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ORIGINAL ARTICLE

How Higher Education Institutions Walk Their Talk on the 2030 Agenda: A Systematic Literature Review

Magali Fia[2] · Khatereh Ghasemzadeh[1] · Angelo Paletta[1]

Abstract

Universities are rethinking their teaching and research programs and their whole third mission in response to the framework provided by the Sustainable Development Goals (SDGs). But how do universities walk the talk? What are the main strategies and activities undertaken by universities to implement the 2030 Agenda? While the higher education literature has documented the growing number of practices and strategies around SDGs, there have been few attempts to synthesize these scholarly resources. Moreover, the knowledge base revolves around an array of activities, which makes the literature seem fragmented. To fill this gap, the present paper conducts a systematic literature review and derives a method of categorizing activities that can support further knowledge growth. We classified 130 selected papers based on the type of university activities considered (research, teaching, third mission, and managing operations) and the level of the implemented action (macro, meso, and micro). Subsequently, we identified the main gaps in the literature and discussed future research avenues for addressing higher education's role in accomplishing SDGs.

Keywords University · Higher education · Sustainable development goals · SDG · Systematic literature review · Sustainability

Abbreviations

HE Higher education

✉ Khatereh Ghasemzadeh
khatereh.ghasemzadeh@unibo.it

Magali Fia
magali.fia@unibo.it

Angelo Paletta
Angelo.paletta@unibo.it

[1] Department of Management, University of Bologna, Via Capo di Lucca, 34, 40126 Bologna, Italy

[2] Department of Management & Yunus Social Business Centre, University of Bologna, Via Capo di Lucca, 34, 40126 Bologna, Italy

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HEI	Higher education institution
SDGs	Sustainable Development Goals
SD	Sustainable Development
ESD	Education for Sustainable Development
NGO	Non-Governmental Organization
ICT	Information and Communication Technologies
VLE	Virtual Learning Environment

Introduction

A mounting number of higher education (HE) institutions are embracing sustainability as a core value in response to the Agenda 2030. Equipped with the Sustainable Development Goals (SDGs) framework, universities are rethinking teaching, research programs, and even the so-called third mission as part of their effort to navigate sustainable development (SD). But there is an open question as to *how* universities walk the talk: What are the main strategies and activities that universities have implemented so far to address the 2030 Agenda? While there is a growing literature around the activities that universities are undertaking in this regard (Chankseliani and McCowan, 2021), few literature reviews synthesize these scholarly resources. Reviews of this topic have mostly focused on: business schools (García-Feijoo et al., 2020); a single nation (Owusu-Agyeman, 2020); a single university mission (e.g., teaching and not research) (Alonso-Garcia et al., 2019; Chiba et al., 2021; Weiss and Barth, 2019); specific SDGs and issues like safe drinking water (Daly et al., 2021), or as a component of Education for Sustainable Development (and specifically SDG 4.7) (Ferrer-Estévez and Chalmeta, 2021).[1] While they highlight important issues,

[1] In more detail, some reviews have a narrow focus. For example, the review on HE and SDGs provided by García-Feijoo et al. (2020) focuses on business schools and highlights the need for interdisciplinary and collaborative work in order to open universities to the outside environment, as well as promote the use of active methodologies such as student mobility and study tours, flipped classroom, and different initiatives within teaching, research, and management processes to achieve the SDGs. Similarly, Owusu-Agyeman (2020) undertakes a systematic review of SD and HE in the context of Ghana, showing that the adoption of an "ecosystem" composed of research networks, national SD activities, institutional structures and leadership—coupled with the adoption of the UN's 2030 Agenda concepts in the curricula—enhance the understanding of ESD. Another review carried out by Alonso-Garcia et al. (2019) focuses on articles concerning the application of technology Information and Communication Technologies (ICT) and Virtual Learning Environment (VLE) in teaching practices to embrace SDGs within HEIs. In a similar vein, the review of Chiba et al. (2021) points out the positive outcomes of participatory learning, promoting curricula based on students' interests and motivations as effective teaching and learning methods to foster SD. Similarly, Weiss and Barth (2019) scrutinized current research on the implementation of sustainability in curricula across countries. Lastly, Daly et al. (2021) honed in on a particular sustainability issue—safe drinking water (SDG 6)—by tracking the research on multiple water source use for drinking water in low- and middle-income countries. To conclude, the recent literature review conducted by Ferrer-Estévez and Chalmeta (2021) adopted a broader focus by analyzing contributions that investigated the implementation of ESD and SDGs at different educational levels: from primary school to HEIs. Specifically, their review focuses on how SDGs have been incorporated at the curricular and extracurricular levels, on the strategies and managerial procedures adopted to integrate the SDGs, and on the teaching approaches and educational methods for implementing the SDGs.

these reviews do not provide a systemic perspective on current approaches and strategies that HEs have adopted to implement the Agenda 2030. Another stream of systematic reviews strictly focused on HE and SD without specifically referring to the Agenda 2030 (Findler et al., 2019; Vaughter et al., 2013). Findler et al.'s (2019) review provides a complete picture of HEIs' SD strategies at multiple levels: "education, research, campus operations, outreach, campus experiences, institutional framework, and assessment and reporting" (p. 25). Meanwhile, the review by Vaughter et al. (2013) classifies the current literature on SD and HEIs according to three streams: institutional curricula, operational policies, and a measurement approach to sustainability. Other studies see SD through a fragmented environmental lens: for example, by emphasizing energy-saving activities, reducing greenhouse emissions, etc. (Amaral et al., 2015; Blanco-Portela et al., 2017). Taking these initial systematic reviews as a foundation, we specifically focus on current analyses of how HEIs are implementing the Agenda 2030.

We believe there are two reasons to run a complete review of current knowledge on the topic. First, a review of existing strategies allows us to monitor the activities that universities have implemented, which can help inform leaders, policymakers, and practitioners (Tranfield et al., 2003). Second, a systematic review can categorize extant research and thereby produce a complete picture of the theories, concepts, or methods circulating in the HE literature, which should support future research.

Therefore, we reviewed the current literature through a systemic approach (see Cao et al., 1999, 2004). We first categorized all extant research according to the type of SDG-related actions investigated: research, teaching, third mission, or management operations. Then, we further classified the selected articles through a three-level approach: *micro, meso*, and *macro*. This systemic framework permits us to assess whether current literature effectively captures the multi-level nature of the phenomenon. First, we summarize the main findings for each type and level of university activity investigated; second, we identify the main gap in the literature and discuss future research trajectories.

The remainder of the paper unfolds as follows: In Section 2, we present the methodology adopted to select the relevant literature, which is based on a replicable, scientific, and transparent three-step research process. In Section 3, we present the descriptive results. Section 4 depicts the framework used for clustering our results. In Section 5, we conclude by discussing future research directions for this topic.

Methodology

We adopted a systematic review method (Denyer et al., 2008; Tranfield et al., 2003) to discern relevant patterns in HEs' strategies toward the Agenda 2030. Following a general scope, we conducted our research in the Scopus and Web of Science (WoS) databases in order to capture a higher number of scholarly contributions. We chose those databases due to their reliable indexing (Martínez-López et al., 2018; Stahlschmidt and Stephen, 2020). We applied the following keywords to a search of titles, abstracts, and keywords: (Agenda 2030 OR SDG OR sustainable-development-goal*) AND (university OR higher-education OR college OR business-school*). We

restricted the search to peer-reviewed articles, which are deemed to have a higher quality with respect to other contributions (Ramos-Rodríguez and Ruíz-Navarro, 2004). We also focused on the areas of Economy, Business, Management, Social Sciences, and Education and Educational Research in order to find articles that would better fit our emphasis on HEIs' strategy toward and management of SDGs. This procedure resulted in 635 hits in Scopus and 171 hits in WoS. After removing duplicate articles, we achieved a final sample of 698 papers. Furthermore, we excluded articles dealing with general sustainability issues, which entailed removing all articles published before 2015 (to match the year the Agenda 2030 was launched). Accordingly, the search period spanned from January, 2015 until March 31, 2021. We ignored off-topic journals that do not deal with the HE literature on SDGs (e.g., Social Indicators Research, Journal of Water Sanitation and Hygiene for Development, Library Management). Similarly, we did not consider papers that discussed SDGs outside the context of HE: for example, contributions to firms and Non-Governmental Organization (NGOs). Lastly, we ignored papers dealing with educational levels other than HE (e.g., general education, informal education, and primary and secondary school education). By applying these general inclusion criteria, we narrowed the sample to 175 articles. We then proceeded to read the articles and used some specific criteria to further limit the sample and excluded those that aligned with these criteria: (a) papers focusing on universities' strategies for improving education quality in specific reference to SDG 4 targets; (b) papers evaluating students and teachers' perceptions about SDGs without referring to any teaching strategy; (c) papers concerning HE policymaking and planning at the national level. With these boundaries, we achieved a final set of 130 articles. Figure 1 represents the iterative process of selecting the sample.

In the second step, we analyzed and coded the 130 articles regarding the type of paper (conceptual or empirical); the method adopted (qualitative or quantitative); the context of the studies (the countries and higher education institutions (HEIs) analyzed); and whether they address a single SDG, a group of SDGs, or the entire profile of Agenda 2030 (which we labeled as overall). Moreover, we coded the articles according to the university activities they addressed: teaching, research, third mission (i.e., public engagement activities), and management operations. The first three types mirror universities' three missions, while the fourth category encompasses all the activities related to governance processes and management strategies related to fulfilling Agenda 2030.

Next, we used a multi-level perspective to further code the literature according to the HEI's level of implementation: *macro, meso, micro*.[2] The *macro-level* collects the strategies and practices implemented at the general university level, i.e., in

[2] The multi-level perspective has been adopted in the innovation literature to describe the complex dynamics of changes (see Geels and Schot, 2007; Rip and Kemp, 1998) and the interplay between landscape (macro), socio-technical structures (meso), and practices (micro). The macro-meso-micro approach has also been adopted in the Business Ethics literature (see McDonald and Nijhof, 1999) to describe different implementations of ethical values within organizations: at the strategic governance level (macro), the organizational level (meso), and individual ethics (micro). Here, we adopt this framework to describe the changes in the context of university sustainability practices.

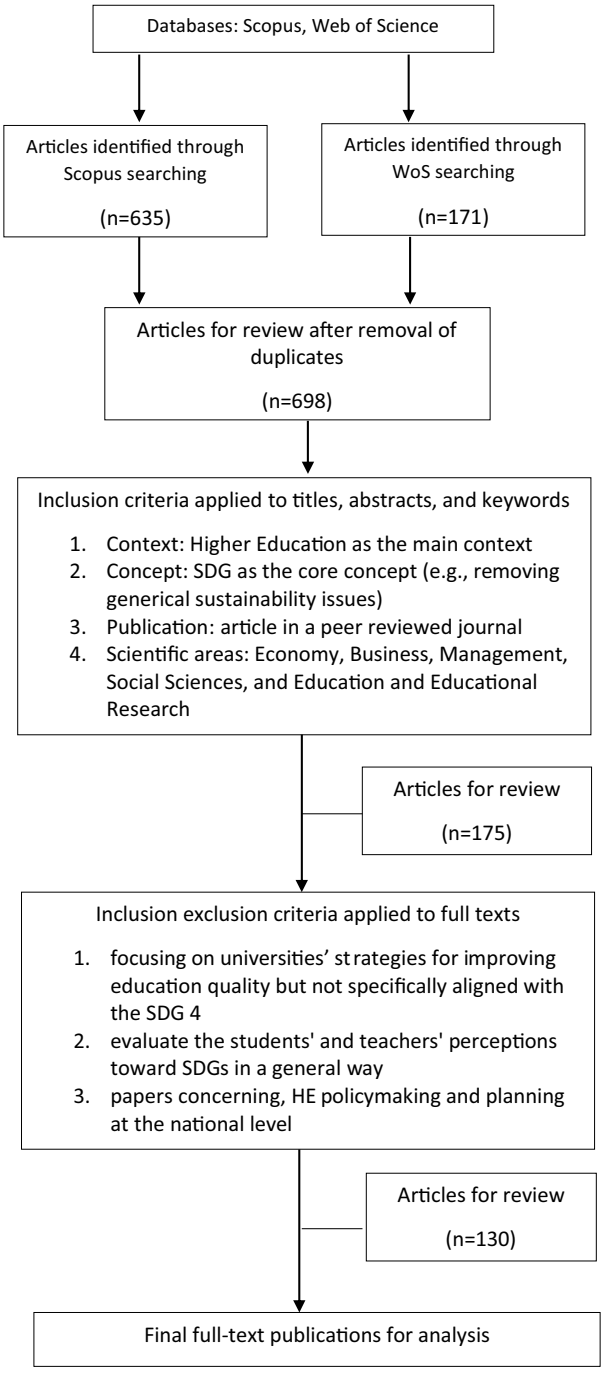

Fig. 1 Data selection procedure

key organizational structures (such as dedicated units, offices, committees, and university-level programs) and processes (planning, budgeting, evaluation, and reports/rankings). The *meso-level* captures the more decentralized strategies and practices of departments or intra-departments (e.g., department-, campus-, and school-level activities/projects, intra-departmental activities and initiatives, etc.). The *micro-level* includes strategies and practices carried out by researchers (such as single/particular research projects or third mission activities), students' specific activities within a program, or specific course designs (i.e., single specialized courses or fields of study). All three authors separately applied the content analysis and coding procedure to the full text of each article. We resolved any disagreements through iterative discussion sessions. Note that we classified articles that analyzed multiple activities at multiple levels as belonging to more than one category.

Descriptive Results

The sample contains articles published from 2017 to 2021 that followed an increasing trend: 6% (7) in 2017, 9% (12) in 2018, 32% (42) in 2019, 45% (59) in 2020, and 8% (10) in the 2021.[3] We assume that there was a time lag between the launch of Agenda 2030 in 2015 and subsequent efforts to study the phenomenon.

Regarding the publication source, the largest contributors were "Sustainability" (featuring 41% of the papers or 54) and the "International Journal of Sustainability in Higher Education" (18% or 23), while other HE-focused journals (such as "Higher Education", "Education Sciences", and "International Journal of Management Education") collectively housed 9% (12) of the selected papers. "Sustainability" is not directly connected to the HE literature, which suggests that HE-specific journals have not been the primary targets for sustainability research on HE. Moreover, given the recency of our investigated topic, it may simply be that journals with a lower time-to-publication obtained a higher number of articles.

Regarding the articles' adopted methodology, 90% (118) were empirical, 7% (9) were conceptual, and 2% (3) were literature reviews. Among the empirical studies, 72% (85) adopted qualitative methods, 19% (22) used quantitative methods, and 9% (11) applied a mix of both. Meanwhile, 54% (63) of the studies followed a single- or multiple-case study approach, 16% (20) adopted a survey method, 9% (12) utilized content analysis, and 12% (15) followed a mixed-method approach. The rest of the studies applied various other methods (e.g., focus groups, experiments, etc.). Papers employing the case study method applied a single case study at the national level or multiple case studies at the cross-national level. Spain and United States were the most frequently studied context for researches related to HEIs' strategies towards SDGs.

Regarding HEIs' orientation toward SDGs' (namely, whether the actions implemented by HEIs address a single SDG, a group of SDGs, or the entire profile of Agenda 2030), 44% (58) of the papers have a broad focus (the overall range of

[3] Consider that we collected data between February and March 2021.

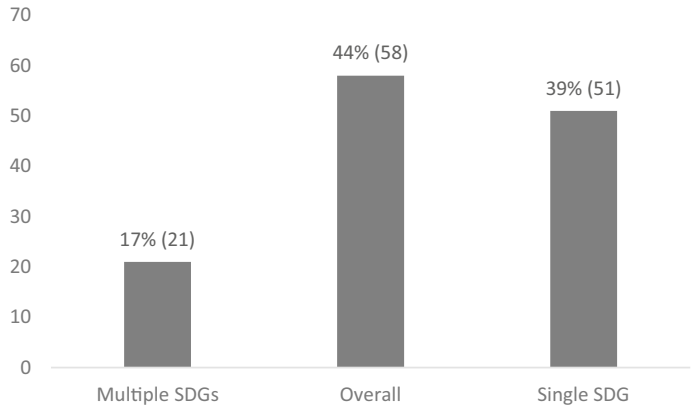

Fig. 2 Frequency of the SDGs' orientation

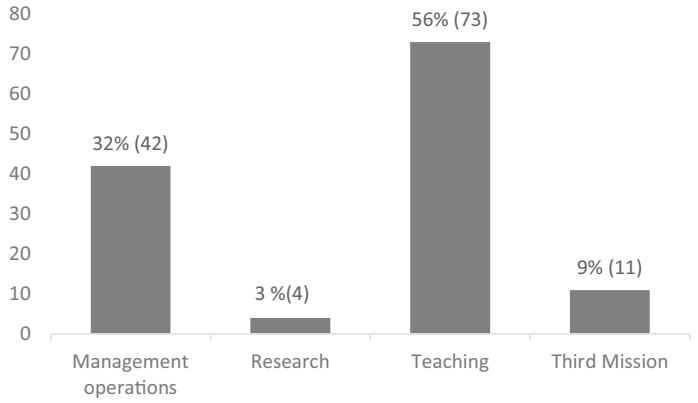

Fig. 3 Frequency of the type of activities

SDGs), 39% (51) have a narrow focus (i.e., a single SDG), and 17% (21) focus on some selected SDGs (see Fig. 2).

Regarding the different universities' activities, the vast number of studies (56%, or 73 papers) focus on teaching activities, 32% (42) address the management operations required to implement the SDG-related strategies, 9% (11) concentrate on third mission activities, and only 3% (4 papers) focus on research activities related on SDGs (see Fig. 3).[4]

Regarding the perspective level adopted, a significant part of the literature (51% or 67 papers) corresponded to a *macro* perspective, while 37% (49) focused mainly on the *micro-level*. Only 9% (12) of the studies predominantly addressed the

[4] The papers that deal with more than one area of intervention have been categorized based on the primary area.

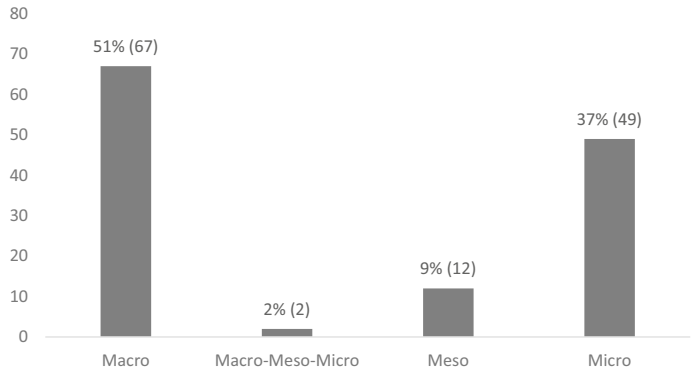

Fig. 4 Frequency of the level of implemented actions

meso-level, while 2% (2) of papers in the whole dataset scrutinized the three levels simultaneously (see Fig. 4).

By adopting a systemic approach (see Cao et al., 1999, 2004), we captured the main aspects of change that have driven HEIs' efforts as they relate to the Agenda 2030 (for the detailed classification of areas and activities, see Table A1 in the online Appendix). Note that the number of articles in this table exceeds the total number of papers since some papers contribute to more than one area of intervention.

Figure 5 provides a map of the 130 articles with respect to the type of activities, levels, and focus. *Teaching* is the activity that attracted the most scholarly publishing. Of those, most studies (45% or 34 papers) analyzed *micro-level* activities such as specific course designs or extracurricular activities that address SDGs. At the *macro-level*, 16% (22) of papers analyzed policies for reorienting curriculum and creating interdisciplinary and interdepartmental strategies. Only 4% (6) of the sampled papers addressed the issue at the *meso-level*, i.e., of curriculum settings and interventions for campuses, departments, and schools. Teaching activities primarily concerned a single SDG at almost all levels, followed by the overall profile of SDGs and multiple SDGs.

Studies only marginally concentrated on the *research* activities; when addressed, they focused on the *macro-level* (overall goals). Only a few articles covered research activities at the *micro-level*, in the form of course modules and research opportunities to address a single SDG or the overall Agenda.

Of the studies that correspond to *third mission* activities, most concerned *macro-level* initiatives (9 papers or 80%) that involve a multitude of organizational actors (Knudsen et al., 2021). Generally, third mission activities are managed from the top so as to leverage the university's image in initiatives geared toward the educational and cultural development of society. Therefore, most of these studies (7 papers or 63%) deal with all 17 SDGs. By contrast, there are very few occurring at the *micro-level* (e.g., addressing researchers' engagement with non-academic stakeholders, such as the general public and local communities).

Of the studies addressing *management operations*, 83% (35) of them occupied the *macro-level*, with an emphasis on the organizational structures and processes needed

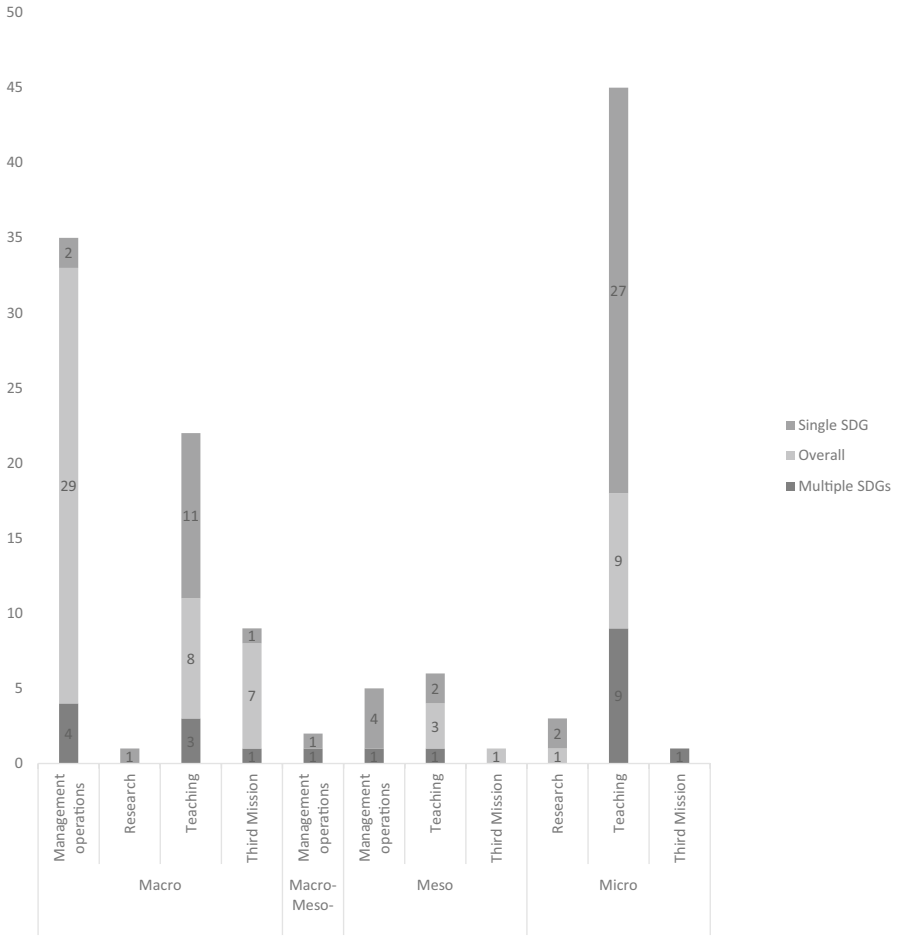

Fig. 5 Prevalent areas of interventions within studies corresponding to levels and SDGs' scope

to incorporate sustainable goals. At this level, 29 articles (69%) focused on HEIs' comprehensive strategies toward Agenda 2030 rather than focusing on a single SDG. Meanwhile, about 9% (6) of studies in this area targeted the *meso-level*, usually regarding efforts to nurture SDGs through governance processes, management strategies, planning, and infrastructure at the campus and department levels. Moving from *macro* to *meso-level* the strategies focus more on single SDG or multiple ranges of SDGs.

Content Analysis

In the following, we summarize the literature for each type of activity while also considering the level of intervention and the focus on SDGs.[5] Our goal is to discuss which streams of literature feature the most publications and derive the main takeaways of each stream. Also, takeaways table (Tables 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 permits to have a clear visual idea of research gaps which can be addressed in future researches.

Teaching

Teaching-macro

The stream of research on teaching activities at the *macro-level* focuses on single SDGs, and particularly on SDG 4—"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". For example, Ferguson and Roofe (2020) analyzed HEIs' efforts to target 4.3 which explicitly refers to universities: "By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university". These efforts include the attempt to establish internal collaborations and external partnerships for a wide array of program to expand access to tertiary education Moreover, Greig and Priddle (2019) emphasized the need to adopt an interdisciplinary and transformative approach in teaching and learning in order to address target 4.7—"By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development". Consequently, sustainability should be a core objective of teaching and assessment procedures, learning practices, and program contents. In this vein, teaching staff need to have the personal and professional capabilities to stimulate students' awareness of economic development, inclusion, and resilience issues (Kopnina, 2018). As evidenced by the COVID-19 crisis, teachers' digital and interactive capabilities are critical to universities' teaching strategy (O'Keeffe, 2020) and the fulfillment of target 4.4: "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship". Notably, this stream of literature illustrates that achieving SDG 4 indirectly contributes to many or all other SDGs. For example, target 4.5 aligns with SDG 5

[5] We obtained the following categories due to their pervasiveness in the literature: Teaching-Macro Single & Overall; Teaching-Meso Overall; Teaching-Micro Single; Research-Macro Overall; Research-Micro Single & Overall; Third Mission-Macro Overall; Management Operations-Macro Overall; Management Operation-Meso Single & Multiple (see the Table A1 in the online appendix for more details).

Table 1 Takeaways teaching literature at macro-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Macro	Single	Reorienting curriculum to raise students' awareness and innovative thinking towards specific SDG Aligning scholarship programs with the sustainable development focusing on a specific SDG Embedding research-based education for sustainable development in curricula according to related sustainable target Impact on students' sustainable behavior through an increasing share of sustainable development topics combined with teaching staff involvement Online tutoring and improvement of teachers' digital and interactive capabilities Evaluation of students' awareness through novel methods Making use of Virtual Learning Environment (VLE) Integrating peace within teaching modules
	Multiple	Employing environmental content and the training of individuals to act with environmental responsibility aligned with SDGS 6,13,14,15 Taking advantage of the course inventory module to explore the sustainability status of the course offerings
	Overall	Utilizing problem-based learning (PBL), project-oriented learning (POL), and cross-disciplinary teaching-learning strategies Forming a specialized Education for Sustainable Development Utilizing SDG-related assessment tools for teaching programs Embedding the SDGs in the strategic planning and social reporting Developing, testing, and using new contents, learning methods and transformative approaches aligned with SDGs Developing more applied research (i.e., practice-oriented) around the SDGs Engaging the students' community, to commit to and act in support of the SDGs Formation of student-focused learning curricula on overall agenda

Table 2 Takeaways teaching literature at meso-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Meso	Single	Development of special programs by special units of university, e.g., unit for people with disability
	Multiple	
	Overall	Increasing interdisciplinary thinking across faculties considering the most prevalent SDGs at each faculty Providing the opportunity of cooperation and communication of academics from different disciplines Planning community-engaged learning, sustainability co-curricular and extracurricular opportunities

(gender equality) by emphasizing gender parity, while target 4.3 contributes to not only SDG1 (no poverty) through the provision of equal access to education for all, but also SDG 8 (decent work and economic growth) through the provision of vocational and technical education and scholarship.

A different stream of literature considers *macro-level* teaching strategies toward all 17 SDGs through a prevailing focus on curricula planning decisions (Aleixo et al., 2020). Some of these studies stress the importance of implementing an extensive reorientation of curriculum and pedagogical strategies across all degree programs. For example, universities need to develop a culture of sustainability that suffuses departments and degree programs, especially for students who are nearing entry to the job market (Albareda-Tiana et al., 2018). Similarly, Elmassah et al. (2020) suggested that HEIs establish standards for propagating SD values in the curricula of different majors, providing new SD-based courses (both singular and integrated), and forming a specialized ESD faculty community that can share experiences and best practices. Other conceptual studies falling in the *macro* category deal with student competencies, inclusive teaching practices, professors' abilities and ethics, and alliances among universities and organizations that are crucial for integrating SDGs into teaching programs (del Olmo Fernández et al., 2020; Zamora-Polo and Sánchez-Martín, 2019). Moreover, Zamora-Polo et al. (2019) argued that students generally lack background knowledge on SDGs, and thus universities need to suffuse all disciplines with both specific and transversal abilities that can be adapted to students' needs. The literature also stresses the importance of assessment tools that can measure a program's success in cultivating students' SDG-related competences (Kioupi and Voulvoulis, 2020). In this vein, Paletta and Bonoli (2019) advanced a framework for analyzing how universities are redesigning activities to achieve SDGs through a unified strategic planning and social reporting. Beyond theoretical discourse, Leal Filho et al. (2019a, b) produced a first quantitative mapping of myriad universities across 17 countries on 5 continents. The authors found that around 30% of the sampled universities fully applied SDGs in their teaching programs, while 40% of them only reached partial inclusion due to the transversal, interdisciplinary, and vague nature of SDGs. To conclude, these pieces of evidence on *macro-level* teaching strategies indicate a need for more scholarship on best practices

Table 3 Takeaways teaching literature at micro-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Micro	Single	Facilitating Massive Open Online Courses (MOOC) with SDG contents Applying experiential learning methods e.g. role playing method Development of Technology Enhanced Learning (TEL) and ICT-based teacher training curricula Promoting project method in multidisciplinary and transdisciplinary teams Developing and testing tailored methods for different majors such as service learning, problem-based learning, project-oriented learning, simulation games and case studies Advancing visual methodologies Evolving competence-oriented teaching for sustainable development considering cognitive, socio-emotional and behavioral domains of learning Applying transformative learning in which students learn managerial soft skills Guaranteeing high quality teaching evaluating teachers': passion for teaching, attention to student's independent learning ability, emphasis on providing the student with proficiency and confidence, and interest on hand-on activities Employing New Environment Learning (NEL) encouraging participation in class, creativity, curiosity, critical thinking among students Utilizing challenged-based learning Using social networks to open up new perspectives and impact students' attitudes Employing flipped classroom method through which information-based environment in which teachers provide a variety of learning resources so that students can complete the knowledge transfer process before the class
	Multiple	Implementing experimental and creative group projects delivering the most focused SDGs in a field Performing cooperative learning Benefiting from MOOCs to promote multiple SDGs simultaneously e.g. promoting lifelong learning and waste water management Considering a mix of environmental, social, economic, and technical dimensions of sustainability in planning the programs Providing the chance for students to relate the SDGs with their future job Finding solution to integrate various sustainability issues e.g. poverty or gender equity into courses

Table 3 (continued)

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
	Overall	Implementing the profile of SDGs in specific higher education majors/courses through developing new competencies, introducing new subjects, and taking into consideration innovative solutions and technologies suited to the majors/courses Designing courses with learning objectives that are clearly aimed at holistic approaches to sustainable societal development Establishing micro-curriculum approach and/or standalone courses for education curriculum such as engineering Developing simulation course -tailored methods Scaffolded application of the SDGs in classroom

Table 4 Takeaways research literature at macro-level

Level	SDGs	What are the best practices/strategies to deploy the SDGs?
Macro	Single	Introducing publicly funded research in the sustainable development framework Conducting research for specific sustainability domains e.g. peaceful and inclusive societies Assigning ESD group for collaborative research Collaborative research on ESD assessment, global competencies, and teachers' understanding of ESD
	Multiple	
	Overall	Establishing specialized SD research centers targeting all the university's stakeholders Facilitating cross-border research collaborations Founding research networks within the SD ecosystem that bring together researchers from different institutions A transparent and organized report of research products, financed research projects, and budget of research-based courses and research facilities

Table 5 Takeaways research literature at micro-level

Level	SDGs	What are the best practices/strategies to deploy the SDGs?
Micro	Single	Take advantage of open laboratories for certain targets e.g., peace and sustainable development Executing practice-oriented research skills courses through which students can share the results of their research projects with campus community
	Multiple	
	Overall	Performing participatory action through which higher education institutions can simultaneously enact and take the SDGs forward Treating the economic, environmental, and social aspects of SD equally. Conducting multi-disciplinary and cross-linked SDG research

and comparatives case-studies. Such evidence could then be shared among universities to bolster their SD strategies. Table 1 summarizes the main takeaways from the literature on teaching and SDGs at the *macro-level.*

Teaching-meso

A few papers analyze teaching issues at the campus, department, or school levels, while generally focusing on all SDGs. This niche debate covers the advantage of adopting cross-curricular approaches (*meso-level*) rather than stand-alone course initiatives (*micro-level*). Lovren et al. (2020) extended the discussion to the department level by introducing four elements for a successful program: (1) interdisciplinary

Table 6 Takeaways third mission literature at macro-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Macro	Single	Establishing cross-sector SDG-related partnership to fulfil SDG 17 Creating collaborative partnership for quality and access of education between individuals within and outside higher education, within and across disciplines and within and across countries
	Multiple	
	Overall	Prioritizing third mission efforts in the vision and mission of the HEIs from top level Forming networks with influential actors (i.e. industry, local government or NGO partners) Nurturing collaboration between research and practice Promoting collaborative research and consulting, licensing, ad hoc advice and networking, technology transfer centers and spin-offs Adopting living lab model Launching platforms for sustainability education and collaborations among academics Intensifying working with government and policymakers as well as the local community Policy making towards knowledge transfer and outreach channels

Table 7 Takeaways third mission literature at micro-level

Micro	Single	
	Multiple	Implementing Service-Learning projects to strengthen collaboration between the HEIs and their entities to serve specific needs of people, make students aware of community needs and eliminate communicational barriers
	Overall	Fostering cross-sector collaboration and supporting diverse stakeholder engagement Promoting cross-country collaboration in research activities of standalone courses

educational courses, (2) improving teachers' skills, (3) enhancing active learning, and (4) setting institutional policies at the faculty level. The literature at teaching *meso-level* generally agrees that academics can leverage the trans-disciplinary approach—through cross-field collaboration—in order to integrate sustainability into teaching programs. This way, teachers gain insights into the sustainability concerns of various majors and the decisions that are made within each discipline (Argento et al., 2020). For example, the University of Toronto has developed three inventories—covering courses, community-engaged learning, and sustainability co-curricular and extracurricular opportunities—to raise students' awareness of and their involvement in sustainability-oriented projects (Brugmann et al., 2019).

Table 2 summarizes the main takeaways from the literature on teaching and SDGs at the *meso-level*.

Table 8 Takeaways management operations literature at macro-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Macro	Single	Incorporating of sustainability values (e.g., peacefulness and inclusiveness) in operations and governance of HEIs Supporting the ESD from the top levels Presenting structural and operational changes to 'walk the talk' Institutional strategic commitment to partnerships, networks, and stakeholders Encouraging sustainable behavior among staff and students
	Multiple	Promote targeted SDGs through Responsible Management Education Coordinating and supporting of ICT adoption by a particular organisational unit
	Overall	Putting SDGs at the core of the governance and management of the university, welcoming all the stakeholders Embedding sustainability into university business strategies, decision-making processes, and practices, Adopting recognized planning, assessment and reporting tools considering SDGs as drivers Positioning governmental and institutional funding; shifting key performance indicators; enhancing cross-disciplinary work; aligning mission/vision statements; and legitimising SDG-focused projects Adopting well-framed approaches by governance bodies to identify the actions required to reach sustainability goals according to the 2030 Agenda, e.g. backcasting approach Embracing shared leadership and collaborative governance approach to bring SD in HEIs Recognising and incorporating cultural adjustments across the HEI Improving the sustainability mindset all over the HEI bodies Sharing the best practices from other HEIs Procurement of viable plans, sufficient funding, and assignment of a core group of capable people to manage the plan

Table 9 Takeaways management operations literature at meso-level

Level	SDGs	What are the practices/strategies adopted to pursue the SDGs?
Meso	Single	Operating campus SDG-related projects/labs/plans such as campus energy efficiency project, waste management lab, and campus mobility plan
	Multiple	Promoting community engagement at wide-campus and single campus levels considering different SDG targets Employing environmental impact assessment technique such as Life Cycle Assessment by universities' decision-makers Drawing on applied management operations to tackle sustainability issues such as waste management and energy saving
	Overall	

Table 10 Takeaways management operations literature concerning all levels

Level	SDGs	What are the best practices/strategies to deploy the SDGs?
All levels	Single	
	Multiple	Nurturing cooperation between different universities at *macro-level* Organising and running of faculties concerning challenges and renew faculties' curriculums at meso-*level* Integrating students and commitment to the needs of the social environments at *micro-level*
	Overall	Creating an organisational unit dedicated to sustainability Rector's delegate on sustainability Applying a consistent and collective strategy for SDGs entrenching in university curricula

Teaching-micro

A different stream of studies concentrates on the teaching and learning practices that address a single SDG (primarily SDG 4 and its targets) in specific course programs.

In the last few years, higher education has increasingly incorporated ICT technologies, such as social media, in order to improve access to quality education (Chin and Jacobsson, 2016; Labonté, 2016). In fact, social media can increase people's knowledge of sustainability, regulate students' engagement with the SDGs, and create alliances among stakeholders (Killian et al., 2019). Likewise, Massive Open Online Courses (MOOCS) are handy tools that facilitate continuous learning by providing low-cost, open materials that can be turned into lesson plans about SDGs in various subject areas (Ortega-Sánchez and Gómez-Trigueros, 2019). Such platforms allow both students and educators to engage in interactive learning around multifaceted sustainability goals. The most significant hurdles to using said platforms, for both students and teachers, involve a lack of digital competences, low-quality materials, and insufficient access to digital resources (Gallagher, 2018).

Moreover, any courses designed around SDGs need to consider the nature of different study fields. For instance, the field of geography encompasses both physical and human environments, which necessitates methods that support all four aspects of sustainability education as defined in the Agenda 2030 framework (environmental, social, economic, and cultural) (Yli-Panula et al., 2020). Meanwhile, the field of engineering emphasizes problem-solving methods that require students to develop trans-disciplinary skills (Orozco-Messana et al., 2020a, b). To foster these methods, engineering courses are often turning to new technologies—such as mobile devices and videos—to facilitate interdisciplinary projects and industry collaborations (Desha et al., 2019; Alonso-Garcia et al., 2019; Schina et al., 2020).

Fewer studies at this level deal with multiple SDGs and/or the overall profile of SDGs. Those in the former group concentrate on balancing the environmental, social, and economic dimensions of sustainability in course planning. They often prioritize the dominant SDGs based on the different field/courses and future job profiles, as well as incorporate general sustainability concerns (e.g., gender equity and poverty) into coursework (Baena-Morales et al., 2020; Castro et al., 2020; Gómez-Llanos and Durán-Barroso, 2020; Manolis and Manoli, 2021; Orozco-Messana et al., 2020a, b; Perales Jarillo et al., 2019). The studies that consider all SDGs involve the application of innovative solutions and technologies (i.e., course-tailored and scaffolded methods), along with the redesign of majors and courses to integrate SDGs (Adach-Pawelus et al., 2021; Ashraf and Alanezi, 2020; Ličen and Jedlicka, 2020; Priyadarshini and Abhilash, 2020; Useh, 2021)

Table 3 summarizes the main takeaways from the literature on teaching and SDGs at the *micro-level*.

Research

Research-macro

This literature stream focuses on reframing research priorities around SDGs, planning new research infrastructures, and creating research groups devoted to addressing societal challenges related to SDGs (Sonetti et al., 2020). Accordingly, a considerable number of studies at the *macro-level* investigate the role of research alliances, scholarships, and research centers in relation to the overall Agenda 2030 (Goodall and Moore, 2019; Sonetti et al., 2020).

The Agenda 2030 explicitly refers to the urgent need for SDG-related scientific research—from vaccine development to water management. As emphasized by UNESCO, research is a key lever for prompting innovation around sustainability and incorporating SDGs into all university activities (García-Feijoo et al., 2020). As such, it is important to increase research funding, target fields that can help resolve global problems, and enhance professional research capacity—all of which requires a constant, dynamic collaboration among universities, governments, and multilateral agencies (Owens, 2017). On this point, scholars have shown that establishing specialized SD research centers is a crucial means of involving all university stakeholders in the overall institutional vision (Elmassah et al., 2020).

To fully undertake the Agenda 2030, universities must establish specific goals for different areas of interventions, along with the respective measurement and reporting systems (García-Feijoo et al., 2020). In this vein, the University of Bologna developed tailored measures to assess its own research activities, ranging from using internal keywords to count the number of publications concerning SDGs, monitoring citations on databases (e.g., Scopus), and creating national and international benchmarks. Likewise, the university regularly reports the research products, financed research projects, and financial amounts dedicated to research-based courses and research facilities (Paletta and Bonoli, 2019).

Table 4 summarizes the main takeaways from the literature on research and SDGs at the *macro-level*.

Research-micro

A few studies analyze research activities at the *micro-level*, tackling single SDGs as well as the overall Agenda 2030. One best practice for universities is to open laboratories of social innovation: optimized spaces where participants (internal and external stakeholders) can collaborate to experiment with ideas, raise concerns, and share best practices (Zermeño and de la Garza, 2020). This stream also outlines other specific actions that can reorient higher education toward sustainable development. For instance, Eppinga et al. (2020) proposed a course module in which students have the opportunity to design and conduct sustainability research, which ultimately increases students' knowledge about SD and their willingness to support university campus and third mission activities. Trott et al. (2018) highlighted that participatory action research allows various stakeholders to work alongside community-engaged scholars to address critical social and environmental problems linked to Agenda 2030. Lastly, (Priyadarshini and Abhilash, 2020) advanced that multi-disciplinary and cross-linked SDG research can help inspire sustainable propensity among students and scholars. Table 5 summarizes the main takeaways from the literature on research and SDGs at the *micro-level*.

Third Mission

Third Mission-Macro

Most studies tackle the third mission activities at the *macro-level* and thus deal with all 17 SDGs. These studies highlight that external stakeholders are central to universities' sustainability transformation (Lozano, 2006). It is clear that HEIs cannot effectively address the SDGs by themselves; instead, they need to engage societal actors in collaboration and co-creation. Accordingly, in their move toward sustainability, university leaders should emphasize their institution's interdependence with society (Purcell et al., 2019). The societal demand for such efforts is reflected in universities integrating strategic perspectives into their visions and missions (Knudsen et al., 2021).

In general, universities realize their third mission activities through various policy levers: knowledge transfer, training, outreach/extension services with governments and policymakers, local community engagement, and creating spaces devoted to such activities (Neary and Osborne, 2018). Universities pull these levers in both formal and informal ways: collaborative research and consulting, licensing, ad hoc advice and networking, technology transfer centers and spin-offs, etc. (Etzkowitz, 2013; Neary and Osborne, 2018). Among third mission activities, nurturing the connections between research and practice is useful for fostering sustainability solutions at all levels (García-Feijoo et al., 2020). In this regard, business schools are valuable in forming synergies, partnerships, and collaborations that can deliver sustainable management practices and boost the required competences (Kolb et al., 2017).

However, universities are less adept at integrating their third mission policies in their public engagement and suffer from the lack of well-explained documentation (Neary and Osborne, 2018). HEIs can enhance their accountability in this regard by regularly reporting data on spin-offs, start-ups, patents, public engagement events, cooperation initiatives, orientation activities, and cooperation and social engagement projects (Paletta and Bonoli, 2019). Table 6 summarizes the main takeaways from the literature on third mission and SDGs at the *macro-level*.

Third Mission-Micro

A few studies evaluate third mission activities at the *micro-level*. For instance, Castro et al. (2020) researched methods of establishing collaborations and improving communication skills in specific courses. In their case, the authors analyzed an engineering courses that established partnerships with various entities in order to help students learn competences and values beyond their basic program. Another means of enhancing collaboration in a standalone course (such as sustainability science) is promoting cross-country research collaborations to tackle environmental and social issues (Priyadarshini and Abhilash, 2020). Additionally, the literature illustrates that participatory action research—taking the form of short-term programs for students—is a flexible and scalable method for realizing the vision of SDGs in HEIs, allowing students to establish relationships with key community members and local scientists (Trott et al., 2018). Table 7 summarizes the main takeaways from the literature on the third mission and SDGs at the *micro-level*.

Management Operations

Management Operations-Macro

Management operations encompass the organizing procedures, actors, structures and governance that HEIs utilize to manage and coordinate around their sustainability agenda (Cicmil et al., 2017). Management operations ensure that all university bodies adopt the Agenda 2030 and integrate sustainability principles into their vision and mission (Blanco-Portela et al., 2017; Ferrer-Balas et al., 2008). Accomplishing

those goals requires long-term strategic planning (Moon et al., 2018), which entails defining objectives, resources, policies, and organizational processes (Leal Filho et al., 2019a, b; Kestin et al., 2017). To that end, universities need to perform structural and cultural adjustments if they want to secure external financing, improve their internet presence and increase their internationalization rate (Blasco et al., 2021). Such adjustments may create tensions due to conflicting institutional goals, cultural inclinations, and individual and organizational drivers. However, shared leadership (i.e., with the involvement of all stakeholders) can alleviate these issues (Purcell et al., 2019) while fostering a collaborative governance approach that provides clearer communication, high-level accountability, and better funding opportunities (Franco et al., 2019).

The literature on this topic also describes the value of developing ethical codes and reporting tools for SD, which can foster the dissemination of SD projects in local communities and the larger territory (Di Nauta et al., 2020; Mion et al., 2019). Likewise, international ranking systems (such as Times Higher Education and Green Metrics) are gaining relevance due to their growing impact on higher education policies, governance strategies, and institutional practices. However, such ranking systems sometimes fail to accurately reflect the SDGs and may neglect to consider the leadership skills and mindsets needed to promote a transition to sustainability (Dyllick and Muff, 2020; Perović and Kosor, 2020; Torabian, 2019). Table 8 summarizes the main takeaways from the literature on management operations and SDGs at the *macro-level*.

Management Operations-Meso

Studies that focus on how to achieve SD and community engagement on single and networked campuses tend to emphasize a specific SDG or multiple SDGs. For example, the University of Bologna created "Unibo Green" as part of an effort to implement government-created initiatives at the campus-level, such as creating living labs and adopting innovative technologies (Paletta and Bonoli, 2019). Similarly, in response to SDG 11, the University of Passo Fundo in Brazil (through the collaboration of four departments and university staff) designed a campus-level mobility plan at campus level consisting of four departments and university staff. This systematic mobility plan identifies campus mobility behavior and recommends sustainable actions that can improve traffic suitability and accessibility in line with the Agenda 2030 (Scheffer et al., 2019). The same campus adopted energy efficiency practices aligned with the targets of SDG 7, such as efficient lightening, Photovoltaic Solar Power Generation; The university also goes to free Energy Market to enhance energy efficiency, increase the share of renewable energy in the global mix, and ultimately improve access to reliable and affordable energy (Rebelatto et al., 2019). Other universities have applied management operations—corresponding to the targets of SDG 12 and 9—to tackle the problem of hazardous waste management and create campus zero-energy infrastructures and projects (Saralegi et al., 2020; Wubah et al., 2020). Interestingly, we found no articles that have analyzed management operation initiatives for overall SDGs at the *meso-level*. This is particularly

noteworthy when considering the utility of departmental units that can coordinate sustainability initiatives and facilitate communication with researchers and students. In any case, Table 9 summarizes the main takeaways from the literature on management operations and SDGs at the *meso-level.*

Management Operations—All Levels

A scant number of studies have scrutinized SDG-related management operations at all three levels.

The largest of such studies, (Domínguez-Fernández et al., 2020), analyzed the following: at the macro-level, the necessity of establishing cross-university relationships and research networks, boost social inclusion and pursue their mission with social responsibility; at the meso-level, the obligation to coordinate and review the collaborations across faculties and review the organization internally by processes in to adjust to the new situations of *macro* networking and at the micro-level, the teaching/learning processes and social integration, employability, and promotion of students is of crucial importance. Meanwhile, Sonetti et al. (2020) mapped the implementation of SDGs in Italian universities based on a top-down/bottom-up approach. The authors showed that the universities mostly focused on creating an organizational unit dedicated to sustainability and overseen by the rector, but they lacked a consistent and collective strategy for entrenching SDGs in university curricula. Table 10 summarizes the main takeaways from the literature on management operations and SDGs that concerns all levels.

Discussion

We performed a systemic review of the current literature to better understand how universities walk their talk on SDGs. To this end, we considered the main governance processes, strategies, and actions that researched universities[6] have implemented so far to fulfill their commitment toward the Agenda 2030.

Our first observation is that the literature appears fragmented, representing a kaleidoscope of approaches and issues. According to a systemic perspective, fragmentation and differentiation are the natural evolutions of systems (French et al., 1985). Thus, the current state of the literature on SDGs and universities (as far as we encountered it) mirrors the evolution of this phenomenon. In short, researched universities are pursuing a growing variety of strategies at different organizational levels in order to meet the goals of the Agenda 2030.

Amidst all this activity, we thought it is critical to systematically evaluate the literature in order to identify the main traits of this phenomenon and define further research trajectories. Therefore, we analyzed and mapped the patterns of practices

[6] Note that we refer to researched universities to clarify that our discussion relates to our sampled universities. Namely, we refer to those that have been object of scholarly research from January 2015 to March 2021 and entered our review.

and strategies according to four areas of activity (research, teaching, third mission, and management operations), three levels of interventions (*macro, meso, micro*), and their degree of focus on SDGs (single, multiple, overall). The studies we reviewed made clear that HEIs are primarily addressing teaching followed by management operations, while third mission and research efforts have gained less attention.

Among *teaching*-oriented papers, the prevailing strategies at the *micro-* and *macro*-levels were respectively about designing specific courses and reorienting overall curricula to address SDG 4. Research has concentrated on SDG 4 (which provides a direct reference to education) since the early 2000s when the UN established the agenda for ESD in 2002: "the academic sector has been playing a strategic role as change agents, educating the managers of today and tomorrow, incorporating the values of responsible corporate citizenship into their education activities" (Escudero, 2006). The researched HEIs have invested enormous effort into responding to this goal, which was only exacerbated by the Agenda 2030 with its emphasis on SDG 4 (as ESD is an integral element of this SDG). At the *micro-level*, the literature has investigated the role of ICT and MOOCs in delivering single courses that contribute to either the overall Agenda or to single SDGs. At the *macro-level*, it seems important to build a culture of sustainability around the overall Agenda. In fact, many studies report cases of teaching initiatives aimed at spreading shared standards and competences among faculty members, staff, and students: for example, by introducing new learning methods, reorienting the curriculum toward SDGs, and utilizing technologies on a large scale.

Here, we want to draw attention to the scant literature on universities' teaching strategies at the *meso-level*, which would include inter-departmental programs devoted to achieving SDGs. There may be empirical difficulties with analyses at this level, such as needing more time to collect data; nonetheless, we hope to see future publications address this gap. In this context, the literature on *teaching*—at all levels—would benefit would benefit from studies that explore the tensions between sustainability goals and implemented solutions. The issue of tensions has been widely investigated in hybrid organizations (see among others: Smith et al., 2013; Smith and Lewis, 2011); future research could leverage this body of work to uncover meaningful similarities and differences.

Meanwhile, we found that the literature oriented toward *research* mainly focused on *macro-level* interventions, such as the planning of complex research programs that address the whole Agenda and are managed at the university level. These efforts reflect the importance of research for generating new ideas and solutions that benefit society; nonetheless, future studies should review research practices at the *meso-* and *micro-levels* in order to comprehensively evaluate research programs' contributions to SDGs. In addition, the literature has largely studied research activities in tandem with teaching strategies; there might be value in concentrating on the research aspect to discern its unique strategies and practices.

We observed a similar trend among the third mission activities: The literature has mainly focused on the *macro-level*, highlighting that top university officials primarily organize the efforts to transfer knowledge to society and engage stakeholders in SDG-related-projects. Furthermore, researched universities' actions toward SDGs enter the management level as a matter of resource planning: for example, by

prioritizing third mission efforts in the vision and mission, creating shared governance processes, licensing, networking, launching platforms, and helping to navigate cultural changes related to achieving the Agenda.

In this context, researched universities tend to adopt one of two approaches when enacting a sustainability strategy—strategic or constitutive (Sacconi, 2006)—and need to be aware of the trade-offs. On one hand, universities' reputations and funds depend on sustainability achievements; hence, universities can adopt a strategic (or *push*) approach that responds to the "sustainability demand", such as incorporating a few green practices into their activities. On the other hand, universities can be constitutionally compelled to undertake activities that benefit stakeholders, which would constitute an intrinsic commitment (or *pull* approach) toward SD. Future research could strive to provide a clearer picture of universities' strategic approach by categorizing different SDG-related initiatives.

Lastly, the stream of literature on management operations has usefully illustrated the administrative path needed to support the achievement of SDGs across the three university missions (teaching, research, and the third mission). With respect to the *macro-level* actions, research has concentrated on the need to improve the university culture around SDGs at the level of leadership and governance—primarily by sharing best practices, building shared-governance patterns through stakeholder dialogue, and integrating sustainability into the core of decision-making, procurement practices and strategic planning. Future research should strive to build a stronger base of evidence about the impact of certain *macro-level* conditions in order to inform university leaders.

Conclusion

Based on our review of 130 selected articles, this paper usefully illustrates the changes that Agenda 2030 is galvanizing within and among researched HEIs. This analysis leads us to make two general conclusions.

The first is that researched universities' strategies towards SDGs are still developing and do not show uniform patterns. In general, their multi-level, multi-action strategies take the following forms: (i) the result of strategic and planning programs at the university level, or (ii) as a pilot case on single courses, research programs, and research-in action projects involving external actors, or (iii) because of an administrative activity aimed at monitoring and communicating the image toward SDGs at the level of departments or the whole university.

Moreover, researched universities have adopted very different strategies to implement these actions: from *micro* initiatives that only address one area (e.g., teaching or research) and a single SDG, to *macro-level* strategies that consider all SDGs at once. The first category of papers reflects scattered, niche initiatives; the second type encompasses more integrated strategies that combine a broad focus on SDGs at the *macro-level* with the management of different *micro-level* initiatives. However, the growing number of studies at the *micro-level* signals a bottom-up dynamic driven by student-focused initiatives, which signals their role as the game-changers of today and tomorrow. Given the aggregate potential of

micro-level initiatives, future researchers should explore the role of such niches in driving changes toward SD. That said, the current literature has devoted meager interest to the *meso-level*, which captures the strategic initiatives at the departmental and campus levels. There is a lack of scholarship on research and third mission activities in relation to the meso-level, which is reflected in HEIs' general lack of implementation at this level. Here, we advance a methodological explanation: the *meso-level* case study requires more effort to not only collect data, but also organize and implement initiatives. Indeed, inter-department or inter-school projects face more hurdles due to departments' different leadership and orientations. Accordingly, future research should strive to circumvent these challenges in order to fill the current knowledge gaps on *meso-level* initiatives.

Additionally, this review underscores the different maturity levels of researched universities' SDG-related strategies. Future research will need to renew our understanding of the field as the phenomenon evolves. For instance, studies could seek to explain universities' different patterns in transitioning toward sustainability. Moreover, given current growth trends, we expect to see a surge in publications as the 2030 deadline approaches. Therefore, we think it would be worthwhile to evaluate the literature in five-year intervals (e.g., 2021–2025, 2026–2030, and 2031–2035) in order to account for any substantial changes.

The second conclusion is that various researched universities lack a common framework for implementing their Agenda 2030 strategies. Extant studies do not explicitly position a given action within a multi-level and multi-action framework; this unstructured approach makes it difficult to translate the experience into policy that can advance the university's goals. As a result, knowledge seems fragmented and best practices are harder to identify and replicate. Future research could address this gap by framing their contributions in line with our proposed framework. Greater structure would add clarity to the debate and provide a more complete understanding of HEIs' efforts to implement the Agenda 2030.

To conclude, while our approach aligns with other systematic literature reviews (i.e., Findler et al., 2019; Ferrer-Estévez and Chalmeta, 2021), it features some notable limitations. First, we focused on peer-reviewed articles and excluded studies published as book chapters, conference proceedings, grey literature and books, and in languages other than English. Second, we limited our review to the WoS and Scopus databases; future studies could extend this scope. Third, while we applied a broad spectrum of keywords in the search string, our Boolean operators may not have captured works that are implicitly related to SDGs. Hence, future research might consider casting a wider net with more sustainability-related keywords.

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Consent to participate We have read and We understand the provided information and have had the opportunity to ask questions. We understand that our participation is voluntary and that we are free to withdraw at any time, without giving a reason and without cost.

Consent for publication We give our consent for the publication of identifiable details, which can include photograph(s) and/or videos and/or case history and/or details within the text ("Material") to be published in the "Higher Education Policy" Journal. Therefore, anyone can read material published in the Journal.

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