see its entrepreneurial potential. Clearer conceptual framing could position NetZero as distinct from broader sustainability goals, directly linked to innovation and growth opportunities. Similarly, it overlaps with Theme 3 (implementation), as participants explained that understanding the urgency of NetZero was insufficient without actionable pathways for building ventures around it.

At the ecosystem level, the lack of emphasis on NetZero opportunities challenges the idea of universities as entrepreneurial ecosystems (Guerrero et al., 2016; Audretsch & Belitski, 2017). If entrepreneurship centres and curricula do not connect climate goals with venture opportunities, the ecosystem risks reproducing traditional business models rather than fostering innovation for sustainability. Prior research has shown that university ecosystems play a catalytic role in shaping entrepreneurial trajectories (Volkmann et al., 2021). Our findings extend this by showing that omissions in framing NetZero as opportunity actively constrain the formation of climate-oriented ventures. The divergence between policy ambitions and educational practice is also notable. The UK government has made NetZero by 2050 a national commitment (HM Government, 2021), and yet students reported that their education rarely prepared them to contribute through entrepreneurship. This mismatch suggests that universities are not fully leveraging their potential as partners in achieving national climate goals.

Our findings both confirm and extend existing literature. They confirm critiques that sustainability is marginalised in entrepreneurship curricula, but they extend this by showing how the absence of NetZero opportunity framing undermines the motivational mechanisms theorised in TPB. The contribution here lies in shifting the conversation: NetZero in entrepreneurship education must not only be about awareness but about opportunity recognition, venture design, and value creation — the core logics of entrepreneurship.

5.2 Lack of Appropriate Terminology

The findings revealed that inconsistent and overlapping terminology (CSR, triple bottom line, SDGs, NetZero) confused students and weakened the pedagogical impact of sustainability education. This resonates with Shrivastava et al. (2012), who argued that without a shared conceptual vocabulary, sustainability knowledge lacks clarity and comparability across contexts. Our participants confirmed this at the lived experience level, particularly noting that when terms were conflated, the specific meaning and entrepreneurial potential of NetZero was lost.

From the lens of the Theory of Planned Behaviour (TPB), this inconsistency undermines subjective norms. If students do not see NetZero articulated as a distinct and widely endorsed entrepreneurial

expectation, they are less likely to perceive it as a normative standard for venture creation. Fayolle and Liñán (2014) stress that intention is strengthened when normative signals are clear and consistent; our findings show that terminological ambiguity dilutes these signals. This problem is especially acute in international classrooms, where students compare UK discourses with home-country contexts. As highlighted by W3 in the findings, students from regions where sustainability is less institutionalised found it even harder to differentiate between overlapping concepts. Prior research on international entrepreneurship education has not sufficiently acknowledged how terminological inconsistency can become a cross-cultural barrier. Our study contributes by demonstrating that language and conceptual clarity are not just academic issues but crucial enablers of inclusive entrepreneurial ecosystems.

This theme also connects with Theme 1 (NetZero as opportunity) and Theme 3 (implementation). If students cannot distinguish NetZero from CSR or social purpose, they struggle to see it as an entrepreneurial opportunity (Theme 1). Likewise, if they lack precise definitions, they cannot translate NetZero into practical tools and business models (Theme 3). In this way, terminology becomes a cross-cutting foundation upon which awareness, opportunity recognition, and implementation depend. At the institutional level, the absence of a shared vocabulary undermines universities' role as entrepreneurial ecosystems (Guerrero et al., 2016). Ecosystems depend on common frames of reference to connect actors and resources (Audretsch & Belitski, 2017). If accelerators, sustainability offices, and entrepreneurship modules use divergent language, they inadvertently reproduce silos (as seen in Theme 5). Thus, terminological inconsistency not only confuses students but fragments institutional support structures.

Our findings confirm existing critiques of inconsistent sustainability vocabularies but extend the literature in two ways. First, they show how ambiguity affects students' entrepreneurial intentions by weakening the normative and motivational mechanisms identified in TPB. Second, they reveal how these effects are magnified in international classrooms, raising issues of inclusivity and accessibility in entrepreneurship education. By demonstrating that a lack of terminological clarity has consequences for both intention formation and ecosystem integration, the study underscores the foundational importance of a shared NetZero vocabulary in higher education.

5.3 From Awareness to Action: Bridging the Intention–Action Gap

While universities frequently raise awareness of the importance of NetZero, the findings show they often fail to provide students with sufficient guidance on how to integrate these principles into entrepreneurial ventures. Participants described a gap between knowing about climate imperatives and being able to translate them into actionable business strategies. This reflects Fayolle and Gailly's (2015) argument that entrepreneurship education tends to shape attitudes but lacks mechanisms to support behaviour. Similarly, Demirel et al. (2019) caution that sustainability-oriented intentions often remain unimplemented when institutional scaffolding is weak.

Through the lens of the Theory of Planned Behaviour (TPB) (Ajzen, 1991), these gaps reflect weaknesses in perceived behavioural control. Students may recognise NetZero as valuable (attitudes) and acknowledge the broader societal importance of sustainability (subjective norms), but without access to mentoring, networks, and practical tools, they doubt their own capacity to build ventures aligned with NetZero. This undermines the intention–action link that TPB identifies as crucial. Our findings extend TPB by showing that institutional design — including the provision of structured resources and guidance — actively shapes whether students feel able to pursue sustainability-oriented entrepreneurship.

This gap also connects with other themes. The absence of practical implementation guidance compounds the challenge identified in Theme 1 (framing NetZero as opportunity): if sustainability is not shown as a business opportunity and simultaneously lacks actionable pathways, students are unlikely to integrate it into their ventures. It also intersects with Theme 4 (experiential learning), as students repeatedly highlighted the absence of hands-on exposure to tools such as carbon accounting, sustainable supply chain design, and energy efficiency modelling. Finally, Theme 5 (silos) amplifies the issue, since even when sustainability resources exist, weak communication across units prevents students from accessing them.

Prior literature has emphasised the intention–action gap in sustainable entrepreneurship (Markman et al., 2016; Islam & Mehdi, 2024). Our contribution is to show how this gap is experienced by students in higher education: as missing "guidance steps," fragmented access to resources, and insufficient mentoring. This lived experience evidence adds nuance to prior conceptual discussions and suggests that the failure to support implementation is not simply a curricular shortcoming, but a systemic design flaw in entrepreneurial ecosystems within universities.

In practical terms, this finding suggests that entrepreneurship education must move beyond teaching why NetZero matters to embedding how it can be achieved in entrepreneurial practice. Embedding simulations, case-based exercises, and collaborative projects with local climate innovators could strengthen students' perceived ability to launch NetZero ventures. In this way, universities can bridge the intention–action gap and position themselves as active enablers of climate-conscious entrepreneurship.

5.4 Beyond Classroom Training

The findings showed that while universities frequently introduce students to sustainability concepts in classroom settings, they rarely extend this engagement into the real-world contexts where entrepreneurial learning becomes transformative. Participants repeatedly stressed the absence of guest lectures, alumni showcases, field visits, and exposure to successful NetZero entrepreneurs. This reinforces prior research emphasising that entrepreneurship education is most effective when it

combines theoretical knowledge with experiential learning and role models (Brundiers, Wiek & Redman, 2010; Rae, 2010).

From the perspective of the Theory of Planned Behaviour (TPB), this lack of experiential exposure weakens both subjective norms and perceived behavioural control. Role models and industry engagement are central in shaping what students perceive as normal or aspirational (Lans et al., 2014). When sustainability is absent from guest lectures and entrepreneurial panels, students receive weak normative cues that NetZero entrepreneurship is valued. At the same time, the absence of opportunities to "see and do" lowers their sense of competence, undermining their perceived ability to pursue NetZero ventures. Our findings extend TPB by showing how pedagogical choices around experiential content can either amplify or dilute the social and control mechanisms that underpin entrepreneurial intention.

This theme also interacts with others. Without exposure to sustainability entrepreneurs, students struggle to connect abstract climate knowledge to practical opportunity (Theme 1). Likewise, the absence of applied training hinders their ability to implement NetZero in business models (Theme 3). The issue is further compounded by institutional silos (Theme 5): even when external speakers or events are available in one part of the university, weak communication and coordination mean entrepreneurship students are often unaware of them.

Existing literature on entrepreneurial ecosystems (Guerrero et al., 2016; Audretsch & Belitski, 2017) positions universities as central nodes that connect students to external actors. Our findings diverge by showing that while connections may exist in principle, their content orientation often overlooks sustainability. In other words, universities are already offering networking opportunities, but they largely reproduce mainstream entrepreneurship rather than advancing NetZero agendas. This nuance extends prior work by highlighting that the challenge is not simply "more experiential learning" but relevant experiential learning aligned with climate-conscious entrepreneurship.

The contribution of this study is therefore twofold. First, it confirms the central role of experiential and role model exposure in shaping entrepreneurial self-efficacy but extends this by showing that content matters as much as format. Second, it reveals that even when institutions offer rich experiential ecosystems, their neglect of sustainability content sends weak normative signals to students. If universities are to cultivate NetZero entrepreneurs, they must recalibrate experiential learning to feature climate innovators, sustainable alumni founders, and partnerships with organisations actively pursuing NetZero transitions.

5.5 Universities as Entrepreneurial Ecosystems: The Problem of Silos

The findings revealed that while universities provide multiple resources to support entrepreneurship and sustainability — such as accelerators, clubs, research centres, and sustainability offices — these often operate in silos, with limited integration or communication. Participants noted that opportunities exist, but they are fragmented and poorly communicated, requiring students to actively "chase" resources rather than being proactively supported. This echoes existing critiques of fragmented institutional structures, where the lack of coordination reduces the effectiveness of entrepreneurship education (Volkmann et al., 2021).

From the perspective of entrepreneurial ecosystem theory, this represents a significant limitation. Universities are increasingly recognised as key ecosystem actors that connect resources, networks, and knowledge (Guerrero et al., 2016; Audretsch & Belitski, 2017). However, our findings suggest that instead of functioning as integrated ecosystems, universities often resemble loose collections of disconnected initiatives. This fragmentation reduces the visibility of NetZero-related opportunities and undermines the systemic support students need to launch sustainability-oriented ventures. The findings also resonate with the Theory of Planned Behaviour (TPB). Poor communication and fragmented support structures weaken subjective norms by signalling that NetZero entrepreneurship is not an institutional priority. At the same time, they undermine perceived behavioural control, since students who are unaware of or unable to access relevant resources perceive fewer opportunities to act on their intentions. Thus, silos have both cultural and practical consequences, shaping the motivational mechanisms central to TPB.

Connections with other themes further illustrate the systemic nature of this problem. For example, Theme 2 (terminology) shows that inconsistency in language confuses students, while silos exacerbate this by distributing conflicting messages across different departments. Theme 4 (experiential learning) highlights the absence of sustainability-focused guest speakers and role models, which often stems from weak coordination between entrepreneurship centres and sustainability offices. In this way, the silo issue cuts across multiple dimensions of the student experience, compounding the challenges of framing, implementation, and experiential exposure. At the same time, the findings diverge from some ecosystem literature that celebrates universities as integrators of entrepreneurship and innovation (Audretsch et al., 2019). While such models may describe institutional aspirations, our evidence suggests that at the student level, ecosystems are perceived as disjointed and inaccessible. This divergence underscores the importance of incorporating student perspectives into ecosystem research, since the mere presence of resources does not guarantee their integration or impact.

The contribution of this theme lies in reframing silos as both a structural and informational problem. Structurally, different units often pursue their own agendas with limited coordination. Informationally, communication channels are weak, leaving students unaware of opportunities. This

double fragmentation highlights the need for universities to create more joined-up systems — not just co-located resources but coordinated strategies and shared communication platforms that make NetZero entrepreneurship visible and accessible.

5.6 Contributions

Taken together, the findings of this study advance both theory and practice in entrepreneurship education for sustainability. Thematically, they demonstrate how gaps in opportunity framing, conceptual clarity, implementation support, experiential learning, and institutional integration intersect to constrain NetZero start-up creation. Theoretically, the study extends the Theory of Planned Behaviour by showing that institutional practices may mediate the three determinants of intention: attitudes (shaped by whether NetZero is framed as an opportunity), subjective norms (influenced by the consistency of terminology and exposure to role models), and perceived behavioural control (affected by access to tools, networks, and coordinated resources). The research also contributes to entrepreneurial ecosystem literature by revealing that universities, while positioned as key ecosystem actors, are often perceived by students as fragmented and poorly connected, with silos and weak communication limiting their systemic potential. Practically, the findings point to specific institutional levers, from embedding NetZero in core curricula to breaking down silos between sustainability and entrepreneurship initiatives, that can transform higher education into a catalyst for climate-conscious entrepreneurship. These insights lay the foundation for the Recommendations that follow, which translate these contributions into actionable strategies for universities and policymakers.

6. Recommendations

The findings of this study underscore critical gaps in entrepreneurship education and its ability to support NetZero-oriented ventures. To transform higher education institutions (HEIs) into engines of sustainability-focused innovation, this section offers five targeted recommendations. These suggestions respond to participant insights and are framed within the broader academic literature on sustainability, entrepreneurial intention, and educational ecosystems. They also align with the Sustainable Development Goals — particularly SDG 4 (Quality Education) and SDG 13 (Climate Action).

6.1 Integrate NetZero into Core Entrepreneurship Curricula

The traditional siloing of sustainability content from core entrepreneurship subjects limits students' ability to see climate challenges as business opportunities. HEIs must reframe sustainability, and specifically NetZero, as a strategic foundation for innovation, embedding it into the design and development of business models. This shift demands more than just the inclusion of environmental modules. Instead, it requires a reorientation of entrepreneurship pedagogy toward sustainability-

oriented venture creation (Muñoz and Dimov, 2015; Stubbs and Cocklin, 2008). Courses should include topics such as carbon pricing, environmental risk modelling, and sustainable product development. Such integrative teaching has been shown to elevate entrepreneurial intentions when sustainability is positioned as a driver of value (Bischoff and Volkmann, 2018).

6.2 Establish a Shared Terminology and Conceptual Framework

Students across multiple institutions reported confusion due to inconsistent terminology used in teaching materials , e.g., conflating CSR, triple bottom line, SDGs, and NetZero. A unified conceptual language is needed to ensure clarity and precision, especially for international and interdisciplinary cohorts. A clear definitional framework can also help embed sustainability into the institutional culture of the university (Shrivastava, Ivanaj and Ivanaj, 2012). Creating consistent sustainability glossaries and frameworks across faculties can facilitate cross-disciplinary understanding and help students map their learning across courses and activities.

6.3 Provide Practical Implementation Support

Entrepreneurial intention must be matched with action-oriented tools and support systems. Universities should provide hands-on training on applying NetZero strategies — including carbon footprint analysis, supply chain decarbonisation, green marketing, and access to sustainability funding. Providing these experiential opportunities can help overcome the intention–action gap observed in sustainability-oriented entrepreneurship (Fayolle and Gailly, 2015; Zahra et al., 2009).

Start-up support should be tailored to sustainability ventures, including NetZero-specific accelerators, mentoring by green founders, and specialised seed funding mechanisms. As Markman et al. (2016) argue, sustainable entrepreneurship flourishes when institutions support multiple goals — including social, environmental, and financial performance — within business formation.

6.4 Enhance Experiential Learning and Industry Exposure

Moving beyond classroom instruction to include real-world experiences is critical. Engaging students in case-based learning, site visits, pitch events, and alumni panels centred on sustainability has been shown to enhance learning outcomes and retention (Brundiers, Wiek and Redman, 2010). Guest lectures from founders of sustainable ventures can serve as motivational touchpoints and offer students role models who challenge the conventional norms of business success (Rae, 2010). More importantly, sustained relationships between HEIs and green start-ups provide students with live learning environments — turning the classroom into a sustainability incubator.

6.5 Break Down Institutional Silos and Build Entrepreneurial Ecosystems

This recommendation addresses institutional structure. Many sustainability initiatives, entrepreneurship centres, and support programmes operate in silos, limiting visibility and synergy. A systems-oriented approach is needed to ensure that students can access and benefit from the full spectrum of resources available on campus. As Morris, Shirokova and Tsukanova (2017) argue,

successful university ecosystems support sustainable entrepreneurship through integration of curricula, infrastructure, mentorship, and networks. Institutions should consider establishing a unified sustainability-entrepreneurship hub — a one-stop platform where students find mentorship, funding, partnerships, and NetZero guidance in a coordinated manner.

6.6 Strategic Alignment with the SDGs

Implementing these recommendations can help universities deliver on key elements of:
SDG 4 (Quality Education) - by making entrepreneurship curricula inclusive, contextually relevant, and socially responsive; and SDG 13 (Climate Action) - by empowering students to become founders of ventures that actively mitigate climate change. By reimagining entrepreneurship education through the lens of NetZero innovation, universities can position themselves at the heart of a new, climate-conscious entrepreneurial ecosystem.

7. Limitations

While this study offers important insights into the role of entrepreneurship education in enabling NetZero-oriented ventures, several limitations should be acknowledged to contextualise the findings and inform future research directions.

7.1 Sample Scope and Generalisability

The research is based on interviews with 32 recent graduates from four UK universities, each with relatively advanced entrepreneurship ecosystems. While this purposive sample ensured rich, relevant data, it may not capture the full diversity of student experiences across the UK or globally. Entrepreneurship education practices vary significantly across countries, disciplines, and institutional types. Therefore, the findings may have limited generalisability beyond the sampled context.

Moreover, participants self-identified as founders of NetZero-oriented businesses, which introduces a degree of self-selection bias. Those who chose to participate were likely more engaged with sustainability and entrepreneurship than the broader graduate population. Future studies may consider larger, more representative samples or comparative case studies across different university types and national systems.

7.2 Methodological Boundaries

The study adopted a qualitative interpretivist approach using semi-structured interviews and the Gioia method. While appropriate for exploring under-researched and complex social phenomena, this method does not allow for statistical generalisation or hypothesis testing. The emphasis was on depth rather than breadth.

Additionally, although thematic saturation was achieved, the reliance on self-reported narratives introduces potential recall bias and social desirability bias, particularly when discussing institutional

support or personal motivation. Triangulation with institutional documents, curricula, or educator perspectives could enhance validity in future studies.

7.3 Temporal Constraints and Post-COVID Context

Most participants graduated between 2020 and 2023, a period marked by significant disruption in higher education due to the COVID-19 pandemic and it's aftereffects. Remote teaching, hybrid learning formats, and limited access to on-campus resources likely influenced students' engagement with entrepreneurship support services. While this context adds depth to the study, it may also skew findings in ways that are specific to this historical moment.

As universities return to more stable operations, future research should examine whether the barriers and gaps identified here persist, diminish, or evolve in new forms.

7.4 Focus on Student-Led Perspectives

This research intentionally focused on the student entrepreneur's perspective to foreground lived experiences and bottom-up insights. However, this perspective excludes the views of faculty members, entrepreneurship educators, and policy makers within universities, who are equally influential in shaping curricular and institutional ecosystems.

Incorporating multiple stakeholder voices through multi-actor research designs would provide a more comprehensive picture of how NetZero thinking is—or is not—integrated across the entrepreneurship education spectrum.

7.5 Conceptual Scope

Finally, the study is bounded by its focus on NetZero entrepreneurship. While this offers a sharp and policy-relevant lens, it does not encompass broader sustainability entrepreneurship themes such as biodiversity, just transition, or climate adaptation. Future research may expand this focus to include other dimensions of environmental and social entrepreneurship, offering a more holistic understanding of sustainability-driven innovation in higher education.

8. Conclusions

Intrinsic to the notion that we are living in times of competing concerns, including climate change, food security and energy security, this research is topical and important for society. This study advances research on entrepreneurship education and brings new knowledge on the impact of entrepreneurial ecosystems in the context of climate change. The findings of this research addresses theory and practice alike. This study explored how entrepreneurship education within higher education institutions (HEIs) influences the creation of NetZero-aligned start-ups. Drawing on the experiences of 32 recent UK university graduates who launched climate-conscious ventures, the research revealed five systemic gaps: the limited framing of NetZero as a business opportunity, inconsistent sustainability terminology, insufficient implementation guidance, lack of experiential learning, and fragmented institutional ecosystems.

These insights demonstrate that while HEIs have embraced sustainability discourse at a strategic level, significant barriers remain at the operational and pedagogical levels—particularly in entrepreneurship education. In its current form, entrepreneurship training often stops short of equipping students with the tools, networks, and clarity needed to create ventures that are both financially viable and environmentally impactful.

By integrating NetZero thinking into curricula, offering hands-on implementation support, and fostering interdisciplinary collaboration, universities can catalyse a new wave of student-led climate innovation. Doing so requires a deliberate reconfiguration of educational ecosystems—connecting knowledge, intention, and institutional infrastructure.

The study makes three core contributions. First, it provides empirical evidence linking entrepreneurship education with the operationalisation of NetZero values in new business formation. Second, it offers a conceptual framework that captures the multi-level dynamics—curriculum, intention, ecosystem—that shape climate-oriented entrepreneurial pathways. Third, it presents actionable recommendations for institutions aiming to align their teaching, support structures, and community engagement efforts with sustainability imperatives.

In advancing both SDG 4 (Quality Education) and SDG 13 (Climate Action), this research affirms the potential of HEIs not only as knowledge providers but as active co-creators of a sustainable, low-carbon future. By centring NetZero within entrepreneurship education, universities can position their graduates not merely as job seekers, but as solution-builders for one of humanity's most urgent challenges.

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Appendix 1 - Anonymised Participants and University Profile

Participant ID	Age	Gender	Degree Level	Graduation Year	Venture Type
A1	25	Female	BSc	2022	Sustainable Food Packaging
A2	27	Male	MSc	2021	Renewable Energy Consultancy
A3	26	Female	MSc	2023	Carbon Footprint Analytics
A4	24	Male	BSc	2024	Eco-friendly Transport Solutions
A5	28	Female	MSc	2020	Circular Economy Retail
A6	29	Male	MSc	2021	Low-carbon Building Materials
A7	30	Female	MSc	2022	Green Supply Chain Services
A8	25	Male	BSc	2023	Sustainable Tourism Platform
W1	25	Male	MSc	2020	Renewable Energy Solutions
W2	27	Female	BSc	2021	Sustainable Fashion
W3	26	Female	MSc	2022	Carbon Accounting Services
W4	28	Male	BSc	2023	Eco-friendly Packaging
W5	24	Female	BSc	2024	Sustainable Agriculture
W6	29	Male	MSc	2021	Green Construction
W7	26	Female	MSc	2022	Urban Farming Solutions
W8	28	Male	BSc	2020	Sustainable Logistics Platform
D1	30	Male	MSc	2020	Recycling Technologies
D2	26	Female	BSc	2023	Electric Mobility
D3	27	Male	MSc	2022	Energy Efficiency Consulting
D4	25	Female	BSc	2024	Water Purification Systems
D5	28	Male	MSc	2021	Circular Economy Marketplace
D6	27	Male	MSc	2023	Smart Energy Monitoring Systems
D7	24	Female	BSc	2024	Sustainable Beauty & Cosmetics
D8	30	Male	MSc	2021	Eco-friendly Construction Materials
D9	25	Female	MSc	2022	Plastic Waste Recycling Services
C1	24	Female	BSc	2020	Upcycled Products
C2	31	Male	MSc	2023	Green FinTech
C3	26	Female	MSc	2024	Organic Food Supply
C4	27	Male	MSc	2021	Sustainable Tourism
C5	29	Female	MSc	2022	CleanTech R&D
C6	28	Male	MSc	2020	Community Solar Projects
C7	29	Male	MSc	2021	Low-carbon Transport Sharing Venture

C – This university's entrepreneurship hub connects research, teaching, and practice, offering mentoring, networking, and events to help students develop and launch ventures. It also provides incubation and acceleration facilities, seed funding opportunities, and targeted programmes for early-stage businesses. On sustainability, it delivers specialist master's degrees and professional courses in areas such as low-carbon systems, environmental management, and sustainable business, integrating climate-focused content across disciplines.

W – This institution integrates entrepreneurship into student life through coaching, academic modules, and innovation programmes, complemented by a dedicated innovation district that connects students and startups with industry networks. Its sustainability agenda includes a net-zero carbon

energy target by 2030 and net-zero for all emissions by 2050, alongside curricular offerings that focus on sustainable business practices, organisational transformation, and climate-focused leadership.

A – This university supports entrepreneurial students through accelerator programmes, startup bootcamps, and a year-long incubator with mentoring, workspace, and funding advice. It embeds sustainability into operations and teaching, with a strategy to achieve net-zero Scope 1 and 2 emissions by 2030 and significant investment in a zero-carbon campus. Its initiatives include professional sustainability training programmes, sector-specific climate action support, and compulsory environmental sustainability learning for undergraduates.

D – This institution promotes entrepreneurship through its business school's enterprise centre, offering venture support, competitions, and experiential learning modules that encourage students to test and launch their ideas. In sustainability, it has committed to achieving net-zero carbon emissions by 2035, with climate-focused modules embedded across multiple programmes and cross-disciplinary research addressing global environmental challenges.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.