



Review

Embracing higher education leadership in sustainability: A systematic review



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ABSTRACT

Education has long been praised for its economic benefits, which stem from the developed technical skills and improved health conditions it promotes. Nonetheless, improving the quality of education, including sustainability, has become a policy focus since the Tbilisi Declaration and, more recently, in the Sustainable Development Goals.

How to increase the contribution of higher education to sustainability is the subject of a robust debate, not only in terms of graduates' competencies but also in its linkages to society at large. The objective of the paper is to identify the main concerns and proposed strategies in recent literature on this topic to elucidate how to overcome the gap between the actions and desires of international institutions and stakeholders.

A systematic review of the literature in the last five years supported with the PRISMA workflow and a check of natural processing language was undertaken. Five main topics were identified, including economic effects from higher education, social impacts, pedagogical-related issues, higher education institutions' environmental behaviour, and their structural challenges when implementing sustainability.

The analysis indicated that institutions have focused on environmental measures but have paid scant attention to society, their communities, collaboration with other institutions, changes in the training of managers and lecturers and the proper assessment of internal structures that drive the commitment of institutions and education to embrace sustainability. Drawing from the literature, a set of five strategies is recommended to lessen the reported problems and further embrace sustainability in higher education. Hence, innovation in management, planning, openness, training of stakeholders in sustainability, negotiation, and building multipartner networks seem to be the key drivers for adopting sustainability.

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1. Introduction

Education has become increasingly relevant to the general population since the 19th century. One of the factors for this situation is the economic benefits born from two main circumstances: first, labour adopting technical skills taught in the schooling system, and second, the overall improvement of health conditions (Freeman, 2002). Furthermore, with higher education levels, the gap between developed countries that first adopted training skills and other nations has climbed in recent decades.

In 1948, education, ranging from elementary to higher education (HE), was recognized by the United Nations General Assembly as a basic human right (United Nations General Assembly, 1948). The United Nations Assembly assigned the mandate of fostering education to The United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1945. Since then, UNESCO has launched guidelines to deliver education worldwide and improve the quality of education over time. The organization has promoted initiatives aimed at supporting equity, bolstering the development and evolution of the educational process from early stages up to late ages, combating diseases, and more recently, UNESCO has embraced sustainable development as part of its guidelines since the 1970s decade (UNESCO Education Sector, 2017).

UNESCO classifies education in eight different stages (ISCED classification), where basic education only responds to the age of entrance. Only then are students able to attend higher levels, supported with the skills learned in the preceding stages. Attendance or passing applicable exams of previous levels is a prerequisite for higher ISCED education (UNESCO Institute for Statistics, 2012).

ISCED levels 5 to 8 are those for tertiary education, and the term higher education (HE) is used interchangeably among academia, researchers and institutions. HE builds on the secondary level, which runs up to level 4. HE is intended to provide attendees with specific skills that enable them to solve complex situations that demand specialization in their field of expertise. This level is appreciated by the depth of concepts rather than the variety of topics.

Level 5, although considered HE, is mainly vocational education, while level 6 is composed of studies where the focus is placed on the deepening of concepts. Meanwhile, ISCED level 7 stands for Master degrees and 8 for the Doctorate level. Graduates of 6 through 8 levels obtain a research mindset that qualifies them to dig into complex concepts. Therefore, they are able to understand complicated phenomena, propose solutions or integrate different techniques to boost productivity, achieve unattained results, or improve society as a whole.

The benefits of attending HE are seen in terms of an earnings premium over the rest of the population; higher probabilities of getting a job, closing the gender gap, organized migration, and such yields are even more visible in future generations (OECD, 2018). Moreover, World Bank (2015) said that the desired outcomes from education for any institution involved in the process, broadly speaking, are three. First, to enhance student successes within the economy; second, to engage with society by building the actual desire of attending education; and finally, to guarantee child/student participation in the long run, which means that future

generations become more likely to attend due to the achievements of past and actual generations. The virtuous cycle keeps delivering graduates with incremental social compromise. Then, HE plays a crucial role in renovating society for all stakeholders, and the benefits for the community widely surpass the economic yields that receive graduates and their families.

In this regard, McMahon (2018) found that HE is particularly beneficial for the environment, as graduates and students are less likely to be water and air pollutants than those who have not attended HE. The author also perceived higher participation in democracy, respect for civil rights, political stability, and lower crime rates, which is reinforced by the literature. Hence, the benefits are tangible for economic, social, and environmental topics.

Nevertheless, several voices are warning of the irrelevance of HE, both in developing and developed countries. To name some of those trends, Zhang et al. (2013) expressed concern that expenditure in research universities in China, one of the largest emerging research countries in this century, is not making their researchers get in contact and be included in research groups in Western countries, rendering most of that work wasted. Digging deeper, Wang (2019) found that universities with extensive funding in China are not more productive in terms of research, patents, and transfer of knowledge than those without large incentives. Marginson (2018) described that in the United Kingdom, public sponsorship goes to elite universities with top rankings that are leading in the research arena, leaving others in a difficult situation to catch up. However, regarding student satisfaction, Nurunnabi and Abdelhadi (2019) found no difference between elite universities and non-elite universities, although the former employ the best faculty staff.

In the United States, Murray (2018) depicted the change in students' demography of HE as new applications have consistently fallen in recent years. More than one-third of students are now over 30 years old and demand a set of skills focused on practical things applicable to their actual jobs rather than theorizing. Ruppel Shell (2018) thinks that background is a significant influencer in the attendance of HE and that minorities still lag behind. The wage gap associated with bachelor's degrees over high school diplomas has vanished over the years. The rising costs of HE play a key role in detriment of the willingness to attend HE. In Germany, there is a considerable debate on the extent of HE. Teichler (2018) explained that the funding scheme has lift attendance numbers in the country, the national policy yet covers HE, and its quality is steady. As a result, Germany has become a leader in research, and its universities and programmes are among the top in the world (National Science Board National Science Foundation, 2019; UNESCO Institute of Statistics, 2020). However, this success has raised local eyebrows, who say that the country does not need that number of researchers, and having too many of them leaves the country vulnerable to the need for workers for more technical jobs (Teichler, 2018).

For decades, the World Bank has been fostering extensive access to basic and higher levels of education, especially in underdeveloped and emerging countries. However, it perceives that education has not reached the desired spillover effect, which induces new generations to attend higher levels and that graduates do not acquire a large set of qualifications and competencies that boost

entire societies out of poverty or improve them in the long run (World Bank, 2011).

Therefore, the quality of education has turned out to be crucial, since the Tbilisi Declaration, education was asked to improve its quality. For the agreement on the Millennium Development Goals (MDGs), education played a vital role in transforming society in the three mentioned pillars. By 2015, the General Assembly adopted the 2030 Agenda for Sustainable Development that relies on the Sustainable Development Goals (SDGs) to reach its purpose. In the text of the SDGs, education is allocated in the fourth goal, ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all (United Nations General Assembly, 2015).

Consequently, researchers from different scientific fields have been working in reinvigorating education, some of them pay their attention to HE, and in particular, to make HE sustainable across the board. One of the main fruits is the competencies that ultimately change society and make individuals more engaged with their environment. Since the beginning of the century, a debate has taken the stage on which competencies could foster sustainability in daily lives.

Wiek et al. (2011) summarized critical competencies in sustainability, which include systems-thinking, anticipatory, normative, strategic skills and interpersonal competence. Over the years, authors have agreed on other competencies such as values thinking (highly related to society), futures thinking, and implementation. All of them convert into an interpersonal skill that is shown with interpersonal relations and solving problems, which ultimately affect academic behaviour, and all are related to every field of science (Brundiers et al., 2020).

Other authors have called for interdisciplinary work coupled with the promotion of self-learning under an environment where these two factors are the framework, not just an activity of the students, to support skills such as communication and dissemination of information (Mansilla, 2006; Pinto et al., 2019). Researchers are concerned about how educators and teachers should structure their programmes for building bridges between aspects, construct a more robust framework, and encourage students, which becomes the next pedagogical step about sustainability.

Assessment of competencies to check that they and learning outcomes are aligned is widely diverse, making it hard to have a unique discourse and adjust as much as possible to implement them (Cebrián et al., 2019). Furthermore, Lozano (2006a) tried to develop a tool to make easier the assessment of commitment of HEIs when implementing sustainability and the communication of their achievements to encourage stakeholders. However, the lack of a universal framework played against the purpose of a unique and shared background.

Another approach tries to conduct research on sustainability and apply theoretical frameworks to educational processes, where the problem is dismissing the economic, social, and environmental activities within the institution (Karatzoglou, 2013). Therefore, Barth and Rieckmann (2012) and Lozano et al. (2013b) coincide that the university system should be changed to ensure sustainability in HE and HEIs rather than observing single topics measured first.

The present research could significantly contribute to the understanding of HE and HEI failures or achievements in three topics: (1) the embrace of sustainability within the institutions themselves, (2) how pedagogy is used to induce competencies related to sustainability, and (3) the perception that society has of HE and HEIs. As explained above, the three are significant concerns. To do this, a systematic review of the literature is performed to obtain a solid overview of HE achievements in this topic using the PRISMA method (Moher et al., 2009) and natural language processing technology to avoid biases.

Then, this research focuses on (1) the actual state in implementing sustainability in HE: Has HE yet embraced sustainability in its daily delivery process? This step should consider that sustainability encompasses the economic, social, and environmental pillars altogether. (2) Is there a prevalent trend for obstacles or potential improvements among updated literature? This means that consistency could highlight achievements or prevalent issues to be further analysed. In doing so, this manuscript aims to contribute to the Lozano et al. (2013a) editorial, whose objective was to raise awareness among decision-makers, academics, and researchers about the failing HE process and the problematic system.

The rest of this document is organized in four more sections. The first describes the methodology used in this systematic review, including the workflow adopted. The second section details the results of the review. The third discusses the actual state of HE regarding sustainability, where authors venture to propose a set of five strategies after the analysis. In addition, the final section summarizes the findings.

2. Methods

This manuscript proposes a systematic review of the literature whose workflow is replicable at any time. Kitchenham (2004) suggested the sequencing of the steps to make them traceable and susceptible to being performed again. Fig. 1 shows this sequence from the very early stage of designing the research. Additionally, central in this systematization is following an internationally accepted method of analysis. The PRISMA guidelines proposed by Moher et al. (2009) were chosen, where selected keywords, databases, and inclusion criteria narrowed the publication spectrum by reading both the abstract and the full text of the manuscript to obtain a set of included studies.

In this research, the analysis is restricted to articles within the lifespan of a manuscript in social sciences, which is commonly accepted to be five years (Davis, 2013). As this review was performed in 2019, one of the inclusion criteria is that material should not be published before 2015. Additionally, as the focus is to understand precisely where HE stands as a game changer, vocational education was excluded due to the background explained in Section 1. The database used is ScienceDirect for convenience reasons and its wide range of social sciences publications, in addition to including journals from across the world, which ultimately adds a non-discriminatory fact in our work.

Immediately after selected papers were gathered, data were also extracted from publications in the form of engineered topics that stem from reading the full-body text. To do this, the classification into engineered topics can be achieved under the comments of Cronin et al. (2008), where three steps were determined: (1) Literature was enlisted chronologically, (2) Themes were derived from both the title of the paper and the careful reading of the full-text body, with the objective of finding the narrative from the writers that make sense in terms of sustainability; here, special effort is put forward as researchers express in complex ways, and (3) This information was contrasted with author keywords to see how they voiced sustainability in their research.

To ensure the quality of this last stage, which is subject to biases from the researcher (Møller and Jennions, 2001), natural language processing technology, a branch of artificial intelligence, was used to meet the key phrases in the writing of the author(s) of each included paper and compare them to the overall classification of every manuscript to signal whether the publication should be reread when there is little concordance. This assessment was performed in the abstract of the publication for two reasons: (1) analysing full-text paper significantly increases the use of the

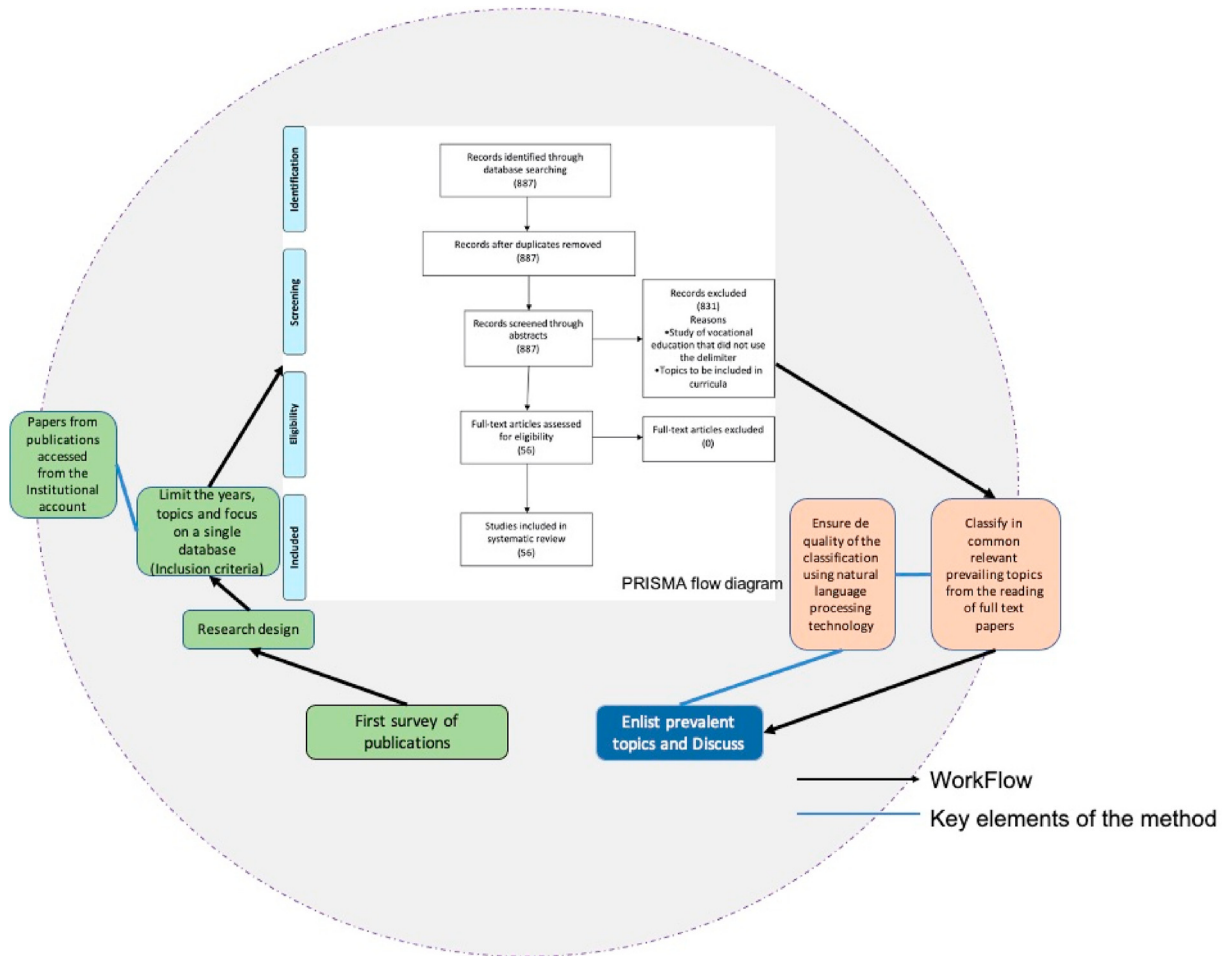


Fig. 1. Workflow chart of the systematic review with the PRISMA method.

software and associated expenses, and (2) not assessing the logic and the writing of the authors, wanting to check the correct understanding of each paper to reduce any bias in the analysis. For this purpose, the popular service AWS Comprehend, which is applied to marketing and customer satisfaction analysis, was preferred. Specifically, the built-in model was selected for the real-time analysis tool for the purpose of ensuring quality. The use of a predetermined template for syntax and semantic levels, whose focus is commercial assessment, adds to impartiality and replicability.

The mapping of the relevance gives an additional idea of the quality of the publications included. According to McKercher (2012), influence is a vital indicator of the actual relevance of research articles. Influence metrics are better captured with citations and sharing of research. Cites are particularly low in the newest publications as a result of citation bias because researchers tend to cite papers whose results prove the initial hypothesis adding to their own (Duyx et al., 2017) or have had a positive acceptance, inherently subject to time. Nonetheless, captures cover a broader picture of the impact of each work. A key component of captures is social media, as it is the most recent way to measure the influence and impact of publications and is used in advertising, marketing, and political environments. The overall role of this form of influence in society was explained by De Filippo and Serrano-López (2018), where researchers promote their own work through several forms of interaction with the general public in addition to citations.

Sustainability and higher education are the essential terms of

the research, but using more words concentrates our energies on the pillars of sustainability. Table 1 shows the terms used in the search, as explained at the start of this section. To focus on each pillar, the use of economy, environment and social terms is adequate for the review. Shall remember that these words are general terms, and the engine includes adjectives and adverbs of them, as well as close synonyms that are searched by default. With this double-check procedure, it is possible to better understand the included publications in the review. Section 3 shows the results of the search step by step, as well as the content analysis and setting the stage for a discussion, which can be read in Section 4.

3. Results

The flow explained with the PRISMA guidelines yielded 887 papers during the search of headline terms combined with the selected author-specified keywords. Fig. 1 merges the method and the search results using the standard template from Moher et al. (2009). A total of 583 of the papers, approximately 66%, responded to the designed environmental dimension terms, 88 or 10% to the economic pillar, and 216 (24%) to the social extent. Table 2 shows the consistent rise in sustainability-related publications year-over-year during the studied timespan, pointing to an explosion during 2018 and 2019. Regarding the author(s) keywords, Table 2 highlights the sudden fall in publications for the economic pillar during 2016 and the apparent low interest in publishing topics other than the environmental. Mendeley software

Table 1
Terms systematically used in the search engine.

Headline search	"higher education" AND "sustainability" – "vocational"
Author-specified keywords	"economy" AND "sustainable" "environment" AND "sustainable" "social" AND "sustainable"

Table 2
Number of manuscripts for each pillar of sustainability and their year of publication.

	Pillar of sustainability			TOTAL
	Economy	Social	Environment	
Year of publication				
2019	19	63	155	237
2018	24	67	140	231
2017	22	40	101	153
2016	9	32	95	136
2015	14	24	92	130
TOTAL	88	216	583	887

automatically removed duplicated records, leaving 708 to manually screen through abstracts.

As previously explained, papers focused on either vocational education or changes in curricula were discarded. Despite using a delimiter in the search machine to exclude documents with "vocational", the search returned publications whose focus is on vocational education (ISCED level 5) because some of these articles do not explicitly use this term, but others such as "technical" or "professional" formation. Similarly, a large number of papers refer to the interest of including particular sustainability topics in the curricula, a reason for the observed boom in the works, including environmentally related keywords. For both reasons, the screening of abstracts resulted in the dismissal of 652 papers, leaving 56 papers associated with the objectives and whose content is analysed in the following section.

The next stage was the full-text reading of the remaining 56 articles to determine if they could add to this work's purpose. No paper was excluded after the reading, as they all seemed relevant to the overall study and met the inclusion criteria. As described in Section 2, measuring the impact of the publications showed that the oldest works receive more attention, and although 2015 and 2016 have few manuscripts, the trend of publications is still rising. On the other hand, citations and social media have become essential factors for making research public, but the trend is lower, as depicted in Fig. 2. Supplementary Data disaggregates this information.

Following the method workflow depicted in Fig. 1, the reading of full-text bodies of selected papers aims to classify each article into prevalent topics. This qualitative analysis is explained by Cronin et al. (2008) as a meta-synthesis, where reducing findings and synthesizing key elements leads to finding new concepts and interpretations. An accepted methodological method in pedagogical guidelines is clarified by Rose et al. (2002), using their template to find the what, how and why concepts within the literature, so ideas and interpretations can be summarized, and new concepts emerge.

As described in Section 1, competencies have become a complicated matter because to some degree, they are influenced by both the outcome of HE and the pedagogical design needed to foster them. Subsequently, they were derived to either social reports or pedagogical reports according to the meta-synthesis method. Therefore, five prevalent issues with broader implications were classified:

- Economic or business-focused issues where HE has direct inherence,
- Socially relevant drawbacks or accomplishments around HE or HEIs,
- Pedagogical-related papers,
- HEIs', with either internal or external insight, environmental behaviour,
- HEIs' structural challenges when implementing sustainability.

Before analysing and discussing them, the correct deep understanding of each publication was checked with the analysis of the abstract, as said, through natural language processing technology. A summary is provided in Supplementary Data, showing the results of the engineered topics, the results of the evaluation using machine learning technology, and the keywords used, organized by year of publication. In some cases, publications clearly express the adoption of sustainability, and the topic was straight. Nevertheless, in others, the complexity of either expressions or the subjects themselves required some reflection on where the paper should be included to narrow this review's results. All papers fulfilled the match of machine learning results with the manually engineered topic, occasionally giving room for discussion.

Looking at the evolution in time of those topics in selected papers, Table 3 shows the last step's results, the content analysis. The included articles describe mostly pedagogical and structural issues within HEIs when implementing or teaching sustainability. In the first scan of publications, few reports were about the structures of HEIs, focusing instead on the curricula and the assessment of sustainability. This work found a continuous trend of analysis and then highlighted problems on this front. Social engagement of HEIs and HE itself was found to be a topic where stakeholders should make special efforts. At first sight, this finding confirms the one explained in Section 1, where HEIs are in danger of losing their relevance concerning society. Environmental and economic reports are the least recurrent topics related to sustainability. Nevertheless, they gained importance during 2019, in contrast to the other topics, which had a steady trend over the years of inclusion in this review. Finally, the analysis and discussion gave room to propose a set of five strategies aiming to contribute to actions towards embracing sustainability in HE.

4. Discussion

This review structured the results presented in Section 3 according to the driving topic of each selected paper, and five themes were found to be central in their work. In this section, their contributions are addressed and discussed.

4.1. Economic or business-focused issues where HE has a direct impact

Education has successfully lifted millions out of poverty, raised the standard of living, made the population live longer, in better conditions, and became much more aware of the environmental impacts from each individual. Furthermore, new evidence has shown that higher levels of income, which are powerfully

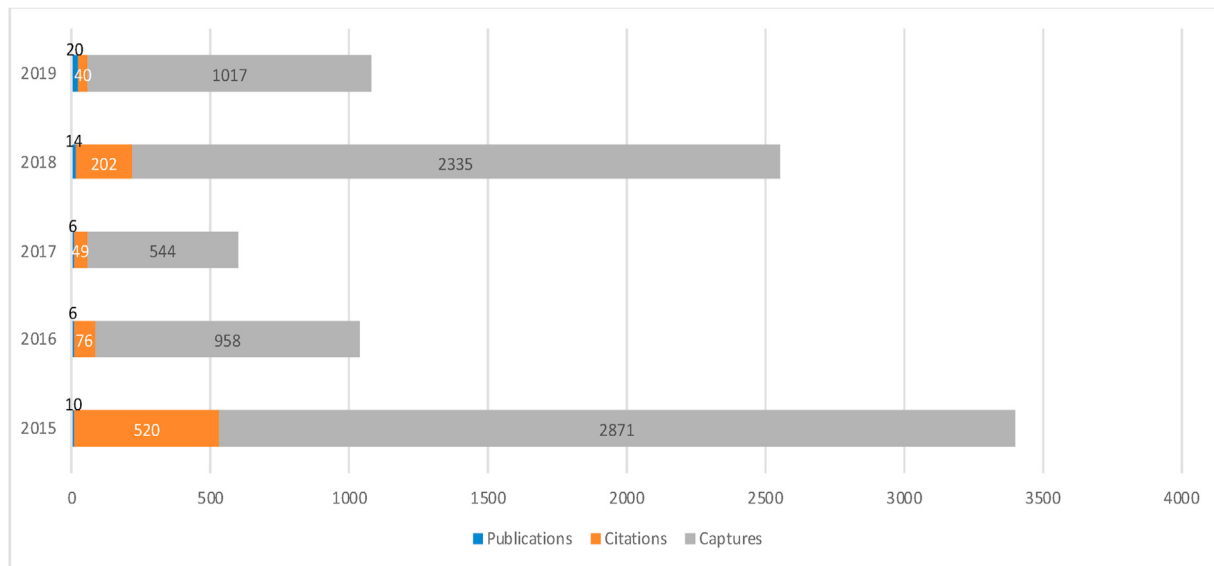


Fig. 2. Number of articles reviewed with their impact measured in citations and captures.

Table 3

Distribution and classification of the selected articles by year of publication and their topic.

Engineered topic	Year of publication					Total
	2015	2016	2017	2018	2019	
Economic	0	0	1	0	5	6
Social issues	2	2	1	3	3	11
Pedagogical issues	4	2	1	5	3	15
Environmental issues of HEIs or HE	1	1	1	2	4	9
Structural issues of HEIs	3	1	2	4	5	15
Total	10	6	6	14	20	56

associated with upper levels of education and bolster consumption, ultimately affect the environment and the targets embodied in SDGs (Hubacek et al., 2017; McMahon, 2018). The connection between the economic and environmental pillars of sustainability is also asserted in the literature, showing a shift in consumption patterns when crises strike. This ends up affecting the higher levels of income, who in return lower their levels of both consumption and impact on the environment, making a more levelled society in terms of environmental effects (López et al., 2016). Hence, policies aimed at fostering economic growth should be coupled with encouraging a different lifestyle, measured with planetary health and social wellbeing (Haberl et al., 2020; Wiedmann et al., 2020).

Even though this is seen as the way forward for HE, the national context has much to do with this adoption. The stagnation in productivity, several local problems, and the specialization of an elite do not support sustainability, something that Stephenson and Zanotti (2019) described. Graduates with world-class qualifications barely escape the economic framework that each nation shapes. A developing country is unlikely to provide opportunities for highly trained individuals, pushing them to face the dilemma of living overqualified in the country's poverty or using their specialization in other nations' benefits.

This is the first setback for HE and HEIs alike, as institutions offer education and solely exist for students and their achievements, and as the World Bank (2015) clarifies, such successes attract the attention and the desire of actual and upcoming generations. If the general population does not perceive achievements, the efforts made by institutions and governments across the globe diminish, adding to inequality and contravening the adopted SDGs. Thus, it is

relevant to think about sustainability as a national priority, where HE can make a difference. Nevertheless, tools are needed to function and extend the economic gains.

4.2. Socially relevant drawbacks or accomplishments around HE or HEIs

Focusing now on the reports regarding the social pillar, HEIs have worked on delivering proficient professionals in their field of expertise. Nevertheless, syllabi barely have a long-term vision where students can question and build networks of both knowledge and persons, which ultimately is a way to gently transform societies, as Benito Olalla and Merino (2019) pointed out. When education pays more attention to technical aspects, not giving room to deep understanding or to the development of competencies that connect the learned concepts with reality, education is unlinked and even forgotten. Interdisciplinary collaborations reinforce this idea and, ultimately, end up engaging individuals, summoning skills and boosting emotional management for the global group sentiment built into a shared feeling aimed at pursuing success (Boix Mansilla et al., 2016).

Going forward, the interaction of HEIs and their communities yields a unique opportunity to engage students and bolster communication with external stakeholders. This should be tied with the knowledge transfer strategy that many HEIs currently use in several countries, making attendees aware of the needs of society and the industrial sector alike (Fleacă et al., 2016; Korobar and Siljanoska, 2016).

This type of contextualization, in addition to boosting the also-

known soft skills, works in the third described category of competencies. Individuals are able to change habits, behaviours and beliefs, thus coming out the expected sustainable change agents, who have the capacity to form and lead plans that respect rights and needs (Demssie et al., 2019). Self-awareness and self-confidence are byproducts that students and stakeholders use to open their minds and reinforce the willingness to override barriers or misconceptions to act within society as better individuals, ultimately upholding society that gives a sense of security (Pappas et al., 2015).

In contrast, the lack of guidance in the management of emotions among HE students is particularly worrying. Personal and professional choices equally affect graduates, stakeholders, and society. The mismanagement of emotions makes individuals opt for circumstances where they feel comfortable, thus risking ethics and long-term benefits, as Viswanath et al. (2018) showed. In their study, HE failed to foster soft skills, inclusion, and ethics.

Under this concept, social relationships should be open at all times and levels to override nonsocial outcomes that may surge. One way was exposed by Kuppens et al. (2018), as graduates tend to bias their relations towards other graduates or people who look such as graduated, which is a form of exclusion under international standards and completely dismisses social competencies. In this case, openness is not materialized, and this type of exclusion adds to the failure in the social pillar of sustainability of HE, who should have promoted social cohesion. Consequently, inclusive competencies and the bolster of social interactions within groups might even disrupt rigid structures in institutions.

Some of these failures of HE and HEIs could have a common root cause, in which the structure and management of HEIs are crucial. Dlouhá et al. (2018) believed that HEIs are subject to political headwinds when they find that networks of HEIs infuse their desired directives into HEIs' mandates. In this line of thought, the management of HEIs prioritizes becoming relevant actors at the national level by drafting regulations and laws, making cases for justice and social bodies, or directly influencing politics. This situation barely adds to that of coming closer to society or the private sector.

In contrast, HEIs that take advantage of their social environment's needs have an even more decisive influence and are favourably perceived. Hassan and Lee (2015) stated that HEIs in Asian countries, particularly China, are making phenomenal progress in sustainability integration, as they are part of urban planning in their locations, implementing sustainable mobility plans. HE has seen an incremental role in planning and participation in recent years on the topic. The aid of students, who are seen as future agents of change (Biberhofer and Rammel, 2017), can also become a factor in making cities sustainable.

In this sense, Marsal-Llacuna and Segal (2016, 2017) exercised the free bidirectional flow of information. This flow incorporates all participants' levels in the design and implementation of smart cities, including graduates and HEIs, as they hold essential research on the topic. The flow converges qualitative and quantitative data that influence activities on either side of the project. This design enhances the influence of any HEI because it introduces a useful tool in economic activity. Although a longitudinal multicity study is needed, this same type of flow is a vivid debate in political design in some parts of the world.

Similarly, coparticipation of civil society in venture investment is critical to sustaining research and outcomes from universities. In this idea, Fuster et al. (2019) portrayed Spanish HEIs based in a region characterized by patents and research. Institutions transfer the results of their research activity by licensing and venture capital investments with society, and then innovation is adopted for the overall benefit of the region.

In short, the different reports and theories refer to the management of emotions steamed from students and personnel with exposure to direct concepts in the field, reinforcement with bidirectional flows of information and contextualization as much as possible. This should focus on society and the improving interaction of stakeholders, which ultimately has a root in the pedagogy nested in institutions and content.

4.3. Pedagogical-related papers

Innovation not only goes outside HEIs but also exists within institutions to overcome structural and pedagogical barriers that deter the successful implementation of sustainability in each HEI. Pilot projects are the first step when implementing what seems to be innovative. Robina-Ramírez and Medina-Merodio (2019) and Collins et al. (2018) showed that the direct exposure of students to sustainable content (e.g., footprint calculators), which is later taken to communities where they can learn or deploy their learnings, can make these students reduce their own footprints. This makes education further mark a change in the behaviour of attendees.

Working *in situ* greatly improves the learning process and boosts competencies alike. Anand et al. (2015) reported significant satisfaction among all stakeholders when educators are taken to the vineyard in advance of students because they are able to wire whatever is relevant on-site of the subject teachers are explaining.

Unfortunately, research on HE in the context of sustainability has found that the focus is on curriculum, teaching, and learning approaches, biased towards Western researchers with descriptive studies that do not truly assess students' competencies (Barth and Rieckmann, 2016). Consequently, too much effort goes into continuing the traditional way of teaching that now delivers sustainability as another topic within syllabi, but this is not efficient, and HEIs fail to give proper training in the subject.

Hence, in the most recent years, the vivid debate tries to acknowledge a proper pedagogical approach to deliver education and boost competencies regarding sustainability, but even the term competence is not well understood for different abilities of learners and their willingness to use them, which indicates that there is not one single best pedagogical method (Shephard et al., 2019).

Trying to improve this situation, changing the pedagogical model and adapting it to the host society seems to give one option to engage students and communities. This provides room for alternative methods that prime students for questioning, becoming critical, socializing, participating, and being transparent (Biberhofer and Rammel, 2017; Hensley, 2018). Reinforcing this idea, recent surveys found that approaches such as problem-based approaches, community services, ecological justice, and linkages to the community yield the best practices for pedagogy in the wake of sustainability (Lozano et al., 2019). The issue is the resistance of educators and institutions, as they are not entirely confident of this new approach, which leads us to think about a structural challenge within HEIs and the subsequent regenerative paradigm (Sonetti et al., 2019).

4.4. HEIs' structural challenges when implementing sustainability

Unfortunately, integrative experiences of HEIs and their communities are not a common factor. Many HEIs dismiss the opportunity to innovate and change inside and outside their walls. The internal structures of HEIs are a significant obstacle to implementing sustainable practices. Employees tend to prioritize their comfort zone, which is directly associated with their disinformation. Thus, it is quite challenging to deliver sustainability concepts and practice to students and external stakeholders, as Sammalisto et al. (2015), Leal Filho et al. (2016) and Aleixo et al. (2018) all

concur. Moreover, among HEIs, there is no universal conception of what sustainability means in all pillars. (Leal Filho et al., 2019) validated the notion of HEIs' disinterest in connecting with society, as HEIs do not encourage engagement with the community, and highlighted the lack of coordination of HEIs or adopting a unique idea of what socially sustainable activities would be.

In the other pillars, Hess and Collins (2018) underpin this idea by explaining the gap that universities have created independently. Research universities have a better understanding of what sustainability is in environmental and economic topics, but this information is not shared with those who focus on art subjects. Within institutions, employees are inadequately prepared to deal with the challenge. Illiteracy in environmental themes is rampant among HEIs. Bekaroo et al. (2019) demonstrate this by employees' ignorance of their own footprint. Then, management might or may not be aware of the needs, but the road is difficult even with knowledge.

The realization of employment and a stable future relies on a good understanding between HEIs and the industry about the latter's actual needs regarding qualifications and competencies. The private sector demands from HEIs and world leaders that graduates shall hold entrepreneurial and social competencies combined with the expected technical expertise (Paletta et al., 2019). These authors state that these competencies were once fostered by universities when they were open arenas to respectfully debate, but currently HEIs have refrained from encouraging such interactions for the fear that the discussion becomes offensive or hurts high sensitivities.

4.5. Strategies pursuing the adoption of sustainability

In the pursuit of solving these issues, several researchers have voiced strategies that could add to changing the present analysis's concerns. The reviewed literature supports elaborating a subset of strategies that can be grouped into five different categories. Each of them could become a line of research and consequent implementation in the sight of integrating sustainability. Additionally, potential synergies between SDGs and the proposed strategies are pointed out.

One of them could be the **integral transformation of the identity of each institution**. To date, institutions have worked on redesigning their courses but lack a deeper integration of sustainability in their practices, teaching, and stakeholders' relations. Almost no institution has worked in a system to assess sustainability integration to either their practices or to redesign courses according to their communities' reality, thinking that they have already achieved it (Figueiró and Raufflet, 2015). Assessing any of the chosen approaches risks a shock in the institution's identity because many managers usually turn a blind eye to uncomfortable facts. Promoting the change of identity first could automatically demand assessment, and the integration of sustainability might be assured.

If the institution is not able or does not want to perform the assessment, external bodies are a reliable option and can be an eye-opener, as teachers and researchers frequently tend to think that their courses integrate and contextualize sustainability more than what an impartial body could say (Stough et al., 2018). HEIs use external bodies to assure that their operations meet emissions and environmental standards and to certificate programmes, research, and the overall employability of graduates. Such certifications do not further assess graduates' success or consider the opinion of the private sector or society.

Under this strategy, HEIs should be entirely objective, maintaining soberness and independence from national trends and objectives. Politics play a crucial role in both the solution and the problem, as institutions tend to influence the opinion for several

reasons that range from budget to permits and eases from regulations. Friman et al. (2018) confirm that national objectives have a meaningful role in the extent of HEIs' intentions related to sustainability.

Within these ideas, some countries and HEIs have adopted benchmarks and trends designed on other continents but have not adapted them to their actual circumstances. Hence, HEIs embark on those benchmarks to find them impossible to implement due to either the inappropriate use of targets or the waste of resources following endless rules that in some cases could even contradict one another, as Ragazzi and Ghidini (2017) and Martins et al. (2019) uncovered. Sustainable competencies are also encouraged by institutions, but they are seemingly not promoted "in stone"; reflections and assessment should be crucial in the pursuit that graduates and nongraduates can improve sustainability (Wiek et al., 2011).

To link this strategy to the SDGs, each institution can design its own action plan according to local circumstances but consider that such changes should benefit the institution's image. This should add to making stakeholders perceive it better, ending in upholding education, inducing the self-perception of sustainable practices, and encouraging them to embrace responsible patterns regarding the environment, consumption, and society, all of which add to SDG4, SDG8, and SDG10.

A second strategy might come from the **openness within structure and management** combined with the free dissemination of information about the relevant sustainable practices adopted in each HEI. Employees' resistance to change is hardened by ignorance or deliberate disregard from managers of HEIs. The change of some key personnel and the openness to the flow of information in either direction can help (Leon et al., 2018; Mendoza et al., 2019; Ramísio et al., 2019). proposed a mixture of top-bottom and bottom-top approaches, where managers instruct employees on sustainability while listening to their resistances and opinions, twisting the strategy as much as needed to faster implement sustainable practices in HEIs.

Similarly, Draheim et al. (2019) suggested that disseminating information about relevant sustainable practices among stakeholders reduces issues, disagreements and the will to disregard information and implementation rules. Filho et al. (2019) added that the more embedded sustainable practices are in mandates, actions towards community and internal stakeholders tend to be more responsible and sustainable, pushing for the institution to become a leader.

To further entrench sustainability, the establishment of sub-strategies aimed at reinforcing adoption is vital. Such a subset could include direct rewards, recognition, funding of projects, or any other subset that management could consider to modify solid structures that do not allow institutions to embrace sustainability. Zen et al. (2016) and Wang et al. (2019) both related cases where rewarding stakeholders fosters and broadens adoption. Clearly, this strategy has to overcome the inherent obstruction to change that lies in missing relevant information, resources, and sub-strategies. The resistance can be so hard that stakeholders explicitly take action to block all efforts on the topic. Shawe et al. (2019) and Freidenfelds et al. (2018) elaborated and proposed the careful use of the strategy rather than its withdrawal.

The suggested strategy is compelling because it contributes to SDG4, SDG13, and SDG15. With the appropriate openness of the structure of HEIs, adopting sustainable policies by institutions towards the environment is more effortless. Moreover, the dissemination of information and achievements has the potential to yield SDG5, gender equality, because visibility of results induces thinking about the groups involved, where participation is crucial, as reported in the literature.

Another strategy could be the **explicit formation and training of educators, employees, and managers** of each HEI. [Sinakou et al. \(2018\)](#) highlighted teachers' remarkable commitment to the topic of sustainability, although many of the actual educators lack sustainable skills due to their limited experience, reinforced by older generations with no training at all.

Furthermore, HEIs employ doctoral candidates unexperienced in pedagogical matters, coupled with the fact that their tutors belong to generations that did not focus on sustainability holistically speaking. In the best-case scenario, teachings embrace only one dimension, as the leading researcher has gained qualifications in one area over the years. Nevertheless, educators as bodies usually do not give full experience to students. Accordingly, [Cicmil et al. \(2017\)](#) proposed that HEIs should pedagogically innovate, fostering creativity inside the institution and outside as well.

Continuous negotiation is a must in this context, building bridges between universities, students in the classroom, internal stakeholders, and society. In this way, HEIs link to stakeholders under a model of cooperation from all sides. Negotiation diminishes the tensions arising among stakeholders who do not share values, education, and commitment to sustainability and those who have usually followed a hierarchical rule of using checklists for meeting targets. [Hoover and Harder \(2015\)](#) and [Dlouhá et al. \(2017\)](#) contributed by indicating that a political change within organizations supports individual opinions and dismantle contradictions in values. Hence, negotiation further backs the inclusion of all areas of HEIs in the pursuit of sustainability.

In the case of the other stakeholders, formation and training aimed at employees and managers provide the benefits of unique language, criteria, and approach to sustainability. Additionally, what happens to be a widespread problem is the lack of unified information among these stakeholders and the consequent inaccurate description of sustainable practices according to [Alonso-Almeida et al. \(2015\)](#) and [Olawumi and Chan \(2018\)](#). Alternatively, the preponderance of only one pillar is the cases reported by [Monforte García et al. \(2017\)](#) and [Li et al. \(2018\)](#). Clearly, negotiation with education and formation is central in the implementation of the plan. Under this vision, the strategy encompasses various goals, especially toughening SDG4 with its own indicators, SDG8, and SDG12. According to much literature in this line, training about current trends in sustainability encourages sustainable consumption, raises equality, and promotes inclusive growth that ultimately fights poverty.

A fourth strategy might come from **putting the community in the centre of sustainable practices**, as it has proven excellent and speedy results across the world. This would be in line with the vision of [Sonetti et al. \(2019\)](#), which implies a shift in the sustainability concept from not only natural resources and energy but also more focused on human-centric attributes. That is, thinking primarily in the community, designing courses and ways of connecting to yield the benefits and hedging risks since earlier stages require such commitment.

[Whitbread \(2015\)](#) described a teaching platform using new technologies to guide sustainable actions, which proved useful in students. Additionally, [Alahmari et al. \(2019\)](#) used augmented reality technologies to teach students sustainable solutions to catastrophic problems that were not easily replicable, with promising results, and suggested further engagement with the community for professional performance.

[Azeiteiro et al. \(2015\)](#) described an HEI where e-learning has become the cornerstone to attract students who engage in higher levels and spread sustainable content to their communities. Much what the World Bank has stated is the success of education. For their part, [Symaco and Tee \(2019\)](#) and [Khalili et al. \(2015\)](#)

encourage institutions to redesign courses and programmes to embed sustainability, considering the benefit of disadvantaged and local community businesses. In other words, boosting the local community instead of focusing on large companies is a way to explain sustainability.

Having this strategy as an umbrella requires an understanding of the context where each institution is located. Sometimes successful cases of inculcation of sustainability concepts among graduated populations fail to immediately permeate the general public and benefit the community at large due to generational mismatches. The private sector may relent the adoption of sustainability, as its own staff is made up of generations sceptical of change towards sustainability or lack the time necessary for graduates to overtake prominent political positions ([Chang and Cheng, 2019](#); [Sanz et al., 2017](#)).

Under this argument, [Shields \(2019\)](#) stressed the achievement among overseas HE students of explaining and encouraging the adoption of personal sustainable practices, despite the steady rise in emissions related to these students' mobility. There is compelling evidence that their individual behaviour has remarkably changed since being exposed to concepts and to an education centred on sustainability during their day-to-day. Long-term expectations take an essential place in the drawing of this strategy.

This strategy is especially beneficial to SDG16, SDG8, SDG9, and SDG11, as inclusiveness is the plan's epicentre; thus, innovation is fostered by contact with the community. Consequently, safety, justice, and a better society could emerge.

A fifth strategy might come from the **collaboration of several HEIs** based either in different municipalities or, better, in different countries. Students end up developing interpersonal and intercultural relations as well as compromising with both their local and abroad communities. This is the case for cross-border educational ties that are facilitated with courses specifically designed to engage students from different backgrounds, as explained by [McPherson et al. \(2016\)](#).

At the national level, the building of networks emphasizing the delivery of basic concepts related to sustainability, the engrossment of such networks, and the exchange of members of the networks promote a policy framework that permanently includes sustainability in daily practice for the nation. Additionally, collaborations that gather partners from different continents have intercultural ingredients. Each member contributes with its experience and vision, providing a more comprehensive picture of sustainability in the student and the institution.

[Brooks \(2018\)](#) explained this regionality, as sustainability is taught in different ways on each side of the Atlantic, which means that some students embrace it much faster than others. Thus, building a bridge through collaboration makes all participants grow at the same speed. This ultimately makes HEIs the place where sustainability is implemented in education and further promoted with practice ([Sonetti et al., 2019](#)).

In this sense, innovation is the natural outcome within HEIs, as knowledge is transferred from one another institution and vice versa. Hence, education, as a complete concept, gains, society gains with the other strategies and inclusion is naturally achieved because everyone shall collaborate. SDG4, SDG8, SDG9, and SDG10 are the logical goals strengthened.

This set of proposed strategies differs from the comprehensive toolbox that [Lozano \(2006b\)](#) suggested, as it now encompasses recent publications that highlight 1) the relevant role that HEIs have in national and political topics, 2) the significant differences about the knowledge that different institutions have and in some cases do not share about sustainability even within the internal stakeholders, 3) the emphasis that environmental actions are put by some institutions, and 4) the need to re-engage with local

communities to regain relevance.

5. Limitations

Systematic reviews show characteristics that can improve the quality and robustness of traditional literature reviews, such as inclusion, increasing breadth, non-discrimination, unbiased analysis and consistent checks, but hold challenges and concerns, as pointed out Mallett et al. (2012). In particular, this study has limits on the available information, which also comes from researchers, policy assessments, reports and recommendations. Relatedly, only article journals in English were selected, and books, chapters and conference proceedings were excluded, as well as institutional websites. Another factor to consider is the fact that the proposed strategies shall be discussed and proven before they are accepted by policymakers and academia. Furthermore, open questions remain as systematic reviews are said to miss context and process, and in multidisciplinary fields, such as sustainability in HE, the evidence assessment, especially that of qualitative nature, can be harder than in more quantitative areas (Mallett et al., 2012). Further research is needed regarding this as well as the potential to adapt the methodology, balancing compliance of the main principles of the method (rigour, transparency and replicability) and flexibility.

6. Conclusions

A systematic review was performed to identify advances in the implementation of sustainability in HE. Fifty-six papers were included in the final stage of the search process, and they were analysed and carefully included in a short list of reports to manage the number of publications and guide the discussion in a meaningful way. To assess this classification, each abstract was checked with natural language processing technology, getting the alignment of all papers to the engineered category and added to the manuscript's interpretation.

The analysis reveals that sustainability has gained relevance over the years in HE, especially since the launch of the SDGs. Little progress has been made in the embrace of sustainability, and the problems are threefold. First, the inclusion of courses that teach sustainable practices has been a popular way to introduce it into curricula. Nonetheless, its success is limited when only some courses try to address it in explicit situations where all pillars are explained and contextualized. This is compounded by educators who lack a deep understanding of sustainability or their experience is equally limited. Furthermore, external stakeholders, such as industry and society, demand graduates with competencies towards sustainability, such as working in heterogeneous groups, adapting to changes in the world and acting autonomously with self-regulation, which HEIs do not induce in students. Second, HEIs' adoption of sustainability in operations is capped by their knowledge of the topic, internal barriers, mandates, and political views, such issues observed independently or altogether. This research found that the embrace of sustainability is rooted in the will, expectations and conceptions that stakeholders have on the matter. Third, the community where each HEI is based increasingly demands further engagement of the institution. Namely, in knowledge transfer or direct contact of students and faculty with society and their economic activities. Something that in some cases have shown success, but it is mostly absent in the literature.

During this research, a set of five different strategies is extracted from the included papers to tackle the reported problems and further embrace sustainability in HE. Innovation in management, planning, openness, training of stakeholders in sustainability, negotiation and building multipartner networks seem to be the key drivers for adopting sustainability in HE and HEIs. Further research

should tackle how exactly these strategies could enhance the relevance for HEIs in their communities first and then in society as a whole, propose specific plans suited to each institution, and build the proper assessment.

This should further build the holistic embrace of sustainability in HE, favourably impacting graduates and their attitudes and benefiting the social pact. In doing so, it should address the considerable concern that arises after considering that international institutions have devoted so much effort to education, while the results lack quality and adequate spillovers.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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