Review

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Review

Sustainable Entrepreneurship Education: A Systematic Bibliometric Literature Review

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Abstract: The importance of shifting to a sustainable economy, based on new capabilities that enable to cope with the current turbulent changes is paramount. Entrepreneurs with sustainable concerns are considered to play a key role in the process by creating innovative, proactive and risk assumption solutions, both with environmental and economic value. To date, there is no consensus on what capabilities education should provide to create sustainable entrepreneurs to cope with sustainability challenges. The aim of this piece of literature is to identify relevant factors for sustainable entrepreneurship education. Bibliographic databases were searched for documents published between 2012 and June 2023 to categorize central issues discussed in the literature on sustainable entrepreneurship education. The review process specifies 59 empirical and non-empirical papers at sustainable entrepreneurship education (SEE). Data analysis revealed diverse models for sustainable entrepreneurship education (SEE) developed for use in both higher education institutions and secondary schools. Future research directions are underscored.

Keywords: entrepreneurship; sustainability; education

1. Introduction

The transition to a sustainable economy is crucial to recover from the catastrophic events that have occurred recently, such as the pandemic COVID, climate change and the current conflict in Eastern Europe [1]. The importance of entrepreneurship in addressing social, environmental, and economic hurdles is central to achieving the Sustainable Development Goals (SDGs) [2]. Sustainable entrepreneurship (SE) is thus considered central to solving challenges through innovative, proactive, and risk-taking solutions [3].

Despite the growing debate about it, there is still no consensus on the definition of SE [4]. Different disciplines have agreed on different concepts of sustainable development and entrepreneurship [5]. However, SE represents an evolution of entrepreneurship that differs from other concepts of entrepreneurship in that it combines both sustainable and economic goals [6]. While the concept of conventional entrepreneurship focuses on economic value creation [7,8], the literature at SE assumes that SE is a process of seizing opportunities to develop and effectively introduce innovations that simultaneously address environmental/social concerns and economic value [9–12]. In this context, an educational framework that brings together the different components of people, environment and profit, is worthwhile [13].

On the one hand, the recognition that SE is a valuable tool to address issues be-yond profit, such as social problems, has fueled the growing interest in educating entrepreneurs about sustainability [3]. On the other hand, higher education institutions play a central role in promoting SE by supporting a SE network and the students working in it [14]. Thus, the main objective of Sustainable Entrepreneurship Education (SEE) is to provide entrepreneurs with capabilities to seize business opportunities considering sustainability issues [13]. Accordingly, the goal of SEE is to promote

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capabilities that enable to survive in turbulent contexts [4,15], taking into account the specificities of the country [16]. Adopting sustainable behaviors is challenging because it involves culture in terms of values and attitudes [3,17] and also ensuing capabilities, in terms of doing differently [18,19] in dealing with novel situations where the previous recipe simply no longer works in terms of learning output, which requires education in light of sustainability [18,19].

Despite the increasing interest in SEE, the lack of integration of sustainability aspects in entrepreneurship education is often criticized [20,21]. Therefore, specific learning environments need to be developed to educate sustainable entrepreneurs [22]. The previous literature needs to be explained in terms of the requirements for sustainable entrepreneurship at SEE. Therefore, the aim of this study is to review the literature at SEE to identify noteworthy and innovative features at SEE. A systematic review was conducted and guided by the research question: What is known in the literature about education for sustainable entrepreneurship?

Published literature reviews on SEE have focused on three areas: learning mechanisms for SEE with respect to innovation [15], the extent to which research on education for sustainable entrepreneurship has addressed the international SDGs in the context of developing countries, social entrepreneurship for sustainable development [23], and research in the academic field of SEE, where advances in higher education for entrepreneurship and sustainable development need to be gathered [24–28]. Some of the literature focuses on sustainable entrepreneurial projects [29], whilst others focus on the circular economy [30–32]. These strands of literature emphasize the approaches and methods currently used in relation to collaborative and experiential learning [33,34] and case study learning for entrepreneurship [35], thus underscoring the interplay of entrepreneurship education processes.

2. Materials and Methods

A Systematic Bibliometric Literature Review (SBLR) was conducted to identify relevant pieces of literature, gathering data for the final report on the relevant factors for sustainable entrepreneurship education, while synthesizing existing knowledge related to the research problem. Increasing emphasis on the SEE has led also to growing research for sustainable development.

As mentioned above, the purpose of this paper is to provide an SBLR on the central research question, namely in answering the question of which issues are principal for sustainable entrepreneurship education.

The study is organized into the following sections: (i) introduction; (ii) materials and methods; (iii) literature analysis; (iv) theoretical perspectives; (v) conclusion. This methodology ensures that the review is thorough, verifiable, and replicable while providing answers to specific research questions [36–39] (Table 1).

To identify potential issues, bibliometric analysis can be used to understand how organizations have adopted the methodology and how they identify potential challenges. The SBLR process is divided into three phases and six steps (Table 1), as proposed by Raimundo and Rosário [37], Rosário et al. [38], and Rosário and Dias [39].

Table 1. SBLR process.

Fase	Step	Description
Exploration	Step 1	formulating the research problem
	Step 2	searching for appropriate literature
	Step 3	critical appraisal of the selected studies
	Step 4	data synthesis from individual sources
Interpretation	Step 5	reporting findings and recommendations
Communication	Step 6	presentation of the SBLR report

Source: own elaboration.

The Scopus, the most significant and extensive peer review database of academia, served as a database for indexed scientific and/or academic documents and thus, was chosen to carry on this SBLR. Nevertheless, we believe that the study is limited in this sense, as it was anchored in such

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methodological criteria, while excluding other academic and scientific sources. Peer-reviewed academic and/or scientific publications through June 2023 were included in the literature search.

The literature search process began with identifying the appropriate database, which in this case was Scopus. The initial keyword "education" was used, resulting in 2,460,170 document results. We included the first inclusion criterion "entrepreneur-ship" we obtained 12,395 documents, the search was also limited to the subject area "Business, Management and Accounting" to narrow down the documents further to 5,609 documents and finally exact keyword "Sustainability" with 59 documents

As a result, 59 documentary results were identified (N=59), which are summarized in the final report Table 2.

Table 2. Screening Methodology.

Database Scopus	Screening	Publications
Meta-search	keyword: education	2,460,170
First Inclusion Criterion	Keywords: education, entrepreneurship	12,395
Second Inclusion Criterion	Keywords: education, entrepreneurship Subject area: business, management and accounting	5,609
Screening	Keywords: education, entrepreneurship Subject area: business, management and accounting Exact keyword: sustainability Published until June 2023	59

Source: own elaboration.

To identify, analyze, and report on the different documents, as proposed by Raimundo and Rosário [37], Rosário et al. [38], and Rosário and Dias [39], content and thematic analysis techniques were used.

The 59 academic and/or scientific documents included in the Scopus index are then examined in a narrative and bibliometric way to deepen the content and possibly derive common themes that directly address the research question [36–39]. Of the 59 selected documents, 44 Articles; 7 are Conference; 5 are Book Chapter; and 3 are Reviews.

3. Literature Analysis: Themes and Trends

Peer-reviewed articles on the subject were screened between 2012 and 2023. Over the period under review, 2021 was the year with the largest number of peer-reviewed articles on the subject, with 11 publications. Figure 1 analysis the peer-reviewed publications published for the period 2012-2023. The publications were sorted out as follows: Emerald Emerging Markets Case Studies (7); Proceedings Of The European Conference On Innovation And Entrepreneurship Ecie (4); with 2 (Education And Training; Entrepreneurship Education And Pedagogy; International Journal Of Innovation And Learning; Journal Of Cleaner Production; Journal Of Entrepreneurship In Emerging Economies); and the rest with 1 publication.

We can say that between 2012 and June 2023 there was a growing interest in re-search on sustainability education and entrepreneurship.

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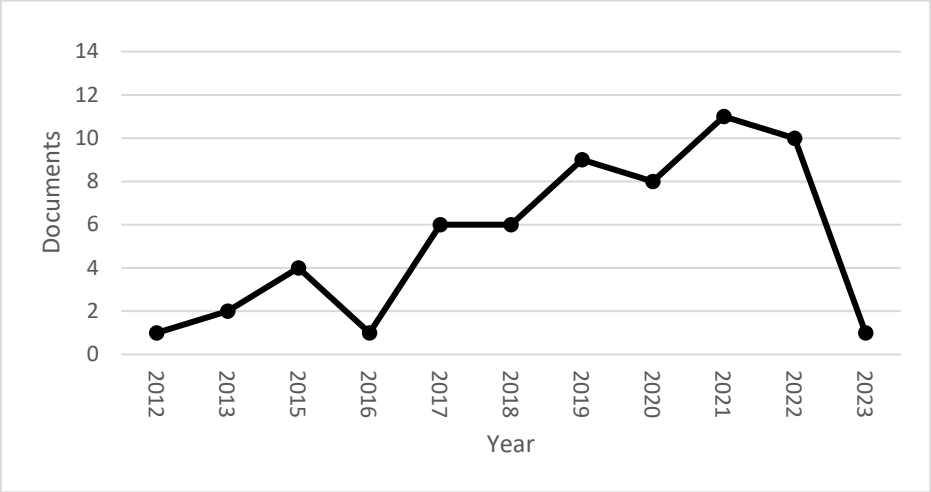

Figure 1. Documents by year. Source: own elaboration.

Figure 2 shows that among the countries with the highest levels of scientific output in related fields, India and the USA have the most publications.

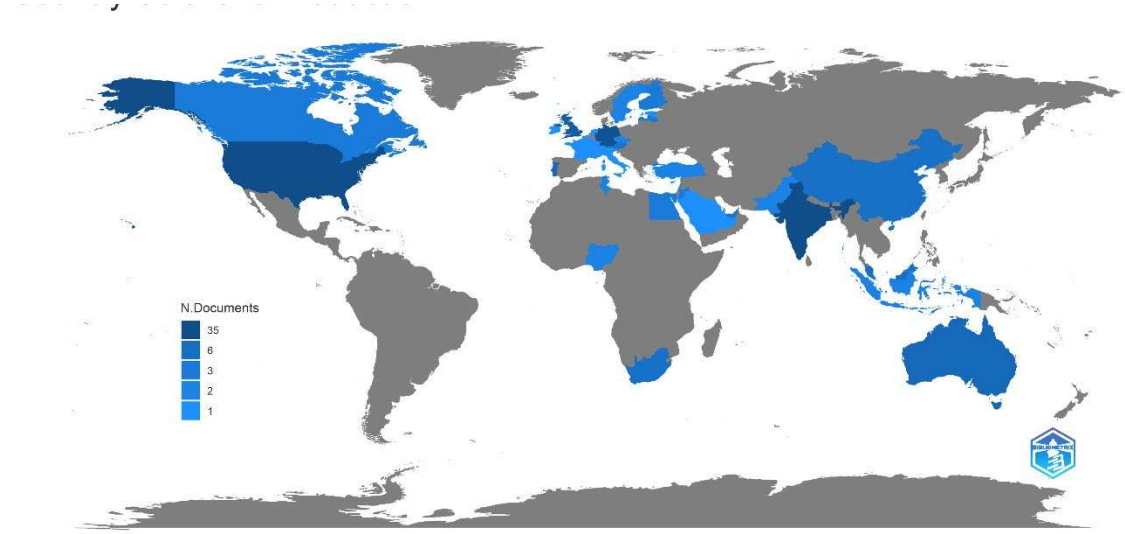

Figure 2. Scientific production by country.

The 10 countries depicted above, represent the highest scientific output in terms of sustainable entrepreneurship education: India (35); USA (35); Germany (26); UK (14); Australia (8); Portugal (8); China (5); Malaysia (5); South Africa (5); and Austria (4).

The Scimago Journal and Country Rank (SJR), the top quartile, and the H index by publication are all examined in Table 1.

The Journal of the Technological Forecasting And Social Change with 2,340 (SJR), Q1 and H index 134. There is a total of 14 journals in Q1, 10 journals in Q2 and Jour-nals in 5 journals in Q3 and 1 journal in Q1, from the best quartile Q1, represents 42% of the 33 journals titles; the best quartile Q2 represents 30%, Q3 represent 15%, best quartile Q4 represents 3% of the 33 journal titles, and finally, 14 publications without data representing 42%.

As shown in Table 1, the vast majority of articles on Education entrepreneurship Sustainability rank on the Q1 best quartile index.

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Table 1. Scimago journal & country rank impact factor.

Title	SJR	Best Quartile	H Index
Technological Forecasting And Social Change	2,340	Q1	134
Business Strategy And The Environment	2,240	Q1	115
Journal Of Cleaner Production	1,920	Q1	232
Entrepreneurship And Regional Development	1,770	Q1	96
Organization And Environment	1,620	Q1	64
Accounting Auditing And Accountability Journal	1,470	Q1	105
Labour Economics	1,200	Q1	79
Global Journal Of Flexible Systems Management	1,180	Q1	37
Management Decision	1,160	Q1	106
Journal Of Competitiveness	0,930	Q1	12
Corporate Governance Bingley	0,850	Q1	64
International Journal Of Management Education	0,820	Q1	34
Journal Of Management Education	0,640	Q2	51
Education And Training	0,610	Q2	71
British Food Journal	0,610	Q2	86
Journal Of Entrepreneurship In Emerging Economies	0,580	Q1	21
International Journal Of Entrepreneurial Venturing	0,510	Q2	20
Journal Of Small Business And Entrepreneurship	0,510	Q2	33
Journal Of Business Economics And Management	0,490	Q2	41
Journal Of Management History	0,490	Q1	22
Administrative Sciences	0,480	Q2	23
Worldwide Hospitality And Tourism Themes	0,390	Q2	24
International Journal Of Innovation And Sustainable Development	0,280	Q3	23
International Journal Of Innovation And Learning	0,240	Q3	27
Journal Of Technology Management And Innovation	0,240	Q3	30
Problems And Perspectives In Management	0,240	Q2	23
Springer Proceedings In Business And Economics	0,240	Q2	23
Emerald Emerging Markets Case Studies	0,230	Q3	7
Transylvanian Review Of Administrative Sciences	0,220	Q3	18
Universidad Y Sociedad	0,130	Q4	4
Proceedings Of The European Conference On Innovation And Entrepreneurship Ecie	0	-*	6
2021 IEEE International Conference On Engineering Technology And Innovation ICE Itmc 2021 Proceedings	0	-*	7
Contemporary Issues In Entrepreneurship Research	0	-*	8
Corporate Ownership And Control	0	-*	21
Entrepreneurship And Sustainability Issues	0	-*	30
Entrepreneurship Education And Pedagogy	-*	-*	-*
Entrepreneurship Education Opportunities Challenges And Future Directions	-*	-*	-*
Green Behavior And Corporate Social Responsibility In Asia	-*	-*	-*
Humanistic Management Journal	-*	-*	-*
Journal Of The International Council For Small Business	-*	-*	-*
New England Journal Of Entrepreneurship	-*	-*	-*
Oxford Handbook Of Business And The Natural Environment	-*	-*	-*
Strategies And Best Practices In Social Innovation An Institutional Perspective	-*	-*	-*
Triple Helix	-*	-*	-*

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Note: * data not available. Source: own elaboration.

The subject areas covered by the 59 scientific articles were: Business, Management and Accounting (59); Social Sciences (24); Economics, Econometrics and Finance (22); Environmental Science (6); Energy (4); Decision Sciences (3); Engineering (3), with 1 (Agricultural and Biological Sciences; Arts and Humanities; Computer Science; Mathematics; and Psychology).

The most quoted article was "Unlocking value for a circular economy through 3D printing: A research agenda" from Despeisse et al. with 249 quotes published in the Journal of the Academy of Marketing Science with 2,340 (SJR), the best quartile (Q1) and with H index (134). The published "proposes a research agenda to determine enablers and barriers for 3DP to achieve a CE".

Figure 3 allows us to examine the development of citations for articles published between 2017 and 2023. The number of citations shows a net positive growth with an R2 of 31% for the ≤2017–2023 period, with 2022 peaking at 231 citations.

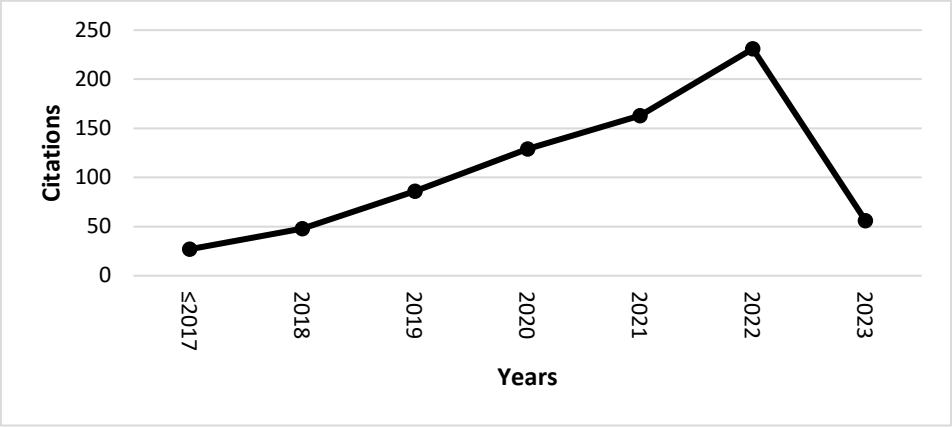

Figure 3. Evolution of citations between ≤2017–2023 period. Source: own elaboration.

Based on the largest number of included articles having at least the same number of citations, the h-index was used to determine the productivity and influence of the published work. Eleven of the papers considered for the h-index received at least 11 citations.

The citations of all academic and/or scientific papers from 2017 to June 2023 are listed in Appendix A, Table A1, with a total of 740 citations. Of the 59 papers, 10 were not cited. From 2017 to June 2023, 2022 documents were self-cited 231 times. Appendix B, Table B1, examines the self-quotation of documents until 2023, of articles 59 were self-quotation for a total of 56 self-quotation "Theorizing the Tripie Helix model: Past, present, and..."were self-cited 12 times.

In Figure 4a bibliometric analysis was carried out to analyse and identify indicators on the dynamics and evolution of scientific information using the main keywords. The analysis of the bibliometric research results using the scientific software VOSviewer, aims to identify the main keywords of research in sustainable entrepreneurial education.

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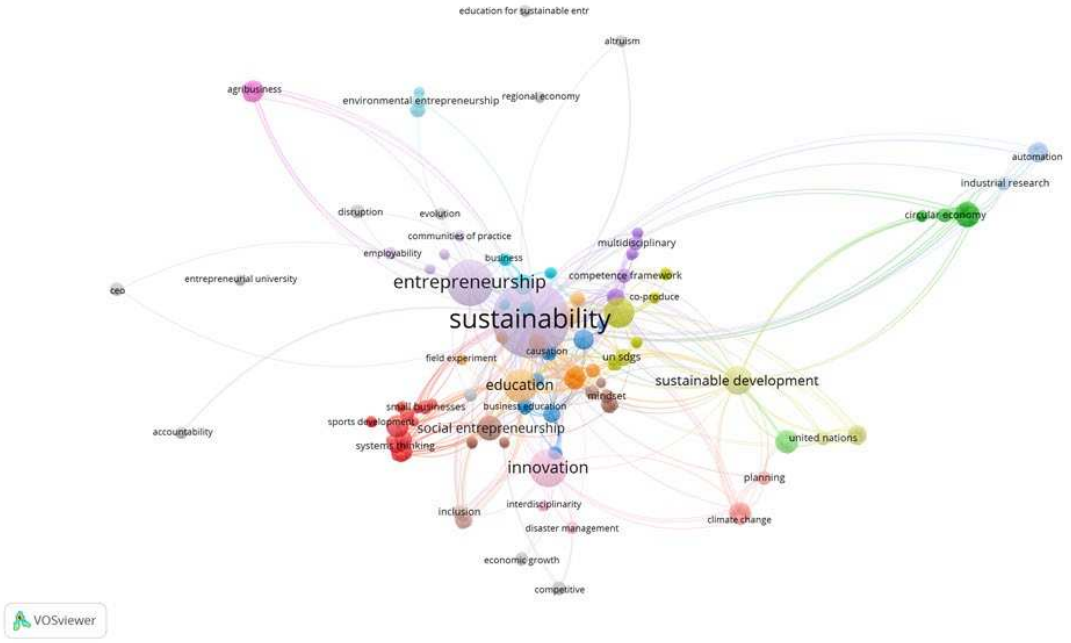

Figure 4. Network of all keywords.

The linked keywords can be analysed in Figure 3, which makes it possible to clarify the network of keywords that appear together/linked in each scientific article, which makes it possible to know the topics analysed by the research and identify future research trends. This figure shows us more clearly most of the network nodes, where the size of the node represents the occurrence of the keyword, that is, the number of occurrences of the keyword. The connectivity between the nodes indicates the co-occurrence of the keywords, and the thickness of the node indicates the frequency of co-occurrence of the keywords. Thus, the larger the node, the more frequently the keyword occurs, and the thicker the connection between the nodes, the more frequently the keywords occur together. Each colour represents a thematic cluster, and the nodes and links in that cluster can be used to explain the topic coverage (nodes) of the topic (cluster) and the relationships (links) between the topics (nodes) that occur under that particular topic (cluster).

The Vosviewer Keyword Development Map results are therefore divided into four main clusters throughout the umbrella theme of sustainable entrepreneurship: education, sustainable development, innovation and social entrepreneurship.

4. Theoretical Perspectives

From the above-mentioned analysis resulted diverse major patterns of interest to highlight and discuss.

4.1. Education

There is a vast array of academic approaches to entrepreneurship. The increasing number of academic courses, faculties or journals on entrepreneurship shows that it is a growing educational subject and scientific branch related to sustainable entrepreneurial practices [40]. Educational efforts to promote entrepreneurship now exist in educational institutions ranging from elementary school to the third cycle of study [41]. This widespread acceptance is fueled by the notion that entrepreneurship is an engine of economic and social development [42].

To date, there is no single definition of entrepreneurship [4]. This heterogeneity is also reflected in research on entrepreneurship education, a discipline that spans several fields [4] and encompasses different definitions. On one side of the continuum stands the European research, which is guided

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by a broader definition of entrepreneurship, according to which it is about the personal development of an entrepreneurial mindset and life skills [7]. On the other side of the continuum stands the North American research, which is oriented toward the narrower definition of entrepreneurship that only embraces business creation [22]. Considering the narrower and the wider perspectives, the term "entrepreneurship education" is used in this paper in broader sense [24].

Also, current research on entrepreneurship education is moving away from the narrow start-up perspective [41], which focuses on a target group of students interested in entrepreneurial careers [7], to a broader perspective that targets all students to foster entrepreneurial skills regardless of future self-employment or employment [41]. In the context of the broader entrepreneurial perspective, entrepreneurial education is not limited to business programs and can be integrated across the curriculum [7].

Furthermore, pedagogy in entrepreneurial education, like pedagogy in general, has evolved from traditional teacher-directed instructional approaches to learner-centered, constructivist approaches [22]. According to some of the literature, pedagogy in entrepreneurial education research today is mainly influenced by six theories and approaches: constructivist philosophy of education [22], experiential learning theory [35], situated learning [22], action learning [35], and problem-based learning [15]. Consequently, the theoretical framework of modern entrepreneurial education is experiential. The use of these modern experiential approaches enables the promotion of learners' innovativeness and creativity [35], whereas empirical findings on entrepreneurial education also depend on the age and gender of learners [43]

The content of entrepreneurship education has therefore evolved from learning about entrepreneurship to learning in or through the experience of entrepreneurship [22,23,35]. Traditional entrepreneurship education content related to the different stages of the entrepreneurial process ranges from developing ideas or discovering opportunities, to writing business plans, to starting a business and managing the associated activities [44], whilst current methodological contributions to the design of entrepreneurial education include, for example, effectuation [3] or start-up processes [22]. Moreover, the global homogeneity of methods used, such as business model [1,13,32] and start-up pitches [44], has been referred to as trivialization of entrepreneurship education and criticized as lack of variation considering aspects such as gender or cultural background [43].

Current research on entrepreneurship education focuses not only on the individual, but increasingly on the environment and the individual's interaction with it [15,40,42]. In the current context of successive crises (e.g., the pandemic), the question of the ethical responsibility of entrepreneurs and entrepreneurial education [35] is gaining significance. Several streams of literature have emerged in this regard.

First, several problem-solving case studies have been developed to identify the driving factors for developing sustainability-focused entrepreneurial intent and to promote the adoption of sustainable practices by entrepreneurs [40]; to identify the characteristics of a social entrepreneur and to determine the leadership skills needed by a social entrepreneur during the life cycle of a social enterprise, while developing insights to examine the unique challenges in the start-up phase of a social enterprise and to improve understanding of the interrelationship between mission focus, and challenges in achieving financial sustainability [22]. It introduces students to the key characteristics of social entrepreneurship through a case study that allows them to move from understanding and applying what social entrepreneurship is to how it works and gain insight into the complexities of working in a complex environment [27]. Also, introduces business models of innovation for sustainability that expand the value proposition to include social, environmental, and multi-stakeholder partnerships in times of crisis, expecting students to analyze concepts through multiple lenses [1]. Entrepreneurship education can therefore contribute to social and economic prosperity by supporting the building of new skills, which requires a shift from teaching as explaining to teaching as doing, from imparting knowledge to building knowledge, from teacher-centered to learner-centered learning, and from didactic instruction to project- and problem-based learning in authentic scientific, social, and technological contexts [15].

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Second, active innovation methods, such as the aforementioned case studies and design thinking, enable to formulate different alternative business models for instance bottled water, while simultaneously achieving financial outcomes and good environmental and social outcomes, which is in line with the ultimate purpose of the business, combined with the concepts of sustainability, entrepreneurship, and innovative education [22]. Moreover, by emphasizing sustainability, ethics, and social entrepreneurship in education through both experiential learning and cross-national student collaboration, empowers students to address social, and environmental issues in complex business situations [35], shifting the tonic from the traditional for-profit perspective to sustainable entrepreneurship. It allows thus to incorporate sustainability into academic curricula and consulting activities [24], which triggers a wide open systemic thinking that is particularly fruitful for students in developing their complex problem-solving skills, thereby strengthening management education [18]. Lastly, children education become also invigorated by field experimenting,, while participating in entrepreneurship education programs and finding that monetary rewards are associated with sustainable behaviors [45].

Third, institutional design of business courses enable to shape the skills and help students develop a sense of self-efficacy that they can make a difference through entrepreneurship while enabling them to understand that business can be a way to practice collaborative innovation [34]. By including the topic of sustainability in the entrepreneurship curricula, it allows to keep in mind that entrepreneurs can help solve sustainability problems [7]. Likewise, curricula should include economic, social, and environmental sustainability for the community to demonstrate the importance of an entrepreneurial mindset, whereas integrating multidisciplinary knowledge. By developing relevant entrepreneurship modules in the education ecosystem focused on soft skills, it addresses the challenges for both educators and policy makers [41]. Furthermore, design thinking principles are particularly useful for educators to facilitate student learning in the development of social ventures, i.e., innovation, impact and sustainability [21].

Fourth, it is paramount to promote a sustainable entrepreneurial vision by incorporating new values for teaching/learning from potential entrepreneurs. Once the idea to create a for-profit, non-profit or hybrid organization is born, it is principal to include the respect for the environment and social problems [23]. In this way, it enhances social entrepreneurship, the need of social enterprise management, the interplay with governance decisions, and the application of theory-based frameworks to make optimal decisions [33]. Moreover, the diversity of social contexts will enrich the individual value pattern related to sustainability, in which SEE is proposed as a whole-society response through participatory sustainability [42] from either from nascent entrepreneurs or established entrepreneurs [20].

Fifth, those teaching methods have been tested in different contexts, for instance combining the interplay between the constructs of innovation, environmental sustainability and entrepreneurship, by students of higher educational institutions in developing countries. In so, it has been commonly accepted that teaching innovation is key to promote entrepreneurship among college students [28], either by incorporating innovation into the real-life businesses constraints, or by an understanding of the informal trade-offs involved [45,46]. Moreover, such innovation can be disseminated through communities of practice, as SEE can positively impact the behaviors and practices of sustainability educators, turning them into agents of collaboration and interaction [17].

Finally, to over enhance sustainability, some authors suggest adopting key strategies from technology companies that could be replicated at the college level. For instance, continued investment in faculty development that might lead to a culture of entrepreneurship [11], entrepreneurial leadership in tech startups [11,44], startup's matrix of strengths, weaknesses, threats, and resulting opportunities; competitive advantage through application of Porter's five forces model; and target market analysis using segmentation, targeting, and positioning principles [4]. In sum, in terms of education, it requires an integrated transdisciplinary tool to develop an active, responsible, and at the same time sustainable, citizen orientation in the educational system [12], although large gaps remain in skills and knowledge related to ethics and creative problem solving [26].

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4.2. Innovation

On these days, it is clear that higher economic prosperity and lower pollution are associated with innovation, underscoring the importance of innovation for sustainability. Some of the literature highlights the positive impact of demographic trends on pollution reduction and economic expansion, toward sustainable development, while emphasizing the need for all people to contribute to economic prosperity and to actively participate in countries' environmental plans [9]. This literature addresses thus the interplay of innovation with education for sustainable entrepreneurship in a variety of areas, from smart cities, entrepreneurial skills and behaviors, for instance, to the knowledge society, socioeconomic ecosystems, and innovative educational frameworks.

First, some studies address education on smart cities by summarizing the different essential dimensions in different educational programs, projects and initiatives that cities around the world have implemented, focusing on varying issues that range from sustainable social innovation to economic growth, environmental protection, quality of life, participatory governance, community development, urban mobility and tourism services [47].

Second, in the vein of smart cities, the triple helix of interactions between academia, industry, and government has been widened beyond cities, underscoring the enhanced role of academia in the transition from an industrial to an innovative entrepreneurial society as a whole, through a model that is at once analytical and normative, theoretical and practical, whilst incorporating diverse social concepts, e.g., Schumpeter's organizational entrepreneurship and social networks, into its framework [14]. Therefore, an attempt has been made to develop innovation-oriented courses that integrate these elements of sustainability into an innovation-driven ecosystem, while promoting a roadmap for an innovative and sustainable society [48].

Third, the literature also explores the impact of causal and effective behaviors on the sustainability orientation of established companies, as if it negatively impact sustainability orientation, it could affect as well the company's ability to create sustainability value. Effective behaviors could thus encourage sustainable entrepreneurs / educators to contend that those behaviors are key elements of sustainable entrepreneurship education [3]. Likewise, it is appropriate for students to reflect on their entrepreneurial attitudes, such as whether they possess the 'empathy' associated with green entrepreneurship or, conversely, whether they need to develop it through entrepreneurial education [49].

Fourth, in order to support those behaviors, innovation is needed in terms of new methods related to online and offline education, which can be achieved through new sustainable solutions for faculty and students in the markets and through the presentation of innovative combinations of digital artifacts and infrastructures [50]. Innovative combinations related to accounting and sustainability, for instance, can also be achieved to bring about sustainable change both in business and academia [44,51]. For example, improving owner/manager education and training would impact the integration of accounting practices in an innovative and sustainable strategy for SMEs, along with technology adoption [8,52].

Finally, transformative enterprise education (TrEE) is proposed to better enable students to produce ethical change and to improve innovative teaching and learning. It allows emphasizing the time needed to challenge prevailing ideas, while creating room for experimentation. Additionally, it places entrepreneurship in a broader context through collaborative learning among students, teachers, entrepreneurs, and various other stakeholders [10]. As a result, innovative solutions will lead to an innovative framework for higher education institutions to become competitive by developing their own products and services, while providing high value to their customers [25]. Ensuing entrepreneurs and correspondent start-ups, will present innovative technological, learning and development capabilities and, as a result, sustainable development and competitive advantage, either for the growth of industrial innovation, or digital entrepreneurship [19].

4.3. SDG

The key issues of sustainable entrepreneurship education are the fundamental issues for sustainable development at the local and global levels. In turn, the 17 SDGs relevant to sustainable

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development are grouped by UNESCO into four key areas: Climate Change, Sustainable Consumption and Production, Biodiversity, and Disaster Risk Reduction [2]. Almost all students in OECD member countries attend schools where these and other issues such as pollution and environmental degradation are part of the curriculum [29]. The Sustainable Development Goals (SDGs) include a total of 169 interrelated environmental, social, and economic goals that address sustainability concerns such as natural resource depletion, pollution, and social injustice. Entrepreneurship and Sustainable Development has now been included in goal four, "Quality Education," which is considered an essential element in achieving all of the goals [16]. The importance of entrepreneurship education to address climate change or reduce inequalities, while contributing to the implementation of the SDGs is therefore internationally recognized [2].

Subsequently, literature on sustainable entrepreneurial education (SEE) have focused on three areas: Teaching and learning methods and approaches used in tertiary education for sustainable entrepreneurship, the extent to which entrepreneurship education research is focused on the international SDGs, and the structure of ongoing research in the academic field of SEE. In this regard, the extent to which entrepreneurial education research addresses multiple SDGs, such as responsible consumption and production, is key. In the case, the entrepreneurial education impact has been hindered for example, by the unemployment, critical to overcoming the cycle of poverty, the unavailability of entrepreneurial education, the lack of experiential teaching and learning approaches, or the limited use of educational technology limit the overall [16].

First, SDGs in Africa and developing countries is an emerging field of study that is divided into two areas of SDG promotion: (1) business growth, entrepreneurship, and poverty alleviation and (2) renewable energy, tourism, and ICT [2]. This literature also focuses primarily on new, necessary measures of environmental and social thinking towards creative and innovative solutions needed to achieve the SDGs (UN), global trends in addressing social and environmental problems through SDGs projects (UN), and examining them for 'innovation' and scalability to consider in more detail [29]

Second, another stream of literature on what constitutes a "social purpose" reflects on the 17 SDGs, the global social entrepreneurship and social innovation movement, ensuing impacts and indigenous wisdom to develop an improved version of the course content. Also, the issues of social responsibility, social innovation, and social entrepreneurship are emphasized [35]. Such stream of literature over enhances the need to expand collaborative networks between countries and institutions, regarding entrepreneurship and sustainability. At the same time, guidelines for teaching business and management in relation to the SDGs are proposed, particularly in relation to college-business relations, job creation and entrepreneurship, while deeming the impact of universities on society. It is highlighted the role that higher education and business education play in achieving the SDGs by mobilizing their leaders, professors, and students through integrated participation [16].

Third, some of the literature aims to gain insights into the extent to which entrepreneurs are committed to the United Nations SDGs (UN) by analyzing the core values of entrepreneurs, comparing them to the UN values, showing that entrepreneurs are committed to sustainability and that the values of education and health, are paramount [14]. Similarly, it explores the extent to which the current wave of entrepreneurship can contribute to achieving global development goals, showing that improving life expectancy and reducing inequality have influenced entrepreneurial outcomes. It is also shown that higher education promotes income rather than innovation, while investment in research and development promotes entrepreneurship [20].

In summary, studies conclude that when examining the entrepreneurial behaviors of sustainable entrepreneurs, they underscore the importance of early exposure to the United Nations Sustainable Development Goals (SDGs), the positive role of an entrepreneurial education program, and the critical role of a supportive entrepreneurial ecosystem that includes diverse and engaged students, as well as, supportive faculty and mentors to meet the SDGs [21].

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4.4. Sustainable Context of Social Entrepreneurship

Despite the universal characteristics of SDGs, entrepreneurship environment varies with context, whereas each context has its own idiosyncrasies. In disadvantaged contexts, the interest in concepts such as social entrepreneurship (SE) is mounting, increasingly part of entrepreneurship education [21,53]. Likewise, social entrepreneurship is a factor of innovation and change that drives human development [5], which makes it a central issue for different strands of the literature that address the context of social entrepreneurship in different ways.

First, some of the literature concludes that entrepreneurship has failed to address the social sustainability issue because its focus is on "making as much money as possible" and because it fails to recognize that the planet is a system. The successful solution should integrate the traditional approaches to entrepreneurship to create a triple bottom line sustainable business model that balances profit, planet, and people [13]. This approach should also be tested through education and training in different environments [13].

Second, the literature suggests that there are three main categories of drivers for entrepreneurial action: economic incentives, personal motivations, and institutional context, with a positive relationship between sustainability orientation and entrepreneurial action that decrease as participants gain more entrepreneurial education. This suggests the need to reflect on the social environment when studying sustainable entrepreneurship [12,54]. With regard to green entrepreneurship, for example, the two moderating roles of collectivism and altruism are studied in the light of distinct contexts of developing countries [40].

Third, other studies overstate the challenges posed by diverse contexts, especially the varying marketing challenges faced by incubators in some countries. Identifying and highlighting the potential disadvantages for 'incubators" can help them succeed or face competitive challenges once they leave their education programs. Some of the required skills are explored, i.e., strategic marketing intelligence to overcome the business challenges and remain sustainable [46].

Fourth, part of the literature focuses on specific learning contexts of human and social capital that influence students' entrepreneurial attitude (EA), while the establishment of academic college teams, groups, networks, and associations could foster opportunities to develop networking between students and entrepreneurs [5]. Equally, the relevance of various CEO context characteristics, such as age and tenure, are explored as important elements influencing leaders in sustainable business models [43]. Also, the context interplay between entrepreneurial education and family business impacts the ensuing competitive advantages [18].

In summary, both the sustainability perspective and the economic-cultural mediations determine potential factors for a model to promote entrepreneurship, in the light of social economy and territorial approach [12]. It is therefore central to develop entrepreneurial skills demanded by the labor market, through the education offered by universities and thus improve training and increase employment opportunities in a given context [30].

4.6. Circular Economy

The circular economy can be seen as key for a new approach to improving the sustainability of entrepreneurship. Three factors, which are closely related, can significantly influence the development of a new circular enterprise [30,55–57].

First, it is principal a purpose-driven motivation for the circular economy as a solution, which should focuses on the environmental education of various market players, through the achievement of entrepreneurial education and experience [56]. By enhancing social and environmental issues through a variety of educational opportunities it enables to highlight and develop effective solutions [31,45,58].

Second, it is central to enhance social and environmental problems, while emphasizing existing policies related to entrepreneurship and ensuing entrepreneurial skills to develop entrepreneurial mindset. It therefore maximizes both the impact of entrepreneurship on society, environment and circular economy [47,59,60].

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Third, it is paramount to understand the purpose of the innovation with respect to business, in terms of circular economy, along with incentives that could comprise for example monetary rewards linked to sustainable outcome measures, in order to encourage sustainable behavior [58]. Some even suggest a research agenda to identify the incentives for a circular economy in terms of better educated and employed people in a more decentralized production system, able to optimize the full potential of a circular economy [61–63].

In summary, the circular economy creates a more sustainable production and consumption model where, for example, raw materials can remain in the production cycle longer and be used repeatedly, creating and communicating much less waste, thus promoting sustainable entrepreneurial behavior that could be disseminated through education.

5. Conclusions

This literature review provides an overview of the state of the art in sustainable entrepreneurship education to contribute to the development of sustainable entrepreneurial behavior. It discusses the key categories of Entrepreneurial Education, Innovation, Sustainable Development Goals - SDG, Sustainable Context of Social Entrepreneurship and Circular Economy to provide a holistic picture of how these themes interplay. SEE is thus an opportune and timely discussion topic in the literature, which has already produced several innovative educational approaches that, together with the SDGs, clearly demonstrate the evolution of sustainable entrepreneurship.

This piece of the literature was pursued starting from the initial research question of what is known in the literature about education for sustainable entrepreneurship. The selected literature focused on the main themes of SEE related to innovation and different implementation contexts and concluded that the earlier the learning process starts on SEE, the better the behavior related to entrepreneurial and sustainable awareness. It is therefore strongly recommended that SEE be extended to all levels of education.

Also, SEE varies with context, as commitment to the SDGs is greater in developed regions than in developing countries, which exacerbates inequality in sustainability, as the latter countries are particularly affected by environmental problems and poverty that contribute to social conflict. Therefore, research on SEE in these countries should be strengthened.

The review also enhances key thematic debates and emerging issues that can be further explored, such as more research on developing regions, with ensuing disadvantaged innovation systems, distinct contextual entrepreneurial skills and less engagement with global SDGs.

Those regional idiosyncrasies also demand diverse theoretical and practical implications for addressing environmental, social, and economic challenges. Sustainable entrepreneurship education should emphasize thus the integration of sustainability principles and practices into entrepreneurial thinking. This implies a shift in the way we understand and teach entrepreneurship, moving beyond profit-centric models to include social and environmental concerns.

It is important an interdisciplinary approach, as sustainable entrepreneurship often requires knowledge from various fields, including environmental science, social sciences, and business management, demanding thus collaboration among different academic disciplines.

Furthermore, sustainable entrepreneurship education encourages students to adopt a systems thinking perspective, which involves understanding how entrepreneurial activity interplays with ecosystems, communities, and supply chains. It puts the tonic on teaching students to recognize their social and environmental responsibilities, while developing their businesses.

Also, practical implications include teaching students how to measure and report on sustainability performance. This includes understanding and using tools like sustainability indices, environmental impact assessments, and social responsibility reporting, in the vein of circular economy, which emphasizes reducing waste and reusing resources.

Sustainable entrepreneurship education has therefore both theoretical and practical implications that foster a holistic understanding of entrepreneurship that considers environmental and social factors alongside economic goals.

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Finally, sustainable entrepreneurship education is an evolving field that seeks to equip individuals with the knowledge and skills to create businesses that prioritize both economic success and environmental and social sustainability: (i) explore how integrating knowledge from various disciplines, such as environmental science, social sciences, and business, can enhance sustainable entrepreneurship education. Research might focus on the effectiveness of interdisciplinary curricula and teaching methods; (ii) investigate methodologies for assessing the impact of sustainable entrepreneurship education. This could involve the development of key performance indicators (Kip's) specific to sustainability and social impact; (iii) research into innovative teaching methods, technologies, and experiential learning approaches that can be used to effectively convey the principles of sustainable entrepreneurship; (iv) online and Blended Learning: With the rise of online education, research could examine the effectiveness of online and blended learning models for sustainable entrepreneurship education, including their impact on accessibility and scalability.

Research in these areas can help shape the future of sustainable entrepreneurship education and contribute to the development of entrepreneurs who can address the complex challenges of sustainability in the 21st century.

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Appendix A

Table A1. Overview of document citations period ≤2017 to 2023.

Documents		≤2017	2018	2019	2020	2021	2022	2023	Total
The role of innovation and tourism in sustainability: wh...	2022	-	-	-	-	-	-	4	4
Examining the enablers of sustainable entrepreneurship...	2022	-	-	-	-	-	-	1	1
Harmonious entrepreneurship: evolution from wealth...	2022	-	-	-	-	-	2	-	2
Determinants of entrepreneurial alertness: towards…	2022	-	-	-	-	-	2	-	2
Reinforcing or counterproductive behaviors for…	2022	-	-	-	-	-	-	1	1
A disruptive model for delivering higher education…	2022	-	-	-	-	-	3	1	4
Transforming enterprise education: sustainable…	2022	-	-	-	-	-	-	1	1
Sustainability and entrepreneurship: emerging opportun...	2022	-	-	-	-	-	2	1	3
[Towards a study model for the promotion of associative...	2021	-	-	-	-	-	1	-	1
Exploring the core values of entrepreneurs:...	2021	-	-	-	-	1	-	-	1
lnnovation Framework for Excellence in Higher...	2021	-	-	-	-	2	3	1	6
A Resource-EfFcient Modular Course Design for…	2021	-	-	-	-	1	4	-	5
Circular start-up development: the case of positive imp...	2021	-	-	-	-	1	2	3	6
Corporate entrepreneurship education's impact on famil...	2021	-	-	-	-	1	3	2	6
GrowBox: the reality of growth challenges for a social...	2021	-	-	-	-	-	1	-	1
Entrepreneurship channels and sustainable development...	2021	-	-	-	-	-	2	-	2

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Beyond making a profit: Using the UN SDGs in entrep...	2021	-	-	-	-	2	1	-	3
Entrepreneurship education challenges for green transf...	2021	-	-	-	-	2	5	-	7
CEO characteristics and sustainability business model in ...	2020	-	-	-	1	6	6	1	14
Systems Thinking as a Tool forTeaching Undergraduate...	2020	-	-	-	1	1	-	-	2
The integration of management accounting practices as...	2020	-	-	-	-	1	1	-	2
Discovery Digital Health strategy: COVID-19 accelerates ...	2020	-	-	-	-	3	2	2	7
Theorizing the Tripie Helix model: Past, present, and…	2020	-	-	-	2	13	36	11	62
From NPO to social enterprise: the story of Schwab...	2019	-	-	-	-	-	1	-	1
Boundary crossing ahead: perspectives of entrep...	2019	-	-	-	1	5	1	-	7
lnnovation-centric courses in hospitality management...	2019	-	-	1	-	-	-	-	1
Silulo Ulutho Technologies: African social enterprise...	2019	-	-	-	-	-	1	-	1
The mindset of Eco and social entrepreneurs: Piloting...	2019	-	-	-	-	1	1	-	2
Environmental orientation among nascent and establ...	2019	-	-	-	2	6	1	-	9
The teaching of innovation and environmental sustainab...	2019	-	-	1	2	3	5	2	13
lntentions to adopt ecopreneurship: Moderating role of...	2018	-	3	7	2	4	2	1	19
Sustainable social innovations in smart cities: Expl...	2018	-	-	-	2	1	-	-	3
Toward a Validated Competence Framework for Sust...	2018	-	8	27	12	24	37	3	111
DesigningWith Purpose: Advocating lnnovation, lmp...	2018	-	2	3	3	9	17	4	38
Contributions to the sdgs through social and eco entrep...	2018	-	-	1	4	3	1	1	10
Sustainable entrepreneurship education: A challenging...	2018	-	-	-	-	-	1	-	1
Marketing challenges for south african public sector...	2017	-	-	2	-	-	-	-	2
Business Notas Usual: Developing Socially Conscious...	2017	-	-	4	5	8	5	2	24
The effect of incentives on sustainable behavior: evidence...	2017	2	1	-	-	2	-	-	5
Unlocking value for a circular economy through 3D prin...	2017	6	23	28	68	43	71	10	249
100 global innovative sustainability projects: Evaluation..	2017	-	3	1	1	1	-	-	**6**
OSCAR Foundation: empowering lives through football	2016	-	-	-	-	1	-	-	**1**
Sustainability: what the entrepreneurship educators think	2015	6	5	6	7	7	5	1	37
A case on a case: Embedding sustainable entrepreneurship int ...	2015	-	-	-	-	-	1	-	1
A mindset of entrepreneurship for sustainability	2015	-	-	-	-	1	-	1	2
Responsible management education: Aclive learning appr...	2015	1	-	-	1	1	1	1	5
Sustainability: A paradigmatic shifl: in entrepreneurship edu ...	2013	2	-	2	2	1	3	-	10
Exploring the incorporation of values for sustainable entrep ...	2013	6	1	2	6	2	1	1	19
Environmental Entrepreneurship	2012	4	2	1	7	6	-	-	20
	Total	27	48	86	129	163	231	56	740

Appendix B

Table B1. Overview of document self-citation period ≤2017 to 2023.

Documents		≤2017	2018	2019	2020	2021	2022	2023	Total
The role of innovation and tourism in sustainability: wh...	2022	-	-	-	-	-	-	1	1
Corporate entrepreneurship education's impact on famil...	2021	-	-	-	-	-	2	-	2
Theorizing the Tripie Helix model: Past, present, and…	2020	-	-	-	-	2	8	2	12
Boundary crossing ahead: perspectives of entrep...	2019	-	-	-	-	1	-	-	1
Environmental orientation among nascent and establ...	2019	-	-	-	-	1	4	-	5
The teaching of innovation and environmental sustainab...	2019	-	-	-	-	1	-	1	2
lntentions to adopt ecopreneurship: Moderating role of...	2018	-	-	-	-	-	1	-	1
Toward a Validated Competence Framework for Sust...	2018	-	4	1	1	1	1	-	8
DesigningWith Purpose: Advocating lnnovation, lmp...	2018	-	-	-	1	-	2	-	3
Business Notas Usual: Developing Socially Conscious...	2017	-	-	-	-	-	-	1	1
Unlocking value for a circular economy through 3D prin...	2017	1	1	4	-	-	1	-	7

100 global innovative sustainability projects: Evaluation..	2017	-	3	-	-	-	-	-	3
OSCAR Foundation: empowering lives through football	2016	1	1	1	1	1	-	1	6
Exploring the incorporation of values for sustainable entrep ...	2013	-	-	-	1	-	-	-	1
Environmental Entrepreneurship	2012	2	-	1	-	-	-	-	3
	Total	4	9	7	4	7	19	6	56

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