



Article

Redefining Sustainability and Entrepreneurship Teaching

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Abstract: The demand for sustainable development is rapidly increasing with the need to create cleaner and greener products for consumers and producers alike. In line with this need, sustainability has become integral to entrepreneurship research. Although sustainability-focused entrepreneurship programs are offered at higher education institutions, gaps remain in identifying novel approaches to combining sustainability and entrepreneurship in university programs. To overcome these gaps, this study provides an approach to redefining how sustainability-based entrepreneurship can be taught in a virtual environment using a cross-institution initiative involving instructors and students from multiple countries and disciplinary backgrounds to provide students with opportunities to solve complex sustainability-based problems affecting society. A post-assessment survey (including open-ended questions related to skill development, intercultural learning, virtual learning, and debrief) was administered to better understand student perceptions of learning and engagement. The qualitative data were analyzed using thematic inductive analysis resulting in three key themes (learning outcomes, supportive learning environment, and intercultural challenges). The Discussion and Conclusion sections highlight implications for practitioners, contributions to the literature, and limitations/future research. Pedagogical strategies for educators and program designers are provided.

Keywords: entrepreneurially-minded learning; sustainable entrepreneurship; culturally responsive teaching; backward course design; virtual learning



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1. Introduction

Entrepreneurship education continues to grow and has shown a significant increase in student competency necessary for the job market [1–3]. By definition, “entrepreneurship is a transversal key competence needed by every citizen for personal fulfillment and development, active citizenship, social inclusion and employment in the knowledge society” [4] (p. 7). Entrepreneurship as a competence is when an individual is allowed “to act upon opportunities” or ideas and change them to create value for others (e.g., products, services, and solutions) [4] (p. 10). Entrepreneurial ventures drive the key to innovation and economic growth [1]. The entrepreneurial curriculum contains several topics: (1) theoretical concepts on how students can identify opportunities and assess business concepts; (2) develop operational plans, fund, explore, launch business ventures, and create new enterprises; and (3) review case studies to explore other venues for examining entrepreneurial strategies and learning about the successes and failures of new ventures [5]. As learning approaches continually evolve and adapt to the changing environment, methodological innovations are necessary for entrepreneurship education to sustain itself in the competitive context [6]. The maturation of entrepreneurship education programs and research, “both within and outside of business programs, has led to a diverse array of academic literature on this topic. The diversity of perspectives has led to many conceptual and educational challenges that remain unresolved within the literature” [7] (p. 1).

Sustainable entrepreneurship has gained momentum over the last few years. It has gained interest with a new paradigm shift in entrepreneurship instruction, moving from traditional perspectives towards sustainability inclusions [8]. The Education for Sustainable Development (ESD) aims to create awareness of sustainability among students.

This is achieved by empowering students with “sustainability competencies through a holistic, interdisciplinary perspective of content and pluralistic learner-centered democratic teaching strategies” [9]. In education, the sustainability triad (Figure 1) has been used as a pedagogical framework for teaching and learning sustainability-based concepts in the classroom [10], consisting of three main dimensions, namely society, economy, and environment [11]. The triad has been used as a teaching approach, yet very little is known about the extent of its implementation in classrooms and its impact on student learning.

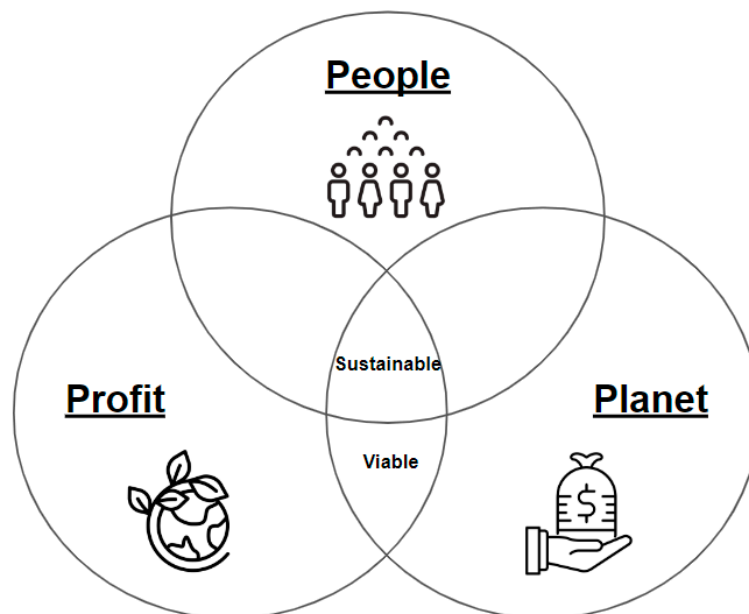


Figure 1. Sustainability triad.

Studies suggest that gaps remain in identifying appropriate pedagogical approaches to combining sustainability and entrepreneurship in university programs [12,13]. The problem is that there are limited guidelines (e.g., instructional strategies, learning framework, and instruments) for educators to teach entrepreneurship with sustainability. This issue is further exacerbated when considering many factors, such as context, delivery, and pedagogical approaches involving interdisciplinary learning. To create an entrepreneurially minded sustainability-based education, researchers have stressed the need for collaboration between universities, industries, and local communities, diversification of audience (e.g., students with different disciplinary backgrounds), shaping an entrepreneurial mindset for dealing with complex sustainability issues, and the integration of entrepreneurship and sustainability learning objectives [13].

In line with the aims and scope of the journal, this study provides noteworthy contributions to teaching and learning in higher education. First, it provides an approach to redefining how sustainability-based entrepreneurship can be taught in a virtual setting. Second, it highlights a cross-institution initiative involving instructors and students from multiple countries and disciplinary backgrounds to provide students with opportunities to solve complex sustainability-based problems in the community. Third, it provides pedagogical strategies for educators and program designers to consider while developing entrepreneurially minded sustainability education. This study suggests an approach to redefining how sustainable entrepreneurship can be taught during a pandemic by collaborating with instructors and students from multiple countries and disciplinary backgrounds. Additionally, this approach provides students with opportunities to develop systems thinking skills and become experts in their professional or research disciplines to solve complex sustainability problems in the community. The curriculum design was based on the four intentions for cultivating the entrepreneurial mindset [14], which include contextualized

classroom; professional skill development; and opportunities to practice, reflect, and obtain feedback, and follows best practices for teaching.

The following research question was used to guide the study: ‘What are student perceptions of participating in a virtual two-week sustainable entrepreneurship course with students from multiple universities and disciplinary backgrounds?’. Next, the manuscript provides the (Section 2) Background for (Section 2.1) Education for sustainable development, (Section 2.2) sustainable entrepreneurship, (Section 2.3) virtual learning, and (Section 2.4) culturally responsive teaching, which provides the foundation for a better understanding of the design considerations for the (Section 2.5) Virtual Sustainability Summer School (Study Overview). The (Section 3) Materials and Methods section offers an overview of the (Section 3.1) intervention and study design, (Section 3.2) data collection, and (Section 3.3) data analysis. This is followed by the (Section 4) Results, which highlights the three core themes identified via qualitative thematic inductive analysis: (Section 4.1) learning outcomes, (Section 4.2) supportive learning environment, and (Section 4.3) intercultural challenges. The (Section 5) Discussion provides a critique of the research study concerning (Section 5.1) the summary of findings, (Section 5.2) responding to the research question, and (Section 5.3) compare and contrast to the literature. Finally, the (Section 6) Conclusion summarizes key takeaways, including (Section 6.1) Overview, (Section 6.2) Implications for Practitioners, (Section 6.3) Contributions, and (Section 6.4) Limitations and Future Research.

2. Background

2.1. Education for Sustainable Development

Higher education for sustainable development aims at facilitating the development of competencies to address environmental and social issues. Such competencies include student skill development, attitudes, and motivation. According to Mindt and Rieckmann [15], competencies of sustainability are perceived as competencies that allow people to solve real-world problems successfully by equipping students not only to acquire and generate knowledge, but also to reflect on the complexity of the problem. Sustainability competencies include systems thinking, anticipatory or future thinking, normative or values thinking, strategic thinking, and interpersonal or collaboration [15]. As such, there are several approaches to integrating sustainable competencies into the entrepreneurship curriculum.

First, the Sustainable Development Goals (SDGs) laid out by the United Nations include 17 topics centered around industry, innovation, and infrastructure [16]. These topics are integrated into the entrepreneurship curriculum as capstone projects or extra credit work, providing an opportunity for students to work towards developing sustainable services or products (e.g., sustainable communities and cities, decent work for all, responsible production, and many more) [17–19]. Second, the National Academy of Engineering (NAE) provides 14 grand challenge topics (National Academy for Engineering, 2022) for engineering and engineering technology majors, allowing students to work towards solving real-world problems (e.g., business-plan competitions) [20,21]. Lastly, the National Science Foundation’s (NSF) 10 Big Ideas (National Science Foundation, 2022) aimed toward interdisciplinary social-technical research (e.g., future of work and growing convergence research) are priority funding programs that align with connecting sustainability and entrepreneurship [22]. While these approaches do offer great benefits for sustainable competence-based teaching and learning, gaps remain in integrating sustainability and entrepreneurship concepts into classroom instruction.

There is a dearth of information centered on best practices for teaching and learning in sustainable entrepreneurship education [8,15,23]. Current approaches to integrating sustainability topics into the entrepreneurship curriculum provide a good starting point for obtaining sustainable competencies, but they have gaps. First, although sustainable development goals explore a wide array of topics, only four out of the 17 goals are applicable in the entrepreneurship context and offer limited guidance for educators to integrate these goals into the classroom. Second, while the NAE grand challenges offer significant topic areas for student projects, there are limited guidelines for educators to integrate these

concepts into the classroom. Lastly, the NSF's 10 Big Ideas offer significant focus areas for entrepreneurship researchers or potential principal investigators (PIs) to conduct research, yet there are limited guidelines for integrating these concepts into the classroom. Limited literature in the context of teaching sustainable entrepreneurship suggests that there is a need to develop a pedagogical approach that combines both sustainability and entrepreneurship concepts to increase student competency that is necessary for the job market.

The Agenda 21–Chapter 36 drafted by the United Nations recognizes the need to reorient education towards sustainable development. This includes reforming formal and non-formal education to develop student skills to assess and address sustainable development issues and develop attitudes and behaviors to recognize the needs of the society (e.g., community or societal problems and real-world challenges) [24,25]. Additionally, Sterling [26] emphasizes the need to re-invent education for sustainable development to allow citizens, in this case, students, to be better equipped with skills that allow them to recognize challenges in the society, community or globally, develop a sense of responsibility to cater to the needs of the people, and develop solutions to make transformative progress towards meeting the sustainable development goals. In response to addressing the gaps identified in the literature specific to sustainable entrepreneurship, including integrating sustainability and entrepreneurship concepts into classroom instruction, this study suggests an approach to teaching sustainable entrepreneurship. The curriculum design was based on the four intentions for cultivating the entrepreneurial mindset [14], including contextualized classrooms; professional skill development; and opportunities to practice, reflect and obtain feedback, following best practices for teaching. Furthermore, this approach includes attributes of (1) sustainable entrepreneurship; (2) virtual learning, where the program was administered over a virtual platform using virtual collaboration technologies during the COVID-19 pandemic; (3) culturally responsive teaching, where instructors and students were from different higher education institutions across the globe; and (4) teaching the entrepreneurial mindset from an interdisciplinary perspective, where students enrolled in the program were from diverse disciplinary backgrounds. The following sections provide background information on the concepts used in developing the virtual sustainability summer program.

2.2. Sustainable Entrepreneurship

Sustainable entrepreneurship (SE) can be defined as the realization of sustainable innovations aimed at the mass market, providing benefit to communities and societies, an opportunity aimed at generating new products, services, techniques, and organizational modes that alleviate social and environmental issues to increase the quality of living [27]. In addition to the definition mentioned above, SE can also be defined as the “process of discovering, evaluating, and exploiting economic opportunities” [28]. Universities have adopted innovative ways of teaching entrepreneurship, including design thinking, hands-on training, business plan competitions, reflective activities, and many more, to instill the entrepreneurial mindset [29]. Teaching sustainable entrepreneurship has several benefits. First, it provides students with the knowledge, skills, motivation, and attitudes to assess opportunities in line with environmental and societal needs [8]. Second, it fosters the development of entrepreneurial competencies in students, including critical thinking, systems thinking, collaboration or interpersonal skills, strategic thinking, opportunity/value recognition, self-reflection, problem-solving, and creativity [30]. Third, in response to meeting the needs of the job market, SE equips students with professional skills, including interpersonal and collaboration skills and multidisciplinary knowledge (e.g., economics, engineering, business management, math, and technology), thus enhancing their employability [12,31–33]. Although teaching SE offers several benefits, challenges exist. First, limited literature on SE education suggests that there is no valid and standard pedagogical framework for educators to integrate into classroom learning [8,13,15]. Second, the assessment of entrepreneurial competencies is challenging as it involves “complex interactions of knowledge, values, attitudes and skills” [30,34–36]. Leveraging digital technologies

for teaching sustainable entrepreneurship has been found to increase student awareness and understanding of the topic/subject, self-efficacy, and motivation and boost digital literacy [29,37].

2.3. Virtual Learning

A virtual learning environment includes teaching and learning using digital media, and is an innovative way of delivering and facilitating content when both the teacher and student are separated by time and space (e.g., diverse learners dispersed across various geographical regions) [38,39]. Typically, virtual course content is delivered in either a synchronous (e.g., real-time delivery) or asynchronous (e.g., not in real-time, self-directed) format. To deliver a traditional classroom experience during the pandemic, this study used virtual collaborative tools to teach entrepreneurship and sustainability concepts. This included video-based instruction (e.g., workshops, lectures, presentations) and virtual meeting platforms such as Zoom or MS Teams [40], and online collaboration with peers and teachers for projects and assignments using virtual technologies such as Google Docs, Google Slides, and Jamboard. Teaching in virtual settings has several excellent benefits. First, it is a flexible option available to instructors and students [38,39,41]. Several institutions offer course information and content in asynchronous and synchronous formats to help learners of all age groups (e.g., adult learners who work full time, from diverse backgrounds) to complete their degree objectives in a self-paced manner. Second, it is a cost-effective option that reduces expenses for staffing, physical buildings, and staff and student travel [38,39,41,42]. Additionally, teachers can diversify their delivery methods and reflect on their teaching practices. Third, it offers accessibility to dispersed students across various geographical areas [38,39]. Furthermore, higher education institutions can extend their outreach to students and teachers (e.g., distance learning) by offering virtual access to course content and delivery.

Although virtual learning offers benefits, challenges still exist. First, as virtual technologies are rapidly evolving and new and improved pedagogical approaches are being implemented, there is a dearth of information on best teaching practices in virtual settings [43]. Second, transitioning from face-to-face to online instruction can be challenging for teachers and learners [44,45]. While instructors face challenges in delivering quality instruction and assessing student learning, students feel isolated, disengaged, and distracted; have decreased motivation; and have limited persistence through the course [46,47]. To address ongoing challenges, educators are adopting evidence-based teaching practices that cater to the needs of ethnically diverse learners (e.g., culturally responsive teaching).

2.4. Culturally Responsive Teaching

According to Vavrus [48] (p. 49), 'culturally responsive teaching is an educational reform that strives to increase engagement and motivation of students from diverse cultural backgrounds'. Additionally, Gay [49] (p. 28) states that 'teaching is most effective when ecological factors, such as prior experiences, community settings, cultural backgrounds, and ethnic identities of teachers and students, are included in its implementation'. Culturally responsive teaching offers several benefits. First, it creates an inclusive and equitable learning environment while cultivating a growth mindset and promoting persistence [50,51]. Second, it fosters the development of professional skills, including collaboration and communication [51–53]. Third, it creates a positive classroom culture where the instructor and students can learn from each other [50,51]. This boosts confidence and self-esteem, strengthens relationships, promotes safe and open dialogue, and cultivates a community-building attitude. Although culturally responsive teaching has significant benefits, challenges still exist. First, it is challenging to discuss controversial topics (e.g., gender, religion, race, and cultural norms) in a culturally responsive classroom that the instructor may have little to no knowledge of [49,51]. This can lead to the instructor avoiding the discussion, disagreeing with the group discussion, and resulting in discomfort and tension in the classroom. Second, there are limited resources and information on best practices for cul-

turally responsive teaching [51–53]. Developing a curriculum for large class sizes and accommodating the learning needs of diverse learners is challenging and overwhelming, resulting in a decreased likelihood of implementing such teaching practices. In response to ongoing challenges, Aceves and Orosco [54] recommend evidence-based practices in culturally responsive teaching, such as collaborative teaching, problem-solving, assessment, critical thinking, and instructional engagement.

2.5. Virtual Sustainability Summer School (Study Overview)

This paper aims to showcase how entrepreneurially minded learning (EML) can be used to teach sustainable entrepreneurship from a culturally responsive perspective in the virtual environment. EML is defined as the ‘inclination to discover, evaluate, and exploit opportunities’, and can be integrated into coursework and be integrated into the classroom by applying the four intentions [14]. Using the four intentions for cultivating the entrepreneurial mindset, the curriculum for the program was designed to integrate sustainability and entrepreneurship concepts, equipping students with crucial sustainable competencies such as systems thinking, values thinking, strategic thinking, and communication and collaboration skills. The following sections highlight the four intentions used when developing an approach to teaching a sustainable entrepreneurship course (Figure 2).

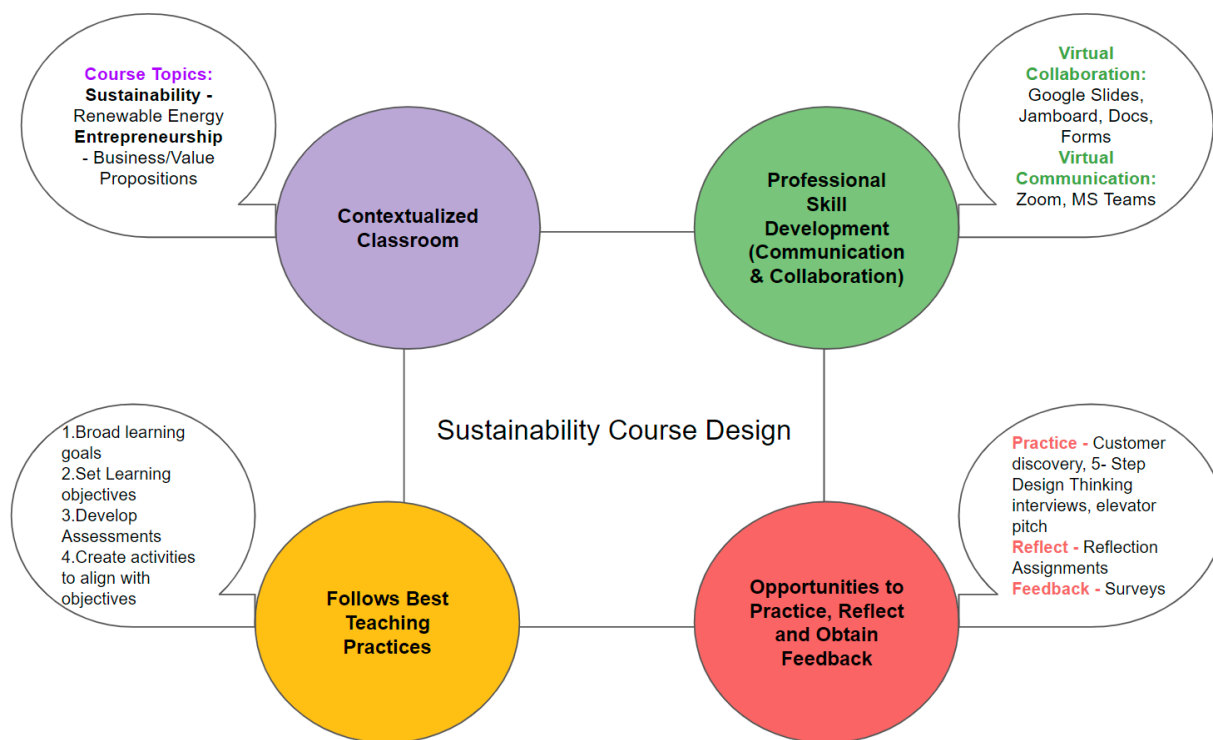


Figure 2. Sustainability course design (based on the four intentions).

- Intention 1: Contextualized to Classroom—The program included an implicit context of entrepreneurship from a sustainability perspective (e.g., course topics included renewable energy and business/value propositions).
- Intention 2: Professional Skill Development (Communication and Collaboration)—The program provided opportunities for professional skill development explicitly for collaboration and communication skill development. These opportunities were offered through virtual collaboration technologies such as Google Jamboard, Google Slides, Google Docs, Google Forms, MS Teams, and Zoom.

- **Intention 3: Opportunity to Practice, Receive Feedback, and Reflect**—To cultivate an entrepreneurial mindset, the program offered opportunities to practice, reflect, and obtain feedback. First, the participants were allowed to explore and practice coming up with ideas for a renewable energy-based topic that is perceived to be feasible, viable, and desirable. Practice opportunities included using the five-step design thinking process for ideation, customer discovery process, conducting customer interviews, and developing elevator pitches for idea/value/business propositions. Second, participants were given the opportunity to reflect on learning (e.g., ideation, customer discovery, interviews, and pitches). Lastly, the participants were given opportunities to provide feedback for program evaluation and assessment purposes.
- **Intention 4: Follows Best Teaching Practices**—The program used a backward course design process, which is an ideal approach for incorporating entrepreneurially minded learning into the classroom curriculum [14]. The instructors started with broad learning goals (primarily done to incorporate the entrepreneurial mindset into the curriculum), followed by setting specific learning objectives (e.g., context and skill development). Learning assessments were developed to evaluate and measure student learning (e.g., assignments, presentations, and surveys) and, finally, learning activities were created to align with the learning objectives (e.g., opportunities to practice).

3. Materials and Methods

3.1. Intervention and Study Design

The virtual sustainability summer school was a two-week course offered to students from multiple universities and disciplinary backgrounds to work together in multidisciplinary teams on community-based sustainability projects. The students were allowed to develop their systems thinking skills and become disciplinary specialists in their professional or research fields to solve complex sustainability problems in their local communities. This intervention included instructors and students from multiple countries and disciplinary backgrounds. During the two-week course, the students worked in small teams, combining their knowledge and experience and using design thinking approaches to develop novel solutions to a wide array of problems posed by the project. A total of eight participants were enrolled in this virtual program, including six male participants and two female participants from Ireland, Bahrain, and the USA.

This study used a project-based approach where participants from multiple disciplinary backgrounds and countries worked in small groups under the supervision of an instructor. The project topic was centered around solar energy, where the problem of solar energy generation and distribution was presented to the students. The summer school curriculum was based on two sustainability perspectives: renewable energy and entrepreneurship. The students used the five-step design thinking process (empathize, define, ideate, prototype, and test) to create a small-scale solar energy prototype while collaborating virtually through the use of virtual technologies such as Google Jamboard, Google Docs, Google Slides, Google Forms, Microsoft Teams, and Zoom. The students used ethnography and interview data collection methods to interact and obtain feedback on a small-scale solar energy innovation or prototype from the customers, i.e., local homeowners who are the greatest beneficiaries of smart grid technology and smart energy generation and distribution techniques. The data collected were used to validate the business model for long-term sustainability. At the end of the course, the teams presented their novel solutions through elevator pitches. Figure 3 provides an overview of the intervention.

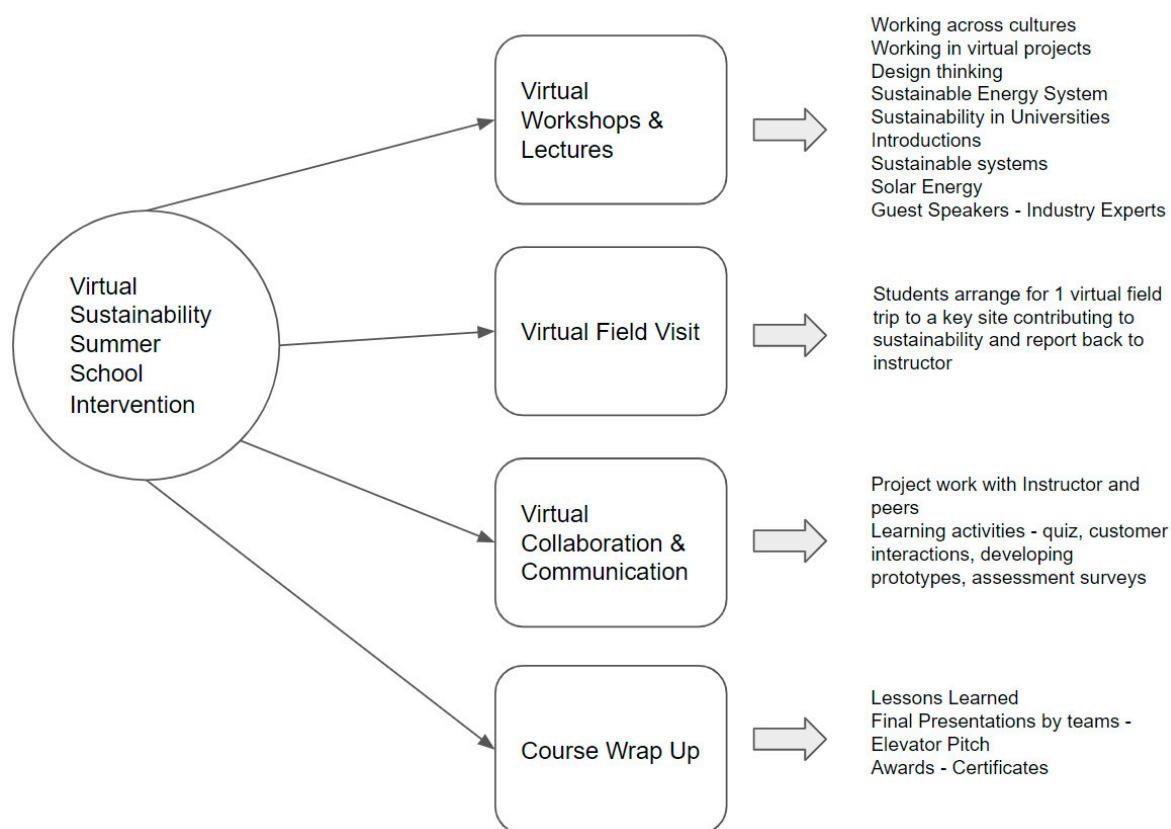


Figure 3. Virtual sustainability summer school intervention outline.

3.2. Data Collection

At the end of the project, the participants were required to complete a post-assessment survey. The post-assessment survey was distributed, collected, and analyzed to understand student perceptions on how integrating entrepreneurially minded learning in a project-based course impacts student learning outcomes and develops the entrepreneurial mindset when applied in a virtual learning format. Table 1 includes a categorical breakdown of the qualitative questions asked in the post-assessment survey.

Table 1. Post-assessment survey outline.

Question Category	Open-Ended Question(s)
Skill Development	Identify 3 things you learned about solar energy Identify 3 things you learned about entrepreneurial thinking
Intercultural Learning	Identify 3 things you learned as a result of working with peers from different countries, different time zones, different universities, and different majors
Virtual Learning	Identify 3 things you learned as a result of using various technologies
Debrief	Taking into consideration your specific Collaborative Project, what went well? What did not go well? What improvements will you make for next time?

3.3. Data Analysis

The study followed a qualitative inductive approach using thematic analysis, which is defined as a qualitative method for discovering patterns within the data [55]. Using the six-step process of conducting thematic analysis, first, the researchers familiarized themselves with the data by reading and rereading student responses on the photovoice

assignment. Second, the NVivo Pro 12 qualitative analysis software was used to code the reflections where the data collected from the completed assignments were used, and NVivo analysis was conducted to explore the potential themes. Third, after coding, the researchers searched for patterns within the data. Fourth, the researchers examined the data to generate initial themes and exchanged exploratory findings. Fifth, after the themes were identified, a visual was created highlighting each theme and its corresponding sub-themes. Direct quotes from the student reflections were taken to corroborate each theme. Lastly, after completion of coding, themes were generated, and two of the authors revised the themes and wrote the results section. Due to the qualitative nature of the research, the primary purpose of the analysis was to explore potential themes within the data [56].

4. Results

The qualitative thematic inductive analysis of the post-assessment survey participant responses led to the identification of three themes: (1) learning outcomes, (2) supportive learning environment, and (3) intercultural challenges. Figure 4 provides a visual summary of the themes identified. *Participant quotes have bolded words/phrases to align with the identified themes and for better readability, followed by a brief discussion for each theme.*

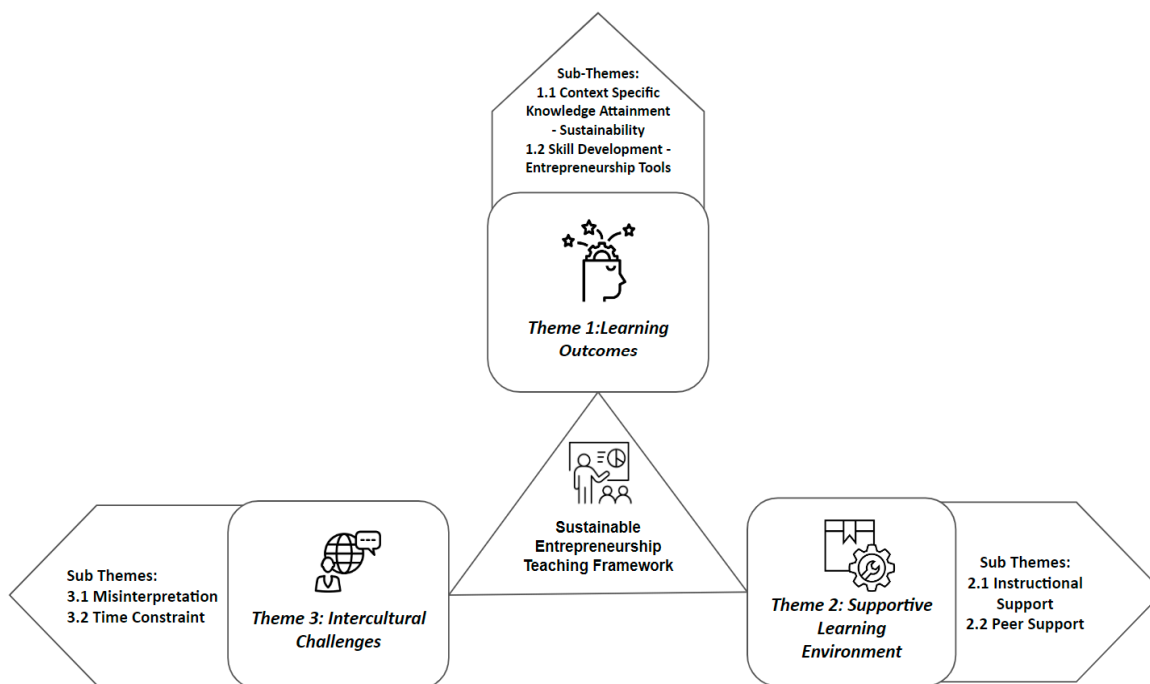


Figure 4. Summary of themes.

4.1. Theme 1: Learning Outcomes

The theme, namely learning outcomes, includes attributes of context-specific knowledge attainment for sustainability and skill development for entrepreneurship tools.

4.1.1. Sub-Theme 1: Context-Specific Knowledge Attainment–Sustainability

Participants acknowledged that they learned new information in the sustainability context for renewable energy (e.g., solar energy) and its applicability from an entrepreneurship perspective (e.g., business for services/products). This is not surprising because, as with any program/course, students are expected to learn new information based on the learning outcomes/goals laid out in the syllabus. Example quotes were as follows:

- 'I know the technical aspects of **solar energy** and specifically PV panels and solar thermal collectors, but I have learned about **solar energy** from a **business perspective**'.

- ‘*Solar* is a lot more *viable* than I thought. Another interesting thing I learnt was the crazy *commercial* potential of Solar. I did several essays/case studies on Solar Energy, and I’ve learnt a lot about what solar panels are made up of and how they work’.
- ‘The potential of *solar energy* is enormous for addressing environmental, can be used in many different environments, i.e., local, national and global, from personal homes to larger businesses. Harnessing Solar energy provides *opportunities* to cut back and eliminate fossil fuels’.

4.1.2. Sub-Theme 2: Skill Development for Entrepreneurship Tools

Participants acknowledged that they learned professional skills such as interviewing, pitch development, and collaboration by leveraging virtual technological tools offered during the program. This is surprising because, in addition to learning how to use digital tools, participants shared the benefits the tools offered such as drafting questions for interviews, collaborating, and brainstorming for project ideas. Example quotes are as follows:

- ‘Design a structured list of questions *for interviews or research* . . . completing and refining the *elevator pitch worksheet*. *Google Jamboard* was new to me and I absolutely loved it. It was great brainstorming tool and I’m glad I now know about it’.
- ‘*Pitch, interview questions, working together in a team*. *Google Jamboard* is a useful tool for *brainstorming ideas* for projects. *Google slides and docs* links can be easily shared’.
- ‘I also came to better understand the interview process, using *Google Jamboard (brainstorm), Google Docs, and Google Slides for presentation*’.

4.2. Theme 2: Supportive Learning Environment

The theme, namely a supportive learning environment, includes attributes of instructional support and peer support.

4.2.1. Sub-Theme 1: Instructional Support

Participants acknowledged that instructor guidance was critical for achieving learning objectives during the program (e.g., program schedule, expectations, and project scope). This is not surprising because participants often need more scaffolding and explicit instructions to better understand program goals and expectations. Example quotes are as follows:

- ‘*Summarizing what we did* in the meeting and what needs to be done at the end of each meeting may help to *make things clearer*. Taking minutes and sharing them among members may help too’.
- ‘I hope for the next time we can all know *what we are needing to do* exactly and have a *bigger picture*, rather than just *day to day plan*’.
- ‘*A clearer picture of what is required* as I spent a lot of time also researching the effects of this technology on human rights and greenwashing by larger companies’.

4.2.2. Sub-Theme 2: Peer Support

The participants acknowledged that working with a diverse group of people enabled them to view the problem from a different perspective, which led to the discovery of new opportunities. This is surprising because participants recognized the significance of peer collaboration and support, identified similarities and differences in terms of diversity (e.g., backgrounds, countries, and culture), and gained new perspectives (e.g., ideas). Diversity, equity, and inclusive (DEI) practices were recognized by the participants. Example quotes are as follows:

- ‘I learnt that everyone brings their own strengths to the group project. Not just from their knowledge in their *perspective* fields and majors, but also from their *background and culture*’.
- ‘There wasn’t anything learned from the different time zones, but because of the *different universities* (and *backgrounds*), I have been *exposed* to ideas from different

perspective, generally speaking, it was interesting to interact with similar minds from completely *different backgrounds* and universities’.

- ‘Learned about *different ideas and mindset* that revolves around this project’.
- ‘The people and *communication* were great at first. I enjoyed *talking* with them and *learning* about them and where they are going with their own majors’.

4.3. Theme 3: Intercultural Challenges

The theme, namely intercultural challenges, includes attributes of misinterpretation and time constraints.

4.3.1. Sub-Theme 1: Misinterpretation

The participants acknowledged that they struggled to understand project objectives (e.g., multiple-word meanings and concepts) and project expectations. This is not surprising, because the participants were from all across the globe, where language barriers and miscommunication issues (e.g., misinterpretation of words, phrases, and instructions) are prevalent. Example quotes are as follows:

- ‘*Misinterpretation* of getting the idea of the slide which lead to *misunderstanding*’.
- ‘Sometimes instructions or ideas were *misinterpreted or misunderstood*’.
- ‘I think there was a *struggle to understand* what the project was from the beginning where we are just winging it without knowing when or how this will all piece together’.

4.3.2. Sub-Theme 2: Time Constraints

The participants acknowledged that as they were distributed across multiple time zones, the amount of time given to complete project deliverables was insufficient, which slowed their progress in the program. This is not surprising because the participants were distributed across multiple time zones, and keeping track of time is often not considered. This can be attributed to factors such as time miscalculations and misinterpretations. Example quotes are as follows:

- ‘I feel like the project is still very unfinished but given the time we had I am not surprised. I feel this would be better as a 3-week class or 4 weeks. Two weeks was just a lot of info in *not a lot of time*’.
- ‘A big issue was the *time zone difference* since I would have preferred to have more meetings with my teammates to discuss the project’.
- ‘You can only do so much with the *time frame* given (especially the *different time zones*)’.

5. Discussion

5.1. Summary of Findings

The findings of this study identified factors to consider while developing a sustainable entrepreneurship curriculum. These factors include learning outcomes, a supportive learning environment, and intercultural challenges. The course should provide learning opportunities for students to gain knowledge in a specific area of interest (e.g., renewable energy and business/value proposition) and skill development that is needed in the job market (e.g., collaboration and communication). Additionally, providing a supportive learning environment (e.g., peer and instructional support) is likely to increase student motivation to learn. Furthermore, entrepreneurship educators, researchers, and program designers should consider barriers to learning (e.g., misinterpretation and time constraints) for students from diverse disciplines and cultures. Entrepreneurship education practitioners can use this information to develop, evaluate, and improve curriculum design for obtaining context-based competencies (e.g., systems thinking, value creation, strategic thinking, collaboration, and communication skills) and to promote the entrepreneurial mindset.

5.2. Responding to the Research Question

In response to the research question, ‘What are student perceptions of participating in a virtual two-week sustainable entrepreneurship course with students from multiple

universities and disciplinary backgrounds?', the findings of this study (Figure 4) suggest pedagogical strategies to consider while designing a curriculum embedded with sustainability and entrepreneurship concepts for interdisciplinary learning. The literature review suggests that there is a dearth of information when considering best practices to teach sustainable entrepreneurship, and emphasizes the need to develop pedagogical approaches that combine both sustainability and entrepreneurship concepts to increase student competency necessary for the job market. The results from this study provide entrepreneurship education practitioners with a toolkit of best practices for teaching entrepreneurially minded sustainable courses involving interdisciplinary and intercultural learning.

In line with the need to reform and re-invent education for sustainable development [4,24,26], the authors provide an approach to teaching sustainable entrepreneurship in a virtual setting by collaborating with instructors and students from multiple countries and disciplinary backgrounds. Additionally, this approach provides students with opportunities to develop systems thinking skills and become experts in their professional or research disciplines to solve complex sustainability problems in the community. By being purposeful in designing the curriculum, the course structure was based on the framework of the four intentions for cultivating the entrepreneurial mindset [14]. This included contextualized classroom (e.g., sustainability and entrepreneurship context), professional skill development (e.g., communication and collaboration), opportunities to practice (e.g., customer discovery, elevator pitch, design thinking, and interviews), reflecting and obtaining feedback, and following best practices for teaching (e.g., backward course design).

5.3. Compare and Contrast to Literature

To corroborate the findings of this study, other research studies were explored that have used the backward course design and design-focused frameworks to integrate the entrepreneurial mindset into the curriculum. According to El-Sayed [57], curriculum design methods such as the reverse or backward design can develop not only entrepreneurial skills and knowledge, 'but also provide intentional experiential-learning opportunities'. Furthermore, it is essential to ensure the careful planning of the entrepreneurially minded curriculum using various pedagogical approaches. Using the backward course design ensures the reinforcement of learning goals, objectives, activities, and assessments [58]. According to Strimel et al. [59], using design-focused frameworks such as the business model canvas, design thinking, and value proposition canvas allow students to improve their design abilities, produce technological innovations, make informed decisions, investigate and exploit opportunities, and create viable solutions with an economic impact. In addition, these strategies enable students to track their design progress in a timely manner. In a study conducted by Reynolds and Kearns [60], the backward course design offered several benefits for educators. These benefits include an enhanced ability to prioritize content delivery, refined lecture preparation, increased creativity, student engagement, and reduced stress.

6. Conclusions

6.1. Overview

Although sustainable entrepreneurship programs are being offered at higher education institutions, gaps remain in identifying appropriate pedagogical approaches for combining sustainability and entrepreneurship in university programs. The problem is that there are limited guidelines (e.g., instructional strategies, learning framework, and instruments) for educators to teach entrepreneurship in relation to sustainability. This issue is further exacerbated when considering a multitude of factors, such as context, delivery, and pedagogical approaches involving interdisciplinary learning. To overcome these gaps, this paper provides an approach to redefining how sustainable entrepreneurship can be taught during a pandemic by collaborating with instructors and students from multiple countries and disciplinary backgrounds, and providing students with opportunities to develop systems thinking skills and become experts in their professional or research disciplines to solve

complex sustainability problems in the community. The preliminary results showcased in this study provide pedagogical strategies for educators and program designers to consider while developing entrepreneurially minded sustainability education.

6.2. Implications for Practitioners

For creating a contextualized classroom, program designers should consider introducing sustainability concepts from an entrepreneurial perspective. For example, the NSF Innovation–Corps Program [61] provides students with the opportunity to explore real-world problems and develop innovative products, services, technologies, and processes that benefit the community. For developing professional skills, program designers should consider introducing students to a wide array of virtual collaborative tools (e.g., Zoom, MS Teams, Google Docs and Slides, and many more) where they can collaborate and communicate with people from diverse backgrounds. Additionally, students develop teamwork skills and become culturally competent. To provide students with the opportunity to practice their newly learned skills, program designers should consider using a step-by-step iterative process. For example, the five-step design thinking process [62] is an iterative process where the students seek to understand the market and customers, explore problems, and create innovative solutions that they can prototype and test. Additionally, other design-based frameworks used for new product development, such as the value proposition canvas and business model canvas, should be considered as they allow students to engage in the entrepreneurial process [58]. As it is an iterative process, program designers should consider including reflection exercises and assignments that provide students with an opportunity to self-reflect. Additionally, instructors can administer surveys, questionnaires, and interviews during the reflection phase to obtain feedback. Finally, to develop a course/program, program designers should consider following the best teaching practices. As suggested in this study, the backward course design is an ideal approach to cultivate the entrepreneurial mindset, where the instructor starts by (1) outlining broad learning goals (to integrate the entrepreneurial mindset into the curriculum), (2) setting specific learning objectives, (3) developing assessments (formative or summative), and (4) creating tasks/activities to support the learning objectives [14].

6.3. Contribution

This study provides noteworthy contributions to teaching and learning in higher education, and aligns with the need to re-invent education for sustainable development. First, it provides an approach for redefining how sustainability-based entrepreneurship can be taught in a virtual setting. Second, it highlights a cross-institution initiative involving instructors and students from multiple countries and disciplinary backgrounds to provide students with opportunities to solve complex sustainability-based problems in the community. Third, it provides pedagogical strategies for educators and program designers to consider while developing entrepreneurially minded sustainability education. By using the approach and integrating the strategies provided in this study, entrepreneurship education practitioners can develop a curriculum embedded with both sustainability and entrepreneurship concepts and effectively teach sustainable entrepreneurship (applicable to both classroom and virtual instruction). Higher education institutional policies should be considered while integrating the proposed framework for teaching sustainability entrepreneurship. First, institutional policies for study abroad programs should be considered and revised based on course requirements. These policies vary based on courses offered at the host university (e.g., remote vs. in-person), credits earned, enrollment (e.g., full-time vs. part-time), and attendance requirements (e.g., on-site vs. remote participation). Second, institutional teaching policies should be reviewed and revised to allow faculty to adjust their schedules and availability (e.g., overtime, contractual commitments, semesters, and workload). Entrepreneurship education practitioners should consider all institutional policies and other logistics while developing in-person or virtual programs.

6.4. Limitations and Future Research

This study had a few noteworthy limitations. First, the study had a limited sample size of only eight participants. Second, the qualitative nature of the study limited the generalizability of the findings. Third, due to the lack of strategies and examples in the literature, it was challenging to gather sufficient information and references for the study. Future research should continue to investigate strategies for teaching sustainable entrepreneurship in higher education, with an emphasis on increasing student competence necessary for the industry workforce. The approach provided in this study should be applied to a larger student population (e.g., more than 15 students) and incorporate multiple data collection instruments (e.g., both qualitative and quantitative methods) to support the findings of this study further. Entrepreneurship education practitioners should continue to investigate, test, and evaluate other curriculum design frameworks and adopt strategies that are best suited for their targeted audience (e.g., students from specific disciplinary backgrounds and cultures).

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