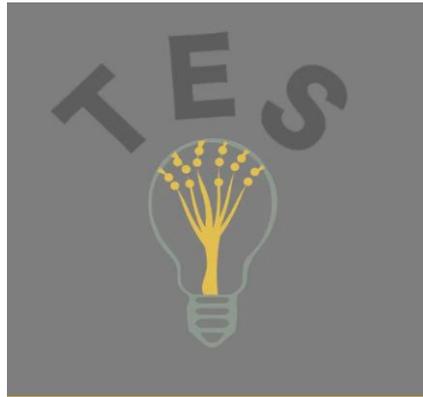


Systematic literature review

Report for Teaching Entrepreneurship for Sustainability (TES) Intellectual Output 1

University of Groningen



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Introduction

In light of the sustainable development goals set in Agenda 2030 of the UN, there is a high need and demand to integrate sustainability into entrepreneurship education as entrepreneurial firms are an essential part of achieving these goals (Hockerts and Wüstenhagen, 2010; Patzelt and Sheperd, 2011). However, sustainability principles are currently often provided as an 'add-on' aspect to entrepreneurship education and teaching, not truly integrating the two concepts (Lans, Blok and Wesselink, 2013; Ploum, Blok, Lans and Omta, 2018). The TES project set out to improve our understanding of how entrepreneurship and sustainability might be united in an integrated teaching approach.

In work package 1 we took the first steps toward reaching the TES objective. In this work package we map and systematize current approaches and practices of teaching sustainable entrepreneurship. Gaining a thorough understanding of the current available approaches to teaching sustainability in entrepreneurship education will provide the required knowledge base for developing a module that teaches sustainable entrepreneurship in an integrated way.

This report is the result of the literature review, including papers published on the combination of entrepreneurship and sustainability education since 2015. The selection of papers included in this review starts from 2015 because the CASE research consortium (funded by Erasmus+) published an extensive literature review including studies up until 2015.

The report is structured as follows: after a description of our methodology, the report starts from presenting the common competencies for sustainable entrepreneurship as described in the literature. This is followed by an overview of the most prominent teaching approaches and tools for SE. The University ecosystem is also included, as this theme emerged as highly important in supporting inter- and transdisciplinary teaching approaches to sustainable entrepreneurship. Finally, assessment of SE competences is discussed, and this is also where the biggest gap in the literature is identified. The conclusion of the report puts forward discussion points and outlines the next steps to meet the TES objectives.

We wish you happy reading!

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Methods

The scoping review

The review started with a scoping review to gain an understanding of the field of SEE. The scoping search was run on database Scopus with the search terms ("*sustainable OR sustainability AND entrepreneurship AND education*"). This search showed that SEE is a relatively new academic field of interest where most articles appeared in the last five years, especially concerning frameworks that integrate different subterrains of knowledge. The process of the scoping review can be viewed in the flowchart. The articles considered for the scoping review were, firstly, selected based on whether they included the intervention of sustainable entrepreneurship education. This can be entrepreneurship education with a sustainability component or vice versa. To assure a wholesome view of the field of SEE the intervention was interpreted broadly. Secondly, the article needs to consider SEE with a certain level of abstraction. This means that the article is not overtly focussed on the application of SEE in a highly specific discipline. Case studies that described specific (hard) skills for ICT, engineering or tourism were common in the results. Such articles were not considered in the scoping review, but rather articles that considered SEE from a more theoretical or conceptual perspective. This was decided in order to gain an understanding of SEE literature independent of specific applications, which aligns with our research objective. Thirdly, the articles needed to include students in higher education as a population as a minimum, meaning that articles that also considered other groups alongside students were also included. The selection criteria were applied to the title and abstract of the articles during the screening of results.

There were in total 810 results that were firstly ordered on "most recent" to get the articles with the most up-to-date knowledge that can function as good starting points for "pearl-growing" and "snowballing". Pearl-growing means identifying a well-known, highly relevant, article within the pool of selected articles with the goal of creating or improving (search) terms for the systematic literature review. Snowballing is a technique where (key) articles are retroactively identified via the referencing list of the retrieved articles.

The first 200 articles were analysed, before results started to become irrelevant based on the screening of title and abstract. Articles that met the selection criteria completely were selected to be retrieved. Next, the results were ordered on "most relevant", a feature provided by Scopus, and the first 200 results were analysed, because again beyond this point most results started to not meet the selection criteria. Articles that met the selection criteria completely were selected to be retrieved. Lastly, the results were ordered on "most cited", and the first 100 results were analysed before a clear gap emerged between articles with many citations, and articles with few. These three different ways of ordering the results allowed us to recognize which articles reappeared in which category. Naturally, "most recent" articles generally do not score highly in "most cited", as citations are accumulated over the years. However, there were exceptions, which demonstrates that an article might be highly influential. Thus, these articles were selected for reading and retrieved. The same logic was applied in the comparison of the results within the other categories. Results that reappeared and 'scored highly' in two or more categories, were selected and retrieved for reading.

After having screened the selected and retrieved articles from Scopus on full text a total of 37 articles were selected to be included in the scoping review. These articles were used for "pearl-growing" and "snowballing" to identify other articles that might be relevant

for the review. Through these strategies another 5 articles were deemed relevant for inclusion in the scoping review, giving a total of 42 articles in the scoping review. To clarify, articles that were screened on full text, but that did not satisfy the inclusion criteria, were not included in this count. The articles included in the scoping review were used to define the inclusion/exclusion criteria, refine search terms, and gain a preliminary understanding of the themes in the field of SEE. The inclusion/exclusion criteria and refined search terms can be viewed in the flowchart.

Formulating the search string

The scoping review revealed that sustainable entrepreneurship knows many alternative names, such as social entrepreneurship, green entrepreneurship or the ecopreneur. Most literature define social entrepreneurship as solely adding to the social side of the triple bottom line, just like green entrepreneurship is entrepreneurship that focusses on the environmental side of the triple helix. However, sometimes these terms are used to encompass both social and environmental value, which corresponds to the definition of sustainable entrepreneurship. With the refined search terms of ("*sustainab* AND education AND entrepreneur**") these alternative terms for sustainable entrepreneurship are included as long as the term sustainable or sustainability is used at least once in the title, abstract or key terms of the article.

To check the workings of this search string alternative searches were run on Scopus. Firstly, to better understand how many articles combine sustainability and entrepreneurship directly, rather than use these terms apart in the title and/or abstract the following search was run:

("sustainab* entrepreneur*" AND education), which gave 74 results. Secondly, to better understand the two subterrains of SEE education and their respective size in literature, the following searches were run:

("sustainab* education" AND entrepreneur*), which gave 24 results, and;

("entrepreneur* education" AND sustainab*), which gave 211 results.

These differences in size are in line with the findings of the scoping review, where it became clear that most literature on SEE starts from entrepreneurship education and consequently incorporates sustainability, rather than vice versa. These findings have elicited the understanding of SEE as following two 'pathways of integration'.

Turning scoping results into data extraction codes

For the scoping review specificity was favoured in articles, resulting in a meta-ethnographic process where themes were identified through open coding of (highly) relevant text, which were then constantly compared to gain an understanding of the field of SEE. Aside from being a critical step to get a grasp of a research field, a scoping review is also essential for the systematic review as these (preliminary) themes provide guidance during the data extraction process. Important themes that the scoping review laid bare can be considered within the PICOC framework (population, intervention, comparison, outcomes and context), which is marked in *cursive* throughout the text below. The themes within the PICOC framework that were phrased into codes are found below with an underlining.

The scoping review revealed that the *population* considered in articles is often students, but many also focussed on teachers (teach-the-teacher articles), practitioners and the sustainable or entrepreneurial university. These types of population were codes in the data extraction form.

The *intervention* sustainable entrepreneurship education generally starts with entrepreneurship education to which sustainability is added, however there are some articles that integrate entrepreneurship into sustainability education. There are thus two pathways of integration regarding SEE that depend much on the disciplinary background of the study or course in question, a finding that relates to the *context* part of the PICOC structure. For example, business schools that have decided to integrate sustainability in entrepreneurship courses want to generate sustainable thinking in students while agricultural studies add entrepreneurship to their sustainability-oriented courses to equip their students with ability to create innovative business models.

The scoping review also showed that there is a variety of forms to teach sustainable entrepreneurship. In higher education there are (master) programs about it, but more often it comes in the form of a course, module or class. Aside from these teaching structures there are also many methods of teaching SEE. In general, SEE leaves traditional lecture-based teaching approaches behind and makes use of more action and challenge-based teaching structures, where students get hands-on experience, and the teacher is a guide that is there to help rather than lecture the student in a top-down structure.

Regarding *outcomes*, most articles are concerned with generating certain competences or aim to better understand how to further the entrepreneurial mindset and/or sustainable orientation, phrased as the code value/intention, of students. They do so through particular teaching approaches or using the university (ecosystem) in a way that fosters SEE. The literature on SEE is surprisingly on one line regarding the competences that SEE should generate and overall identify the same competences, be it at times with a slightly different typology. What the scoping review revealed to be sorely missing in the literature is the question of how to assess SE competence generation. It has been mentioned by a few articles even as an important avenue for future research, making assessment a main code in our review.

The *comparison* part of the PICOC framework, especially important for systematic reviews in the field of medicine from which the framework originates, was not that relevant for our review. Ideally findings of a review are compared with alternative data to gain a more critical understanding of a research field. For SEE specifically the adjacent ‘mother’ fields of education for sustainable development and conventional entrepreneurship education are important to consider. Such a review, however, would have been too broad for the scope of our research.

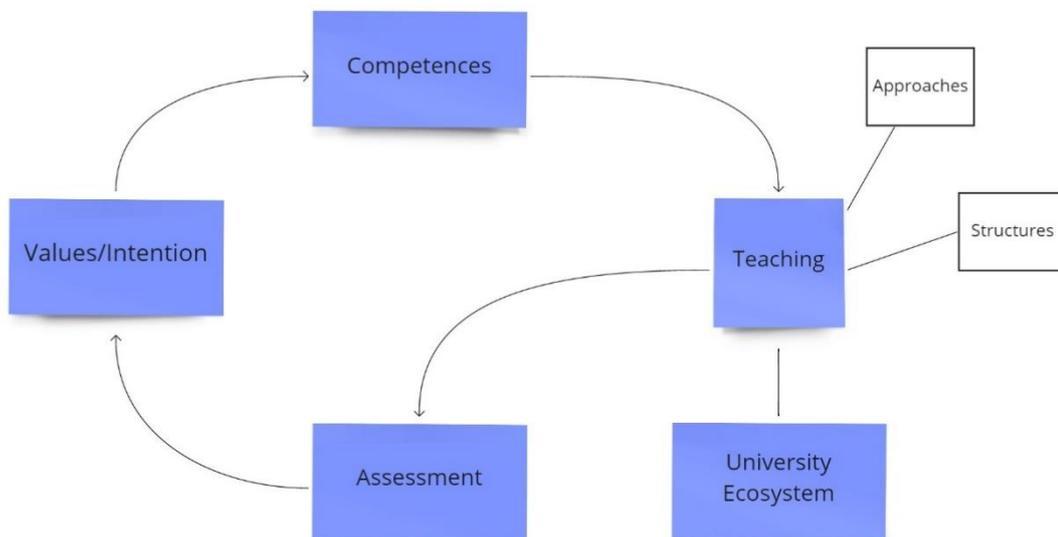
Revised inclusion criteria

Based on the findings of the scoping review the inclusion criteria was adjusted for the screening on title and abstract of the articles for the systematic literature review. The criterium of *population* was kept the same, meaning at the minimum students of higher education need to be included in the study. The criterium of the *intervention* is interpreted broadly for the review as well and defined as the need of teaching sustainability AND entrepreneurship education in some combination. This was decided to accommodate the high variety of ways in which sustainability and entrepreneurship are integrated in higher education. The *outcomes* of the SEE intervention laid down in the study were not a decisive factor in the inclusion/exclusion decision of articles, as we were interested in a broad analysis of findings in SEE literature. The results of a study should be generalizable to other study contexts and thus cannot define SEE competences solely in terms of highly specific (hard) skills applicable only in a particular discipline. Such an understanding of the intervention constrained by the criterium of *context* does not preclude empirical or quantitative studies. It simply assures that

the understanding gained of SEE is not embedded in the sole context of disciplinary skills for a highly specific study that can hardly be generalized to other study settings. Lastly, having found comprehensive SEE curriculum developments based on an extensive synthesis of SEE literature up until 2015 by the CASE project, it was decided that this systematic literature review would only consider articles published in 2015 or later written in English.

Conducting the systematic literature review

The refined search string (which can be found in the flowchart) was run on both the databases Scopus and Web of Science in January 2021, which respectively gave 817 and 499 results. These results were augmented with the results from the alternative search strings run on Scopus. These results were uploaded to “EPPI-Reviewer” (EPPI), a web-based system to help conduct systematic literature reviews. All duplicates were removed by EPPI and articles that were found manually were added, bringing the total amount of articles to be screened on title and abstract for the systematic literature review to 1126. These articles were first screened by one researcher on title and abstract, applying the inclusion criteria. Next, the same articles were screened by another researcher, to reduce personal bias. The differences in inclusion/exclusion decisions were reconciled through a discussion per article. This resulted in 169 articles in total included in the review to be screened on full text. The screening on full text was done in combination with data extraction. The data extraction form is based on the findings of the scoping review structured through the PICOC framework described above, meaning population, intervention, (disciplinary) context and outcomes where key codes. Related to the latter, the main subject of the articles was coded according to a best-fit framework based on the main (research) topics that arose in the scoping review, which were the following:



The section values/intention concerns the attitudinal side of SEE, such as valuing sustainability and having entrepreneurial intention. These attitudinal themes are both at the core of SEE competences, as well as envisioned (learning) outcomes in study programmes. Under the theme competences sub-codes were created based on the CASE project. The CASE project found that the competencies to be fostered were systemic competencies, anticipatory competencies, strategic competencies, normative competencies and interpersonal

competencies. This was based on (1) previous frameworks of Wiek et al. (2011) and Lans et al. (2014), but mostly on (2) a backwards design of study, researching what competencies are needed for SE in practice, based on 48 interviews with companies and 25 interviews with (teachers and other relevant staff) at five universities in the regions of Vienna (Austria), Bolzano (Italy), Vechta (Germany), Brno (Czech Republic) and Gothenburg (Sweden).¹ These findings were underlined and extended by results gained from the workshops with various stakeholders in Vienna and Vechta in consequent work packages (number 3 and 4) and a systematic literature review on teaching and learning methods used in the educational fields of entrepreneurship and sustainable development, covering 110 articles.² From the systematic literature review a list of teaching approaches was created, which was the basis for the coding under the theme ‘teaching’. For the theme ‘university ecosystem’ codes such as ‘sustainable university’ and ‘entrepreneurial university’ were used, as well as codes referring to different types of communities. Lastly, the theme of assessment consisted of codes on learning objectives/outcomes and evaluation tools used in study programmes, e.g. exams and reports.

Other coding tools beside the data extraction form were validity checks, based on the checklists of AMSTAR, CASP and Reliant, and inductive coding.³ Through the validity checks we can gain insight in the rigidity and relevance of an article, which allows us to give more weight to articles with well-conducted studies than articles reporting on a study of lesser quality. In the worst-case scenario, the poor ‘score’ of an article was a reason for its exclusion from the literature review, as mentioned in the flowchart. After the exclusion of the articles that after a full read did not prove to satisfy the inclusion criteria 54 articles were left in the review. The data that was extracted from the articles was ordered according to (sub)code(s) and analysed for overarching themes. Through iterative comparison of the findings across the articles recurring themes and underlying relations became apparent.

Rather than simply summarizing the results of the review, we aim to identify ‘red lines’ that run through the literature and across themes. However, this interpretative side of the review is not included in this report, to allow for your own interpretation during the discussion of the results at the meeting. The results of the systematic literature review originating from both quantitative and qualitative studies were integrated and synthesized in narrative form, which you can find below the flowchart.

¹ Bernhardt J, Lindtner C, Elsen S, Biberhofer P, Rammel C, Schmelz D, Rieckmann M, Bockwoldt L, Ambros M, Cincera J, Orsáková P, Cerný M, Boman J (2016) CASE Report Needs Analysis. Findings on Competencies for Sustainability-driven Entrepreneurship. Free University of Bolzano, Terra Institute

² Biberhofer P, Bockwoldt L et al. (2016) Joint CASE Report on Content and Methods for the Joint Master Program on Sustainability-driven Entrepreneurship. Deliverable of WP3 Content: Sustainable socio-economic development and sustainable entrepreneurship and WP4 Methods: Inter- and transdisciplinary teaching and learning methods, Vienna University of Economics and Business, Austria, University of Vechta, Germany.

³ AMSTAR; http://www.amstar.ca/Amstar_Checklist.php CASP; https://casp-uk.net/wp-content/uploads/2018/01/CASP-Systematic-Review-Checklist_2018.pdf Reliant; <https://lirjournal.org.uk/index.php/lir/article/view/271>

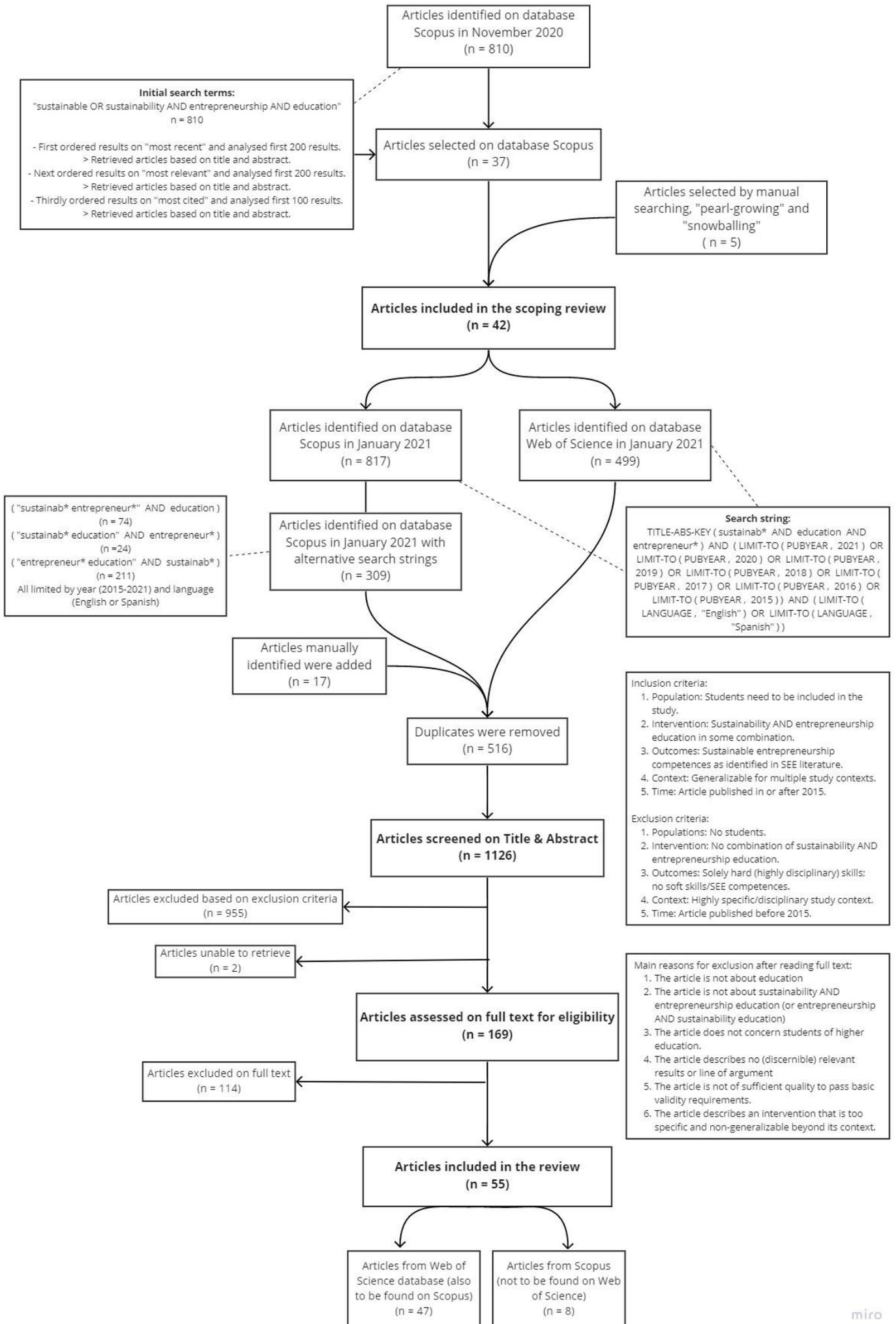
Scoping review

Identification

Screening

Eligibility

Included



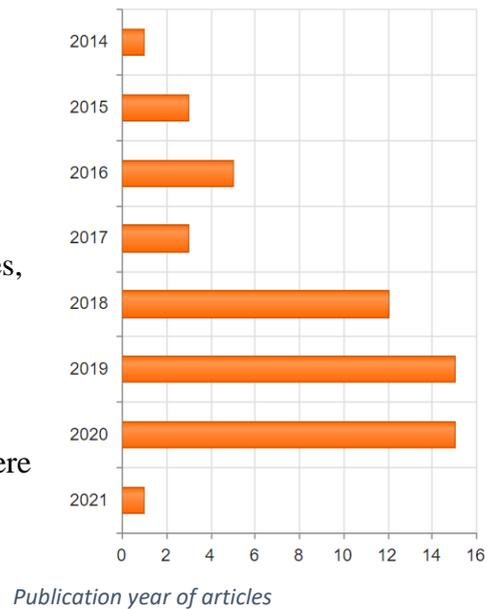
Results

Origin of the articles in the review

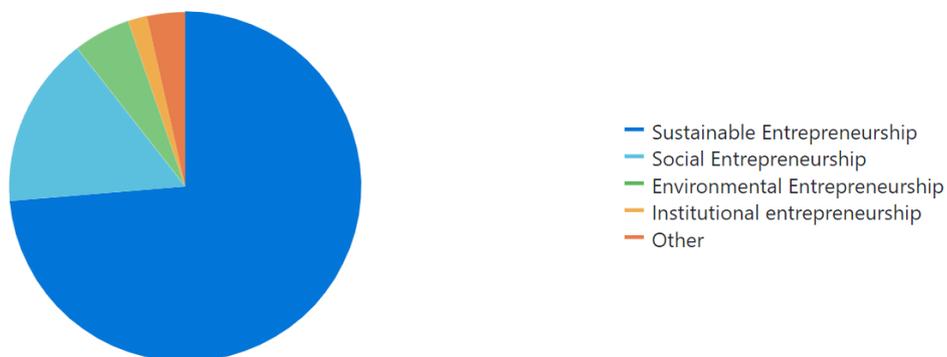
The literature in the review consists of 52 articles from journals and two articles that are conference papers. 11 articles are from the journal sustainability, 5 from the journal of cleaner production and 3 from the International Journal of Sustainability in Higher Education. Other articles come from differing entrepreneurship and management journals, other sustainability journals, education journals or engineering journals.

A quick stocktaking of the origins of articles shows that the field of SEE is a very western affair, and mostly European.⁴ This is in line with previous literature, which points out the ‘Eurocentrism’ in the field of SE (Demssie et al., 2019; Mindt & Rieckmann, 2017; Rashid, 2019). Most articles are from the German-speaking countries Austria, Germany and Switzerland. Next up are the Spanish and Portuguese speaking countries, most notably Spain.

Further, ranking from most articles to least:
 The English-speaking world, with the USA, UK and Australia.
 Then Scandinavia, with Norway, Sweden, Finland, Denmark.
 Then the Netherlands, falling a bit in between regions.
 The East European countries are represented a few times, such as the Czech Republic and Lithuania.
 Then there are a few articles originating from Asia (Pakistan, India, Korea, Malaysia).
 Articles from Africa are notably absent. There are only studies from the African continent in our review that were conducted by external (western) researchers about African countries such as Ghana and Ethiopia.



The main topic/focus of education programme discussed in the paper:⁵

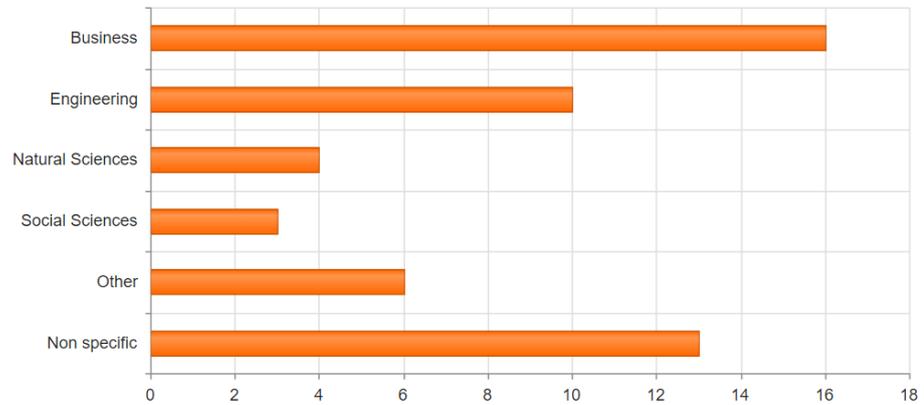


⁴ Based on a count of all countries the study of articles took place in, or if this information was absent the country of residence of the author, or if this was absent the nationality of the author.

⁵ The "other" area comprises of two articles; one describing food system education and one describing a tourism education programme.

Many courses are about social entrepreneurship, but are in practice about sustainable entrepreneurship because they view generating societal impact as encompassing social and ecological value creation, thus involving the three sustainability pillars (Calvo et al., 2020; Halberstadt & Timm, et al., 2019; Kim et al., 2020)

Most SE education programs have their disciplinary roots either in business or engineering education.⁶



Regarding the type of studies described in the articles, it is notable how many studies are not really studies, but solely a description of an author’s own program. Moreover, for almost half of the articles that do conduct a study, this study is related the author’s own program. This might heighten the risk on personal bias, if authors try to ‘sell’ their own teaching approaches.



Legend

● Inward Research (describing own program) ● Outward Research (describing third parties)

⁶ Among “other” are programmes for design students, art students and tourism students. For 14 articles discipline could not be coded, as they did not describe a programme.

Content of SE courses

Competences

The competences that were mentioned in literature as important competences for SE corresponded well to the competences identified by the CASE project from which we departed. System thinking and anticipatory thinking have been found to be the least contested competences in the literature:

System thinking: “the ability to identify and analyze all relevant (sub)systems across different domains (people, planet, profit) and disciplines, including their boundaries” (Ploum et al., 2018) is one of the core competences for SE, mostly needed in the beginning of the entrepreneurial process (Foucrier & Wiek, 2019)

Anticipatory thinking: “The ability to collectively analyze, evaluate, and craft “pictures” of the future in which the impact of local and/or short-term decisions on environmental, social, and economic issues is viewed on a global/cosmopolitan scale and in the long term” (Ploum et al., 2018). Or in other terms, the ability to think long-term (intergenerational) and about social/political developments and to be able to deal with risk and uncertainty (Biberhofer et al., 2019). System thinking and anticipatory thinking share some overlap. System thinking is thinking of different levels of space (local, regional, global), while anticipatory thinking deals with thinking of different levels of time (past, present, future). They both deal with thinking beyond the here and now and venturing into more complex and uncertain considerations.

Normative competence: the ability to define sustainability values as the centre of your entrepreneurial decisions (departing from and paraphrasing the definition of Ploum et al., 2019). ‘Doing the right thing’ is the main driver for the actions that sustainable entrepreneurs undertake and is therefore closely linked to values and worldviews that underlie SE competences (Biberhofer et al., 2019). As such the normative competence can be seen as the most fundamental, or ‘first’, competence for SE. It also comprises negotiation and reconciliation of norms, as one’s own norms will inevitably at some point clash with others, especially as an SE. It therefore has an inherent aspect of critical thinking and being open to diversity to enter into discussion with others, while staying strong on your own values as well. Ploum et al. (2019) finds normative competency and strategic competency to correlate greatly with each other, but this interesting finding might be related to the way they defined normative and strategic competence, namely as a sensitivity to moral issues while strategic competence is viewed as the transformation of intentional behaviour into actionable behaviour (Ploum et al., 2019)

Strategic competency: “is regarded as a set of skills that includes the ability to recognize and analyse problems, see new opportunities and possible solutions, and to bring sometimes highly idealistic visions, ideas and solutions of SDE ‘down to earth’.” (Biberhofer et al., 2019). At the same time strategic competency has a more ‘boring’ side associated with ‘conventional’ management skills. Hence some see creativity and innovativeness as crucial parts of the strategic competency, while others describe strategic competency as comprising

only standard managerial skills that are devoid of any ingenuity. It might therefore be useful to see the strategic competency as a jacket that can be put on in two ways; Students might have to learn that running a successful business demands leadership skills such as innovativeness, having a vision, thinking long term by “using and constantly reworking strategies to remain competitive on the social entrepreneurial market”. (Halberstadt, Schank et al., 2019; Halberstadt, Timm, et al., 2019), as well as managerial skills such as organization, planning and controlling, or: “how to identify a target customer segment, propose a relevant value, identify distribution methods, locate key resources, ensure adequate revenue streams” etc (Serhan & Yannou-Lebris, 2020).

This managerial side also includes the competence to acquire information, or in other words; that the students have done ‘their research’, such as identifying trends, consumer behaviour, public concerns and the market position of competitive products (Serhan & Yannou-Lebris, 2020). Moreover, it includes the competence of measuring (social, ecological or economic) impact, which is especially difficult and important for SE’s (Faludi & Gilbert, 2019; Castro-Spila et al., 2018).

This differentiation between the ‘leader’ and ‘manager’ side of the strategic competence might align with the difference between the strategic and the action competency. Ploum et al. (2018) found that these competencies cannot be distinguished (enough) and should be seen as one competency, namely strategic action competence.

Opportunity identification competence is often mentioned as a competence for conventional entrepreneurs but is not part of the frameworks of competences for SE created by Lans et al. (2014), nor the CASE list. It is debatable whether this is right, as it is an important competence for any type of entrepreneur to be able to recognize opportunities. At the same time, opportunity recognition (OR) is a competence that is hard to develop directly, although there are examples where OR is trained by looking at sustainability problems, SDG’s for example, and then think of possible (business) solutions (Baggen et al., 2018; Ploum et al., 2019). Yet, OR might be better fostered through other competences, e.g. through the systemic and anticipatory competence, as they allow for a better than average understanding of where developments in the world are heading which should help in spotting opportunities for SE.

The ability to work in a visionary manner is an inherent part of leadership. Leadership starts with the self; self-awareness/consciousness and self-knowledge (Parris & McInnis-Bowers, 2017). Knowing what you can do and what you’re good at does not only create self-efficacy but also allows you to see opportunities in your own capabilities. Departing from your own capabilities, or resources, follows the “bird-in-hand” principle of effectual thinking (Parris & McInnis-Bowers, 2017). Effectual thinking overlaps with the resource-utilization competence some authors mention, which is about making use of ‘what is there’, such as skills and knowledge of people/workers (Halberstadt, Timm et al., 2019), but also in a broader sense, like material resources (local natural resources; Renfors, 2020) or institutional arrangements, such as policies (Demssie et al. 2019). The other side of effectual thinking, causal thinking might be more suitable for the managerial side of the strategic competence (Parris & McInnis-Bowers, 2017). In sum, it is unclear where the OR competence should be located within the SE competences framework. It can be viewed as a part of the strategic competence (falling within the leadership side) or part of the anticipatory or systemic competences.

Halberstadt & Timm, et al. (2019) have a different organization and divide SE competences in three categories: Opportunity recognition competences, management competences and (inter) personal competences. System-thinking, anticipatory-thinking and normative competence fall under the first category, while strategic, action and leadership competence fall under the second. It is not unfounded to bring the normative competence in relation with the OR competence. Ploum et al. (2019) found that normative competence is positively related to the amount of business ideas for sustainable development (recognized opportunities) that are thought up. It seems that students with a strong value set are able to identify more sustainability related opportunities. This strengthens the idea that opportunity recognition competence might be furthered by focussing on the competencies of system thinking, foresighted thinking and normative thinking. Moreover, it shows the importance of creativity. Creativity according to Buil et al. (2016) is “the ability to provide a different and innovative approach when faced with a new problem”, which is arguably more important for SE than any other kind of entrepreneur, as they turn sustainability problems and needs into business opportunities (Foucrier & Wiek, 2019).

So, the big question then is, should opportunity recognition be defined as a competence on its own?

Interpersonal competency is especially important for SE, as SE calls for more dialogue than ‘normal’ business and often involves a more diverse set of stakeholders to engage with. It underlies all other competences and is important throughout the whole entrepreneurial process (Foucrier & Wiek, 2019). Characteristics are the ability to communicate in a transdisciplinary way with multi-stakeholder networks, engage in participative teamwork and show integrative leadership. (Biberhofer et al., 2019). Halberstadt & Timm et al. (2019) view personal competences - such as creativity, empathy, flexibility and self-efficacy - , interaction competences - such as interdisciplinary competence, network-building and communication skills - , and general & specific knowledge as part of the overarching interpersonal competence.

The ability to think and work not only interdisciplinary but also transdisciplinary is dubbed the competency of ‘embracing diversity and interdisciplinarity’ in the framework of Lans. (Biberhofer et al., 2019). In the study of Ploum et al. (2018) aimed at validating competences embracing diversity and interdisciplinary competence and interpersonal competence result as different competences, confirming Lans et al. their distinction. However, in the CASE list of competences “coping with diversity” and “intercultural competencies” are both viewed as expressions of the interpersonal competence.

The competence of ‘embracing diversity’ might result as differing from the interpersonal competence because it has a normative component to it. However, Martinez-Campillo et al. (2019) found that the ability to ‘accept individuals with characteristics different from mine’, which can be viewed as the competence to embrace diversity and interdisciplinarity, is different from having a ‘sense of civic and social responsibility’, which is an expression of the normative competence. Combined with the implicit inclination in literature to view dealing with diverse stakeholders as an important expression of interpersonal competence, the findings in the review suggest viewing embracing diversity and interdisciplinarity as part of the interpersonal competence. Most notably in MOOC’s the interpersonal competence seems particularly fostered, whether due to students’ intention to

interact socially or due to the setup of the course. Students interact with each other and engage in social learning, thus creating virtual learning communities.

Industry-specific knowledge is not listed in SE competence frameworks as a competence for SE, however it shows from literature that previous knowledge is important in order to come up with a business idea (Baggen et al., 2018). Especially students with different knowledge backgrounds, be them disciplinary or more culturally, develop innovative business ideas together if they can break through possible barriers of diversity and difference.

Values, worldviews, orientations and intentions in education

Other important themes that come up in the papers are entrepreneurial intention, self-efficacy and sustainability orientation (or values), and how they relate to each other.

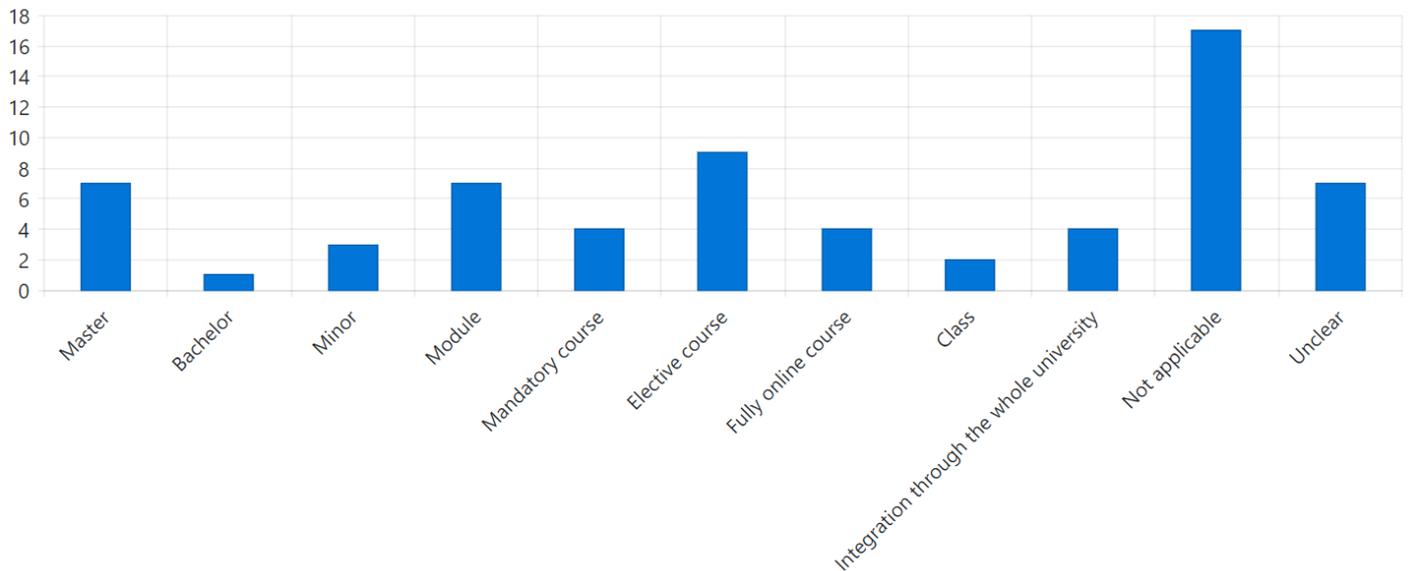
For entrepreneurial intention the main question in the literature concerns its drivers (self-efficacy e.g.) and how it can be measured. Interestingly there is not much literature on sustainability intention. There is only one study (Vuorio) in our review that studies sustainability oriented entrepreneurial intention. The role of self-efficacy for SE's is not clear. In some studies (Ploum et al., 2019; Baggen et al., 2018) self-efficacy has no relation with OR. This might be because self-efficacy plays a (more) important part later on in the entrepreneurial process, rather than at the start, where OR is located.

Biberhofer et al. (2019) depart in their study from the AMO framework, which states that work performance depends on three interacting dimensions: (1) ability, which is defined in terms of competencies, (2) motivation, meaning values and worldviews and (3) opportunity. The more these elements are present, the more sustainability driven entrepreneurs can be successful. These 3 points are interrelated, meaning that if you have ability and motivation but no context for opportunity for action, you can't become effective.

However, teachers are hardly in the place to tell students which values to believe in. At the most they can teach students to talk and think about values. To question them and develop them. This brings to the fore three other competences seen as crucial for SE's, namely creativity, critical thinking and (critical) reflection. Halberstadt & Timm, et al. (2019) view creativity as a sub-competence of interpersonal competence, but most articles mention creativity as an important skill for SE in every aspect, unrelated to a specific competence. The same goes for critical thinking, which can be viewed as a basic competence that is a "prerequisite to foster competencies in sustainability" (Biberhofer et al., 2017). Lastly, (critical) reflection is an important ability for SE's and can be seen as a competence as well as a tool to be used to further SE competence development.

Teaching approaches

Regarding the teaching approaches used in SEE two things come to attention. Firstly, most programs are for graduate students that already have a certain disciplinary background, e.g. in business or engineering. Secondly, most of SEE takes the form of a course or module, rather than a full-fledged program of a year or longer. Thirdly, most SEE are elective rather than mandatory, aiming to attract student that already have an interest in sustainability issues. Lastly, a considerable amount of articles that describe courses are not clear about the form of their program.



Teaching student or teacher

Most articles in the review were about how to teach SE to students. A few (also) concerned the need to teach the teacher. These articles mainly concerned the barriers and opportunities that arise when teachers work in an inter- and transdisciplinary fashion. This includes working with colleagues from a different educational background, from a different cultural background, or working with third parties that come from the world of business, rather than having an (academic) teaching background. Biberhofer et al. (2017) describes how teachers and the third parties they worked with in the Sustainability Challenge (the businesses that provided the challenges) evaluate the course in a multistakeholder workshop. This evaluation connects the previous year with the next year, as it also involves the planning and preparation for the next year. This workshop hence allows for teacher and partaking external partners to learn from last year, while establish a good understanding for next year. Hermann, Bossle & Amaral (2020) also emphasize the importance of collaboration between teachers and local stakeholders “to identify problems with the right characteristics” for their students to solve (p.7). Aside from teachers co-learning and teaching with external stakeholders, SE is also a field that invites teacher-team teaching. SE requires teaching competencies in sustainability and entrepreneurship (Halberstadt & Schank et al., 2019). Co-teaching has also been recognized by the European Project Semester (EPS) as an important teaching approach (Silva et al., 2018). This programme has an “unique supervision model where a panel of multidisciplinary experts, consisting of teachers from various study fields, acts as a consulting committee”, which meets weekly with the teams (p.111).

Experiential or active learning

A key theme in SEE literature is the move from traditional teacher-centred teaching to a more learner-centred teaching approach. Learner-centred learning in the view of Biberhofer et al. (2017) is a form of experience-based learning, in the sense that the “experience of the learner occupies central place in all considerations of teaching and learning” (p.11).

Active and/or experiential learning is a core characteristic of SEE, with the most popular forms being challenge or problem-based learning often set-up as a project or competition. Specifically, Calvo et al. (2020), Castro (2020) and Hermann, Bossle & Amaral (2020) among others, follow an experiential learning pedagogy centred around students aiming to solve ‘real-life’ or ‘real-world’ entrepreneurial problems and situations. Such a solution-oriented teaching approach usually has a collaborative character, while often also being competitive, with teams of students striving to have the best business model or prototype.

This is a list of concrete examples of challenges / PBL approaches that authors reported on:

- Hackathon (Burden & Sprei, 2020)
- Sustainability challenge: solving a real-world problem (Biberhofer et al., 2017)
- Pitch competition (Calvo et al., 2020)
- Solving a real-world problem collaboratively with peers and teachers (Castro, 2020; Karlusch, Sachsenhofer & Reinsberger, 2018)
- Sustainability Challenge: developing a sustainable innovation plan that addresses a sustainable development challenge (Daub et al., 2020)
- Every semester a new challenge is introduced / innovation project / business plan (Grega & Pikon 2018 – describing 7 Master programmes)
- Problem based learning PBL (Hermann, Bossle & Amaral, 2020) broad problem positioning, after which students scope the problem themselves.
- Launch and manage a socially responsible business in an online competitive simulation game (Parris & McInnis-Bower, 2017)
- Designing a sustainable business model and launching a sustainable product – some of which entered the market successfully (Serhan & Yannou-Lebris, 2020).
- Business model presentation competition (Voldsund, Hasleberg & Bragelien, 2020)

Service learning and transformative learning

Other authors talk about ‘learning by doing’ and offer more general interpretations of this approach such as participating in entrepreneurship programmes or taking placement opportunities (Manning et al., 2020). The latter often takes the form of service-learning, which Halberstadt & Schank et al. (2019) define as encompassing “volunteer and community service projects, field studies and internship programs” (p.2) It contrasts with the more traditional form of an internship as students, rather than working for a business or organization, “try to find solutions cooperating with partners such as communities, NGOs and companies.” (Biberhofer et al., 2017; p.11). The word “service” learning might therefore not do the approach complete justice, as students are not simply in service, but rather engage in reciprocal relationships with their partners to generate social/sustainable value (Metha et al., 2016). Service-learning is a great way to improve commitment to society and therefore also a way to engage in transformative learning (Martinez-Campillo et al., 2019). SL is the main teaching approach in 6 articles in the review, of which 3 articles mention transformative

learning. “Transformative learning is characterized by a quality shift in perception and meaning-making, which brings the learner to the crucial point of questioning and reframing his/her world views, assumptions and habits.” (Biberhofer et al., 2017) SL allows for transformative learning because it helps students form and apply values. It makes them aware of societal problems and sparks critical reflection and opinion-formation about the state of the world, and how it should be (Halberstadt & Schank et al., 2019). Transformative learning is not solely enabled by SL. It can also take place in the classroom, for example through discussion that enables critical (self-) reflection.

SL is closely linked to place-based learning, as students are placed in the community with their partners “who are living with disabilities, economic hardship, discrimination, or other disadvantages” (Zhu, Rooney & Philips, 2016; p.14). SL concerns learning through community work and communities with their respective challenges are always unique and context bound. However, the place-based aspect of service-learning is not mentioned by any articles, except for the conceptual paper by Obrecht (2016).

Collaborative, inter- and transdisciplinary learning

In most cases problem- or challenge-based learning is combined with inter- and trans-disciplinary learning. Interdisciplinary learning means students from different backgrounds work together, while transdisciplinary learning refers to students working with people from outside the university, such as businesses and other communities of society, as partners/stakeholders.

In all SE study programmes described in the review, students work collaboratively. For a majority of the programmes the collaborating students come from different educational backgrounds, making the study interdisciplinary. Often the students also come from different cultural backgrounds, such as in the summer school collaboration between Norwegian and Brazilian students described by Hermann, Bossle & Amaral (2020). Here intercultural and interdisciplinary teams worked on a solution to a sustainability problem. In the EPS (European Project Semester) programme for engineering students described by Silva et al. (2018) groups (of 3-6 students) have to be multinational, with a minimum of three nationalities that must be represented when working on their sustainability-driven project. Lastly, in the KIC InnoEnergy master programmes international mobility is an inherent part of study. Students are expected to spend their first year in one university, their second in another and have the possibility of an internship at a third place. (Grega & Pikon, 2018). The set-up of the programme is not only international, involving at least two European technical universities, but also multidisciplinary as a business school is involved, and transdisciplinary through the involvement of energy-related corporations (Grega & Pikon, 2018).

The examples above demonstrate how multiculturalism, interdisciplinarity and trans disciplinarity in practice overlap. Most teamwork in SEE is transdisciplinary, meaning that the teams work with external partners/stakeholders. Since inter- and transdisciplinary learning is in practice often combined in SEE, we cover these forms of learning as one.

A good example of how both service-learning and challenge-based learning combine with inter- and transdisciplinary learning is the "Sustainability Challenge" (Biberhofer et al., 2017). In this programme students can choose either a service-learning or entrepreneurship (business start-up) track for the duration of 1 semester. The course is centred around transdisciplinary learning and teaching (TDLT), which is exemplified by the start of the course through a kick-

off event where students, practitioners and teachers meet. The students then work in interdisciplinary teams of 4-5 for a SL project or a start-up project.

Such a meet-up event of students, teachers and partners aligns with Hermann, Bossle & Amaral (2020) method of starting the course with a café dialogue setting in which students can form groups based on common interests. However, with a café dialogue set-up you risk the chance that students that already know each other (from their previous study for example) flock together. So, another option would be for the teacher to create multidisciplinary groups themselves, as did Martinez-Campillo et al. (2019), setting up teams of 5 with each student coming from a different discipline.

Biberhofer et al. (2017) mention that an interdisciplinary student group composition is a great advantage to the (team) work and the project partners, as outputs are more creative. This is confirmed by Karlusch, Sachsenhofer & Reinsberger (2018) study of “The Garage” 15-week course in Vienna, which describes how artists were added to interdisciplinary teams of business and engineering students that had to come up with a start-up idea. “To reduce the likelihood of technological functional fixedness, engineers were not given decision-making roles within the startup teams.” (p.4). Karlusch, Sachsenhofer & Reinsberger (2018) found that this set-up “allowed all students to use imaginative, creative thought, unencumbered by immediate criticism, to develop new business models” for cleantech challenges (p.9). Interdisciplinary and intercultural teams, however, also have more barriers to work through. One way to pre-emptively tackle possible friction that might come into existence is by letting the groups define their own set of conflict resolution rules in the form of a Team Work Agreement (Silva et al., 2018).

Often the external partners provide the challenges for the student teams (e.g. Grega & Pikon, 2018; Hermann, Bossle & Amaral, 2020) or act as business partners and helplines to the students in a business model competition or hackathon (Brekken et al., 2018; Serhan et al., 2020) An interesting example to describe the coming together of the above described approaches is the ADE (affordable design and entrepreneurship) programme described by Noyes & Linder (2015). In this programme students aim to create social ventures in coordination with stakeholders. The programme has an international transdisciplinary aspect, as the stakeholders are from a non-western context such as Ghana and the students work in interdisciplinary teams, being either from an engineering or entrepreneurship background. Students look at “opportunity briefs” depicting social challenges to decide on what they're going work with local partners. Moreover, they decide which opportunities to pursue in the ADE product-venture incubation “pipeline”, meaning they decide what venture ideas to prioritize and what not to follow up on. In such programmes students do not only learn how to interact with external stakeholders, but also how to bridge cultural differences.

Online learning

Collaborative learning is also an especially important component in online learning in the form of social learning. Online approaches specifically facilitate social interactions and hence learning from one and another (Karlusch, Sachsenhofer & Reinsberger, 2018; Kim et al., 2020; Solórzano-García & Navío-Marco, 2019). This is especially mentioned for MOOC programmes, a format represented three times in the review (Beltrán et al., 2020; Calvo et al., 2020; Solórzano-García & Navío-Marco, 2019). Moreover, online learning, and wider online elements (such as ‘Web 2.0’, ‘e-learning’, and ‘blended learning’) emerged through the

coding as having facilitative functions for sustainable entrepreneurship education delivery, as well as enabling CBL and PBL teaching approaches. For example, Castro (2020), Garcia-Morales et al. (2020) and Hermann, Bossle & Amaral (2020) all highlighted how the integration of online approaches to courses could help to enhance existing activities, by enabling group work and collaboration with external partners (Castro, 2020; Herman & Bossle, 2020) This was often in the form of blended learning, with both online and in-person approach (Hermann & Bossle, 2020). Furthermore, online elements made it easier to bring different stakeholders who may not be able to travel and be physically present within a classroom, to engage and interact with students. Especially in low resource environments such as BOP settings online learning can prove a way to deliver qualitative SE education. However, the use of these tools is noted to require training and preparation (Garcia-Morales et al., 2020). Most programmes use eLearning platforms to some extent, usually to allow faculty communication coordination of assignments (Parris & McInnis-Bowers, 2017). The KSEMP programme described by Kim et al. (2020) goes further in their use of the online platform 'KAIST Impact Hub', which students use to easily get in touch with their mentors, faculty and staff members and share documents, especially regarding their business model development. These findings show the many opportunities that lay within the use of online and e-learning tools that are often not yet exploited to its fullest potential.

About time

Inter- and (or) transdisciplinary teaching approaches are time intensive and as limitation of the programmes described time constraint is among the most mentioned. It takes more time for the students to break through barriers that might exist in their team when their colleagues are from different educational and/or cultural backgrounds (Karlusch, Sachsenhofer & Reinsberger, 2018). Especially when combined with a challenge-based approach, where students work on ill-defined, real-life problems to create a solution (Burden & Sprei, 2020). It is important for students when creating a (business) solution, that this process is seen through to the end, perhaps even validated with potential users (Castro, 2020) Students need enough time to go through the process of trying out, failing, and reflecting on their actions. This should be considered when designing a course (Biberhofer et al., 2017)

Active learning activities need more time, and the university can also prove a barrier (or enabler) in this regard. Brekken et al. (2018) mentions that the teachers "often lack mechanisms to allow for extra time or infrastructure for active learning course designs (i.e., recognition in faculty course load, assignment of teaching assistants, use of innovative classroom environments, compensation for guest speakers, recognition in evaluation processes." (p.14)

Teaching approaches in short:

Active/experiential/real world learning

- Challenge/problem/project/competition/
- Collaborative/interdisciplinary/transdisciplinary
- Service-learning (> mentioned in 6 articles) /internship/transformational learning (> mentioned in 3 articles: the same as SL)

Other approaches and tools:

- Guest lecture

- Field trip
- Students give a presentation
- Workshop/conference/café dialogue
- Discussion
- Coaching (teacher as coach)
- Blended learning/online learning/ web 2.0
- Game-based learning (can also link to challenge based learning and online-learning)
- Simulations/roleplay
- Case studies
- Business model canvas
- SDG's

Tools

A range of tools used in sustainable entrepreneurship education emerged in the coding. These ranged from more tradition case study based approaches (c.f. Brekken et al., 2018), through to more novel sustainable business modelling tools (c.f. Castro, 2020).

The use of both inductive and deductive case studies emerge as teaching tools (Brekken et al., 2018; Faludi & Gilbert, 2019; Grega & Pikon, 2018; Parris & McInnis-Bowers, 2017).

Deductive case approaches often involved the studying of multiple cases, identification of specific issues and their relation to broader impacts and ultimately systematic implications; as such, clear links with systemic competences are observable (Brekken, 2018). Inductive approaches focused to a greater extent on allowing students to develop their own narratives and analysis around a specific case.

(Sustainable) business modelling approaches were identified as being used extensively, especially within CBL and PBL approaches (Castro, 2020; Daub et al., 2020; Faludi & Gilbert, 2019; Foucrier & Wiek, 2019; Hermann, Bossle & Amaral, 2020; Karlusch, Sachsenhofer & Reinsberger, 2018; Martínez-Campillo et al., 2019; Serhan et al., 2020; Wagner et al., 2019). These frameworks were often used in relation to start-up or innovation type assignments, where students were required to develop their own, or adjust an existing, business model (Daub et al., 2020). The more mainstream Business Model Canvas and more sustainability orientated versions, for instance, which integrate triple bottom line thinking, are also used (Karlusch, Sachsenhofer & Reinsberger, 2018).

The SDGs were also identified as a type of tool, used by teaching either as a point of departure for PBL or CBL, or in terms of a reference point when engaging with a specific case or challenge (Castro, 2020; Demssie et al., 2019; Ostergaard, 2020; Rashid, 2019; Silva et al., 2018; Voldsund, 2020). The use of SDGs was to enhance motivation and grounding for challenges (Voldsund, 2020). In the Eco-Trophelia programme for example, students had to address a SDG for their eco-designed business model (Serhan et al., 2020) Lastly, the EntreComp model is a description of a set skills, attitudes and competences seen as needed to be successful in entrepreneurship, introduced by the EU in 2016. Within the articles reviewed, the model was predominantly used as a backing framework, enabling analysis and assessment of student assignments (Chander et al., 2020; Burden & Sprei, 2020).

University ecosystem

There are 6 articles that specifically cover the university ecosystem, which are the following:

Fichter & Tiemann (2018)

Kim et al. (2020)

Tiemann, Fichter & Geier (2018)

Torres et al. (2019)

Wagner et al. (2019)

Wakkee et al. (2019)

Going outside the university

A key aspect of active/experiential teaching methods is transdisciplinary learning; the engagement with community outside the university. Community can denote many different types of stakeholders; it can refer to specific (local) communities, but also to businesses or industries, public institutions, associations or NGO's (Hermann & Bossle, 2020). For real-world teaching partnerships with communities play a key role, for example with industry (Jennings et al., 2015), regional centres of expertise (Biberhofer et al., 2017) or with investors (Kim et al., 2020). These partners can also be active within the university for e.g. special lectures, monitoring and student evaluation (Kim et al., 2020). For a transdisciplinary programme to be successful it is important to select reliable, transparent and communicative partners (Halberstadt & Schank et al., 2019). By incorporating these different stakeholders in SEE as partners, a study programme can achieve co-creation of innovative solutions to sustainability problems. Previously unrelated needs or knowledge are then combined to create successful and sustainable student-led start-ups (Serhan et al., 2020).

Often teachers of SE programmes create these partnerships themselves, but the university can play a key role in establishing and fostering these connections. When universities become a support system for (sustainable) entrepreneurship, they often denote themselves as an "entrepreneurial university". This means that the university plays an active role in supporting entrepreneurial activities, departing from its original function as a knowledge production site, through links research and development (R&D) centres, businesses and government agencies at the local, regional and national level (Kim et al., 2020; Tiemann, Fichter & Geier, 2018). Fichter & Tiemann (2018) view the university as a key support system for entrepreneurship in four ways: (1) education, (2) research, (3) transfer, and (4) supporting new firm creation.

This is closely related to the concept of a "sustainable university", which aims to support societal change through the interlinked dimensions of university, research, teaching and management or outreach (Biberhofer et al., 2017). Universities can be important drivers for sustainability, even in BOP contexts such as India as Wakkee et al. (2019) show. In their longitudinal study they demonstrate how the relocation of a business campus to a region with many polluting firms that created an unhealthy environment was the direct cause for the university to embark on a quest to engage with and help the local community, industry and students. They transformed themselves into a sustainable entrepreneurial university through

the development of a course on sustainable business strategies, the establishment of an incubator and a centre for strategy, sustainability and society.

Inside the university: Barriers and support for SEE

There are many types of barriers that might exist for or within an university that can hinder SEE and the creation of a well-functioning ecosystem that supports SEE. Firstly, SE support is an ill-defined term that can mean many things in practice (Tiemann, Fichter & Geier, 2018). Overall support is either implemented through an additive approach where entrepreneurial orientation and sustainability are two separate objectives, and an integrative approach teaching activities on SE for example are integrated (Tiemann, Fichter & Geier, 2018). For (transdisciplinary) SEE to be the most successful its implementation should be mainstreamed through institutionalization in the university, rather than approached as an ‘add-on’ (Biberhofer et al., 2017).

However, the institutional framework in universities often poses a barrier to (integrative) implementation of SEE (support systems), for example by lacking resources, international cooperation or entrepreneurial intention (Fichter & Tiemann, 2018). Interestingly then, most support for SE(E) also comes through the institutional framework, encompassing the establishment of a clear vision or mission, sustainability departments, entrepreneurship centres, professorships, as well as strong leadership and good governance (Tiemann, Fichter & Geier, 2018). The latter is also confirmed to be an important factor in creating SE(E) support systems in BOP settings, as strong leadership was the biggest factor in the transformation of the university in India described above to become the driver of sustainable entrepreneurship in the region (Wakkee et al., 2019).

After the institutional framework, ‘transfer’, meaning the inside-out activities of the university, is the most important way to provide support. Inside-out activities refer to cooperation with industry or other external networks such as stakeholders from community, external scientific partners or regional governing bodies. Here it is important that universities are aware of their specific regional context, so support forms fit their ecosystem (Wagner et al., 2019; Klapper & Farber, 2016). Lastly, education is a way to provide support, by creating (extra-) curricular courses and specific programmes for SE, and research as well (Tiemann, Fichter & Geier 2018)

The most important factor in breaking through these barriers and providing adequate support is having key persons in place in education, research, transfer and management that promote sustainable entrepreneurship (Fichter & Tiemann, 2018). For education especially it is important that teachers are motivated and committed to sustainable entrepreneurship (Grega & Pikon, 2018; Halberstadt & Schank et al., 2019). Faludi & Gilbert (2019) mention accolades, like a prestigious award, to motivate teachers and researchers, and overcome institutional barriers. Moreover, teachers should have the capacity to teach SE, demonstrating the to train the trainer and build up knowledge (Hermann & Bossle, 2020; Faludi & Gilbert, 2019). Lastly, policy mandates or funding of research or implementation projects by the government can overcome administrative hoops and promote SE(E) (Faludi & Gilbert, 2019; Fichter & Tiemann, 2018).

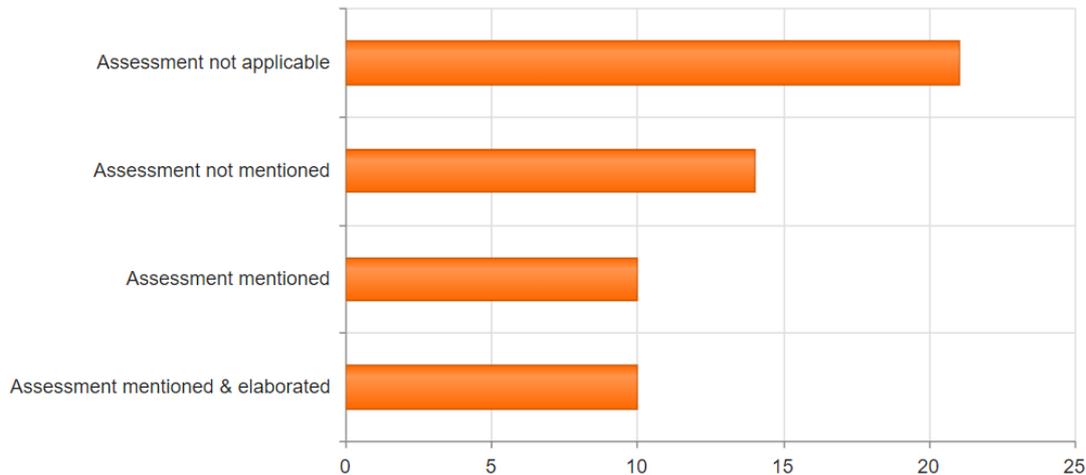
The university as living lab

Sustainable entrepreneurship education is more than a study programme as it engages with the outside world. It interacts with different communities that form its ecosystem, which creates an opportunity for the university to situate itself at the centre of these interactions. The university can go beyond its role as an education platform and become an innovation hub that fosters sustainable entrepreneurs by providing real-life environments and multi-actor engagement tools that provide possible (business) solutions to sustainability problems (Manning et al., 2020; Kim et al., 2020). The university then becomes a 'living lab', which often also includes having (a partnership with) or being an incubator that supports students with patent applications, the transfer of spin-offs into new companies, research-industry collaborations and entrepreneurial training e.g. on management practices (Daub et al., 2020; Noyes & Linder, 2015). Such 'living lab' activities can be integrated with online platforms, as exemplified by the Sustainable Innovation Plan described by Daub et al. (2020). The SIP allows students to measure their ecological and social impact and map the at times "complex financial relationships between the project, the service recipients and the service providers." (Daub et al. 2020; p.104)

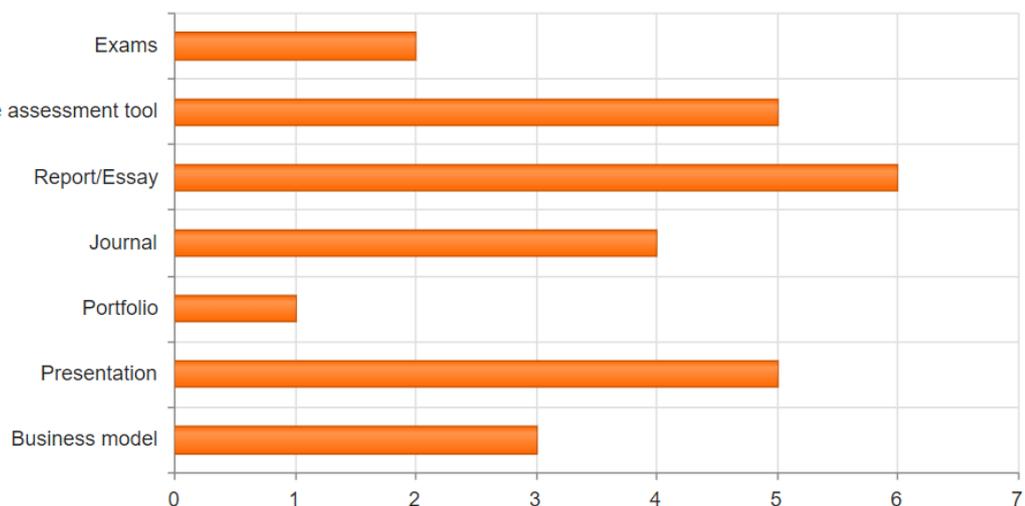
The transformation of an university into the axis of a SE ecosystem can also be a teaching approach which might further entrepreneurial intention. Torres et al. (2019) turned their university into a platform for students, teachers and external partners and stakeholders in a simulation dubbed the "relational university" for undergraduate students of a tourism programme in Spain. They found that after the event the entrepreneurial intention of students had increased, from 40% of the students showing interest in starting a venture to 66%. It can be concluded that the core of a SE university is connectivity, internally and externally, so it can serve as an innovation hub through its generation and transfer of knowledge (Kim, et al., 2020) Moreover, a sustainable entrepreneurial university as the centre of a web of relations with partners in its ecosystem is essential for fostering experiential learning (Torres et al., 2019). Lastly, the literature demonstrates that a top-down approach, resulting from the initiative of a few key individuals, is thus far the most important factor in creating a sustainable and entrepreneurial university, as very few examples of collective efforts exist (Wakkee et al., 2019)

Assessment

The assessment of students is a topic that is covered poorly in the literature on SEE. In most articles it is either not mentioned or mentioned in two, maybe three sentences. Only ten articles are a bit more elaborative, ranging from allocating a paragraph to the topic to a clear overview of assessment criteria (Castro, 2020; Silva et al., 2018).



Due to the experiential/active teaching approaches used in SEE, assessment often takes the form of project or reflection reports (Biberhofer et al., 2017; Brekken et al., 2018; Burden & Sprei, 2020; Silva et al., 2018), journals/diaries and portfolio's, (Jennings et al., 2015; Parris & McInnis-Bowers, 2017; Silvia et al., 2018) or presentations (Castro, 2020; Herman, Bossle, Amaral, 2020; Parris & McInnis-Bowers, 2017), rather than more conventional approaches such as exams (Parris & McInnis-Bowers, 2017; Burden & Sprei, 2020). Conventional assessment tools usually try to measure knowledge, while in SEE the aim is more to generate particular competences, skills and attitudes. This incompatibility of conventional forms of assessment with experiential teaching approaches such as service learning, create a need for flexibility in the curricular formats to allow more suitable assessment methods such as business models/plans, presentations, journals/diaries and reflections (Halberstadt & Schank et al., 2019). Reflection holds a central place in SEE assessment, brought about through a combination of peer and tutor feedback, and individual self-assessment (e.g. Herman, Bossle & Amaral, 2020; Brekken et al., 2018; Burden & Sprei, 2020).



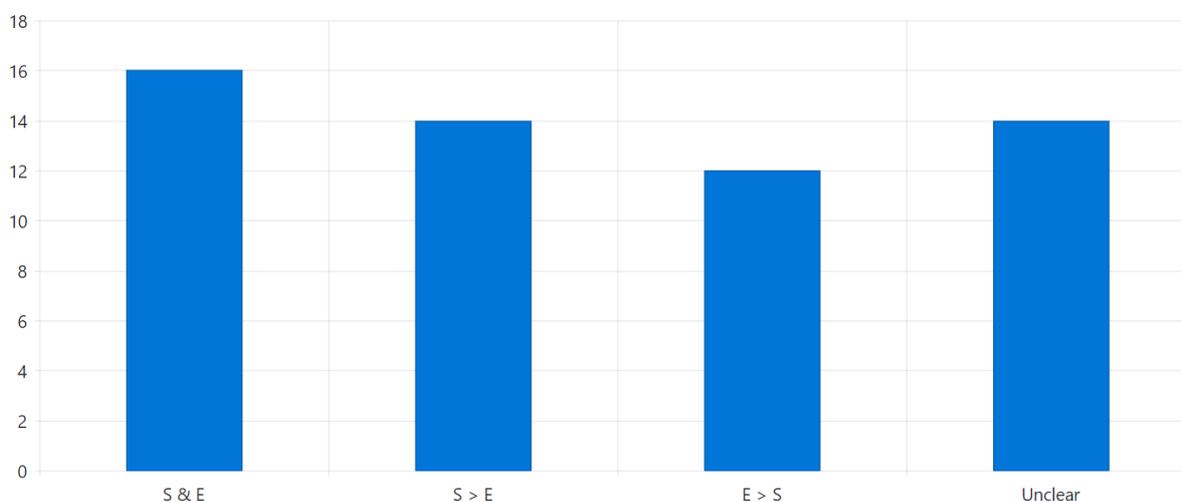
The focus on fostering competences and attitudes rather than knowledge shows in the learning objectives/outcomes described in the literature, such as gaining a critical understanding of SE or sustainable development (Biberhofer et al., 2017; Burden & Sprei, 2020) or communication and group work skills, (Biberhofer et al., 2017; Metha et al., 2016). There are in total 7 articles that mention LO's (Grega & Pikon, 2018; Herman, Bossle & Amaral, 2020; Karlusch, Sachsenhofer & Reinsberger, 2018; Parris & McInnis-Bowers, 2017).

Knowledge attainment of course remains an important learning outcome in SEE, making that most SE programmes structure their learning objectives around three key themes: The cognitive dimension, meaning knowledge acquisition, the affective dimension, referring to more emotional or attitudinal abilities and the skill-based dimension, which is the successful application of cognitive and affective dimensions in a real-life project (Karlusch, Sachsenhofer & Reinsberger, 2018; Burden & Sprei, 2020; Herman, Bossle & Amaral, 2020). Some programmes refer to general established frameworks like the taxonomy of Bloom (e.g. Burden & Sprei, 2020) or more specific entrepreneurial taxonomies, such as the one created by Alain Gibb's (Klapper & Farber, 2016)

Two articles in the review aimed to create a performance assessment test capable of measuring opportunity recognition that does not rely on self-assessment tests (Baggen et al., 2018; Ploum et al., 2019). Baggen et al. (2018) developed the opportunity identification competence assessment test (OICAT), which entailed letting students read a case and come up with as many sustainable start-up ideas as possible in ten minutes. It was tried on two distinct samples, the first being 115 Dutch master's students that had followed entrepreneurship courses with a sustainability component and the second 142 first-year Portuguese bachelor's students that had not followed entrepreneurship courses. The ideas were assessed according to fluency; how comprehensible the idea was, elaboration; how detailed or concrete an idea was, and flexibility; how many categories (based on the SDG's) are covered by an idea. Ploum et al. (2019) did a similar study, aiming to measure the effect of moral competence on opportunity recognition for sustainable development through an idea generation test: the students (96) received a case study of a company for which they had to come up with new (business) ideas. One article concerns the creation of a creative decoding tool to be used as a competence assessment framework for designer students (Ostergaard, 2020).

Preliminary discussion

As far as we know there is only one other systematic literature review on sustainable entrepreneurship education by Sharma, Goyal & Singh (2020).⁷ However, they depart from a different definition of sustainable entrepreneurship, issue a different methodology and hence have different findings than our review. An example is their decision to exclude what we call ‘the pathway of integration’ of entrepreneurship being incorporated into sustainability education. They did so because according to most literature about SEE sustainability is added to entrepreneurship programmes and not vice versa. We indeed also found that most articles integrate sustainability into an entrepreneurship programme, but surprisingly enough almost just as many articles add an entrepreneurial lens to programs concerning sustainability education. This finding might come to the fore in our review because it is a recent development, and our review aims to cover the most recent literature in the field of SEE. Wyness & Jones’ (published in 2019, study conducted at least 18 months earlier) study revealed that a large majority of sustainability educators do not view entrepreneurship as valuable for sustainability education. This might be a remnant from earlier times, where business was seen as the exact capitalistic enemy sustainability education tries to battle. However, with the rise of sustainable entrepreneurship as an educational field this view might be changing, making the integration of entrepreneurship into sustainability education more common.



General observations on interviews

For the review 8 interviews with SE experts have been conducted. The results of these interviews have not yet been analyzed, but it is possible to make some general observations. It is notable how the main focus of SEE for the interviewees is not venture creation perse, but the creation of a mindset. It is about the ability to work together with people from different

⁷ Sharma, S., Goyal, D.P. and Singh, A. (2021), "Systematic review on sustainable entrepreneurship education (SEE): a framework and analysis", *World Journal of Entrepreneurship, Management and Sustainable Development*, Vol. 17 No. 3, pp. 372-395. <https://doi-org.proxy-ub.rug.nl/10.1108/WJEMSD-05-2020-0040>

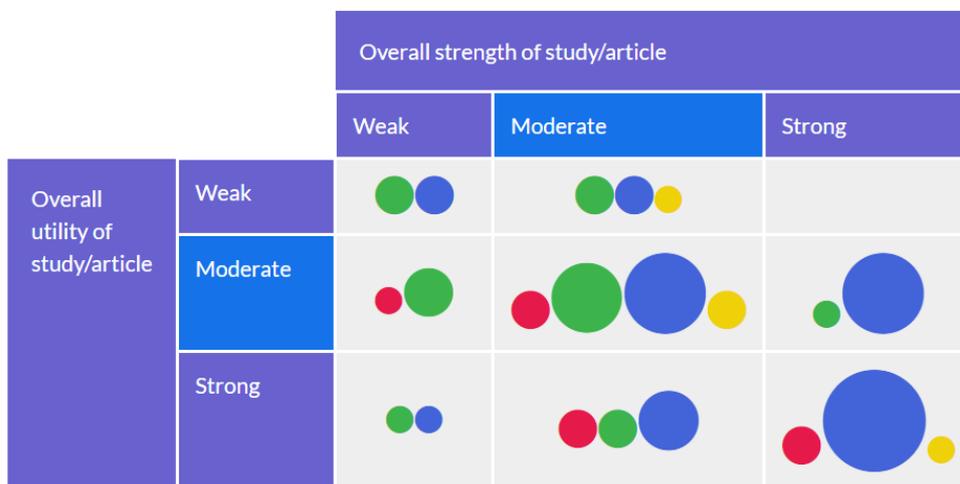
background, be that disciplinary or culturally, and the ability to critically reflect on yourself and the world. To question assumptions, to know yourself in order to make a change and to have an open, global mindset.

Previous knowledge is an important factor, which also shows from the set-up of the programs, where people from different backgrounds come together and are often already further in their studies (e.g. graduates).

All interviewees use project work in their teaching, as it develops all competences and they all view critical reflection as an important part of their courses, especially for assessment.

Quality of the literature

From the 169 articles that were selected for reading on full text only 54 remain. This is in part due to the lack of quality of the articles. In many articles the methods of study were opaque, there were no clear conclusions derived from the results or there was no discernible line of argumentation. Even in the final review there are still articles with questionable studies, as shows in the graph below.



Legend

● (red) Conceptual ● (green) Conceptual + empirical backing ● (blue) Conceptual + empirical study ● (yellow) Empirical study

To conclude this report, this review's value lies in its ability to connect the hitherto mostly unconnected themes in the field of SEE, namely values/intention, competences, teaching approaches, the university ecosystem and assessment. Specifically the review enables the connection of sustainable entrepreneurship competences with teaching approaches (which to our knowledge only two articles have done before) and link teaching approaches to the university ecosystem (which is a novel approach as far as we know). Furthermore, this review tries to tackle the lack of coverage on assessment by actively coding on this theme. Through active focus on assessment the review might make it possible to connect specific forms of assessment to teaching approaches.

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