

# Pursuing the Sustainable Development Goals through Teaching and Learning: A Review of Interdisciplinary Research in Higher Education

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## I. Introduction

The United Nations Sustainable Development Goals (SDGs), ratified in 2015, present a global vision for pursuing just, equitable, and sustainable futures that balances environmental integrity with social well-being and economic prosperity.<sup>1</sup> The 17 goals (Figure 1), and 169 targets, provide objectives for local and global communities alike to work together toward addressing the manifold issues faced by social-ecological-technological systems in the present and future. Determining pathways for achieving the SDGs that engage diverse stakeholders across contexts and facilitate their participation in devising and implementing solutions is a key challenge for sustainability in practice and research.

Figure 1: United Nations Sustainable Development Goals



Enhancing the capacity of individuals to collectively contribute to advancing the aims of the SDGs is essential for cultivating the transformations necessary to support the preservation

<sup>1</sup> United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development*. (United Nations, 2016).

of planetary boundaries<sup>2</sup> and the maintenance of safe and just lifestyles for all.<sup>3</sup> Education has been identified as an appropriate strategy for supporting the pursuit of the SDGs across scales, levels, and contexts.<sup>4</sup> Specifically, higher education has been advanced as an arena to propel sustainability initiatives in connection with the SDGs.<sup>5</sup> Learning experiences in higher education can foster the necessary competencies, such as systems thinking, futures thinking, values thinking, strategic thinking, and collaboration, that individuals require to contribute to collectively solving sustainability problems.<sup>6</sup> Thus, designing meaningful educational experiences that enable the awareness of sustainability issues, the ability to analyze them, and the knowledge, skills, and attitudes to address them through collaborative processes, is essential to pursuing the objectives delineated by the SDGs.

Since the ratification of the goals in 2015, higher education institutions have attempted to address the SDGs in a variety of ways. Yet efforts in teaching and research have often been isolated, fragmented, and suspect in regards to methodological quality and rigor.<sup>7</sup> Recognizing that higher education can play a key role in pursuing the SDGs, stronger efforts need to be made to understand how research and practice are answering this call. This paper seeks to explore the connection between higher education and the SDGs through a systematic literature review in order to enable a deeper understanding of how to utilize teaching and learning to transform the vision of sustainability into a reality.

## II. Background

The UN SDGs present a universal vision for achieving a future for all that is characterized by enhanced well-being and prosperity for humans, social-political-economic systems, and the environment.<sup>8</sup> The goals are comprehensive and apply to all countries, advancing the objectives of the previous Millennium Development Goals by expanding into 17 broad goals (Table 1).

**Table 1: The United Nations Sustainable Development Goals**

Goal	Title	Description
1	No poverty	End poverty in all its forms everywhere
2	Zero hunger	End hunger, achieve food security and improved

<sup>2</sup> Johan Rockstrom, Will Steffen, Kevin Noone, Asa Persson, F. Stuart Chapin II, Eric Lambin, Timothy M. Lenton et al., "Planetary Boundaries: Exploring the Safe Operating Space for Humanity," *Ecology and Society* 14, no. 2 (2009).

<sup>3</sup> Melissa Leach, Kate Raworth, and Johan Rockstrom, *Between Social and Planetary Boundaries: Navigating Pathways in the Safe and Just Space for Humanity* (2013).

<sup>4</sup> Stephen Sterling, "A Commentary on Education and Sustainable Development Goals," *Journal of Education for Sustainable Development* 10, no. 2 (2016): 208-213.

<sup>5</sup> Taya Louise Owens, "Higher Education in the Sustainable Development Goals Framework," *European Journal of Education* 52, no. 4 (2017): 414-420.

<sup>6</sup> Arnim Wiek, Lauren Withycombe, Charles L. Redman, "Key Competencies in Sustainability: A Reference Framework for Academic Program Development," *Sustainability Science* 6, no. 2 (2011): 203-218.

<sup>7</sup> Matthias Barth and Marco Rieckmann, "State of the Art in Research on Higher Education for Sustainable Development," in *Routledge Handbook of Higher Education for Sustainable Development*, eds. Matthias Barth, Gerd Michelsen, Marco Rieckmann, Ian Thomas (Routledge, 2015), 124-137.

<sup>8</sup> United Nations, *Transforming Our World*.

		nutrition, and promote sustainable agriculture
3	Good health and well-being	Ensure healthy lives and promote well-being for all at all ages
4	Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5	Gender equality	Achieve gender equality and empower all women and girls
6	Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
7	Affordable and clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
8	Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9	Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
10	Reduced inequalities	Reduce income inequality within and among countries
11	Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient, and sustainable
12	Responsible consumption and production	Ensure sustainable consumption and production patterns
13	Climate action	Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy
14	Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15	Life on land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16	Peace, justice and strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable

		and inclusive institutions at all levels
17	Partnership for the goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development

In order to meet the SDGs, education will play a key role. UNESCO has recognized education as crucial in the pursuit of sustainability, as evidenced by a host of UNESCO documents that link education and the SDGs.<sup>9</sup> Education furthers initiatives for sustainable development by promoting lifelong learning experiences that support sustainability transformations.<sup>10</sup> Not only can education alert learners to sustainability issues and potential solutions, but it can produce cognitive, socio-emotional, and behavioural learning outcomes.<sup>11</sup> These outcomes help learners to critically navigate complex, uncertain, and dynamic social-ecological systems by helping them to learn to know, critique, bring about change, and care within the context of sustainability.<sup>12</sup> These approaches to teaching and learning are informed by principles identified by UNESCO that:

1. Education is a fundamental human right and an enabling right;
2. Education is a public good;
3. Gender equality is inextricably linked to the right to education for all.<sup>13</sup>

As educators, administrators, and policy-makers continue to determine strategies for education to contribute to advancing sustainability efforts, keeping these principles in mind will help to guide equitable, just, and transformative outcomes that link these two areas.

Beyond general small-scale efforts to connect education to sustainability, education has also been aligned with strategies to achieve the SDGs. The importance of education was significant enough for it to receive its own goal. SDG4 has been broken down to offer seven targets for achieving the goal that focus on: (1) access to quality education, (2) early childhood education, (3) post-secondary education opportunities, (4) adequate training for job skills, (5) elimination of gender and other inequalities, (6) achievement of literacy and numeracy, and (7) the prominence of education for sustainable development and global citizenship education. These are complemented by three targeted modes of implementation: (1) upgrading school facilities, (2) expanding international learning scholarships, and (3) increasing the supply of qualified teachers (Table 2).

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<sup>9</sup> Katia Vladimirova and David Le Blanc, “Exploring Links Between Education and Sustainable Development Goals Through the Lens of UN Flagship Reports,” *Sustainable Development* 24, no. 4 (2016): 254-271.

<sup>10</sup> Vasiliki Kioupi and Nikolaos Voulvoulis, “Education for Sustainable Development: A Systemic Framework for Connecting the SDGs to Educational Outcomes,” *Sustainability* 11, no. 21 (2019).

<sup>11</sup> Marco Rieckmann, *Education for Sustainable Development Goals: Learning Objectives* (UNESCO Publishing, 2017).

<sup>12</sup> United Nations Educational, Scientific and Cultural Organization (UNESCO), *Global Education Monitoring Report Summary 2016: Education for People and Planet: Creating Sustainable Futures for All* (2016).

<sup>13</sup> United Nations Educational, Scientific and Cultural Organization (UNESCO) *Unpacking Sustainable Development Goal 4 Education 2030: Guide* (2016).

**Table 2: SDG 4 Targets**

<b>SDG 4:</b> Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.	
<b>Target 4.1</b>	By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
<b>Target 4.2</b>	By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education.
<b>Target 4.3</b>	By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.
<b>Target 4.4</b>	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.
<b>Target 4.5</b>	By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.
<b>Target 4.6</b>	By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy.
<b>Target 4.7</b>	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.
<b>Target 4.a</b>	Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.
<b>Target 4.b</b>	By 2030, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries.
<b>Target 4.c</b>	By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States.

In addition to the targets of SDG 4, several other SDGs (3, 5, 8, 12, 13) have targets that relate to education (Table 3).

**Table 3: Education in other SDG Targets**

Goal	Target	Description
SDG 3: Health and Well-being	3.7	By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and <b>education</b> , and the integration of reproductive health into national strategies and programmes.
SDG 5: Gender Equality	5.6	Number of countries with laws and regulations that guarantee women aged 15-49 years access to sexual and reproductive health care, information and <b>education</b> .
SDG 8: Decent Work and Economic Growth	8.6	By 2030 substantially reduce the proportion of youth not in employment, <b>education</b> , or training.
SDG 12: Responsible Consumption and Production	12.8	By 2030 ensure that people everywhere have the relevant <b>information</b> and <b>awareness</b> for sustainable development and lifestyles in harmony with nature.
SDG 13: Climate Change Mitigation	13.3	Improve <b>education</b> , awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.

Beyond the prominent role of education as one of the 17 SDGs and its articulation in several other SDG targets, education is interconnected in a variety of ways to the other SDGs.<sup>14</sup> The goals can be categorized by their role in advancing sustainable development into four categories (Table 4): outcome/foundational, human input, physical assets, and enabling.<sup>15</sup> Education (SDG 4) is identified as a human input goal, as it directly represents the means and capacity which may underpin, or undermine, the ability to meet other goals.<sup>16</sup> According to this approach, education can act as a driver, or barrier, to achieving the objectives defined by the SDGs because it engages human actors and furthers their ability to collectively pursue actions that advance sustainability.

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<sup>14</sup> N. Mans and Robert Costanza, "Review of Targets for the Sustainable Development Goals: The Science Perspective," *Stockholm Environment Institute* (2015).

<sup>15</sup> Tom Cerney and Richard Fenner, "The Importance of Achieving Foundational Sustainable Development Goals in Reducing Global Risk," *Futures* 115 (2020).

<sup>16</sup> Cerney and Fenner, "The Importance of Achieving Foundational Sustainable Development Goals".

**Table 4: Categories of Sustainable Development Goals**

Categories	Definition	Related Goals
Outcome/Foundational	Represent social and environmental improvements directly resulting from making progress towards the other goals	<b>1</b> (No poverty), <b>3</b> (Good health and well-being), <b>14</b> (Life below water), <b>15</b> (Life on land)
Human Input	Represent the means and capacity which my underpin (or undermine) the ability to meet the other goals	<b>2</b> (Zero hunger), <b>4</b> (Quality education), <b>5</b> (Gender equality), <b>10</b> (Reduced inequality), <b>13</b> (Climate action), <b>16</b> (Peace, justice and institutions)
Physical Assets	Relate to the engineered infrastructure systems needed to power and deliver essential services	<b>6</b> (Water and sanitation), <b>7</b> (Affordable and clean energy), <b>9</b> (Industry, innovation and infrastructure), <b>11</b> (Sustainable cities), <b>12</b> (Responsible consumption and production)
Enabling	Represent necessary precursors to investment in, and achievement of, the other goals	<b>8</b> (Decent work and economic growth), <b>17</b> (Partnership for the goals)

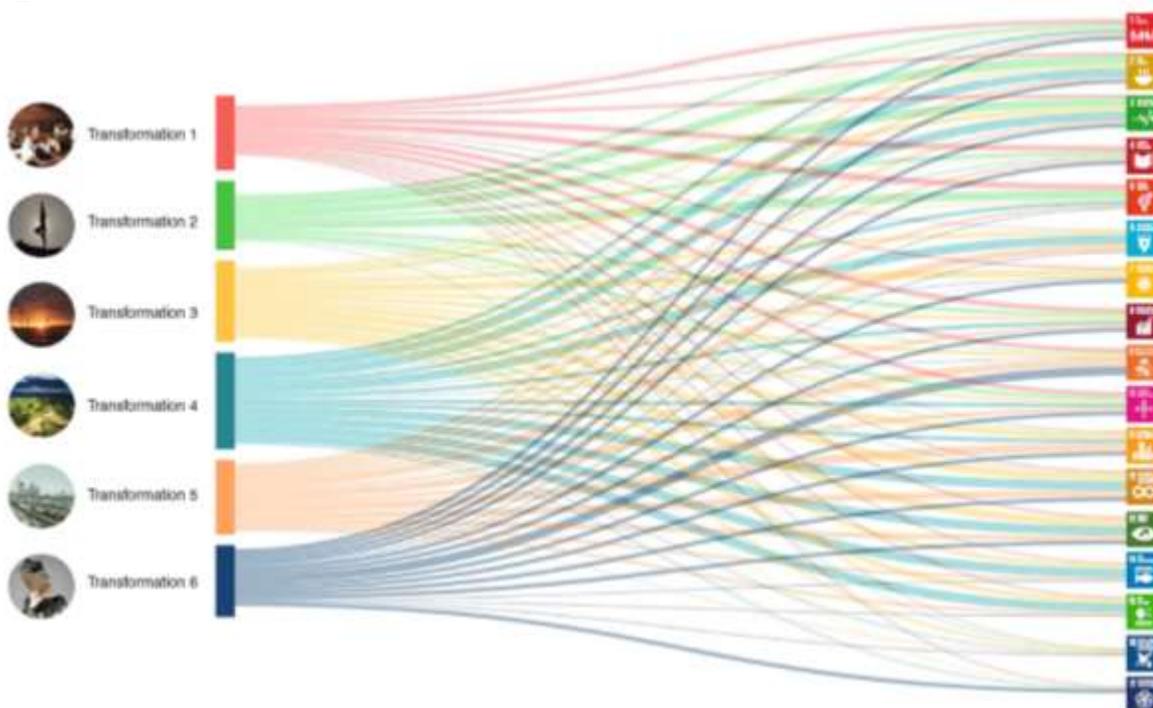
Other literature has determined the specific ways in which education and SDG 4 are related to the other goals. Education has been suggested as one of six necessary transformations to achieve the SDGs (Figure 2).<sup>17</sup> They highlight particularly strong links for education to SDGs 1, 5, 8, 9, 10. Meeting these goals requires creating equitable, accessible, and robust educational systems in order to build human capital that promotes economic growth and decent work, eliminates extreme poverty, and overcomes gender and other inequalities.<sup>18</sup> Transforming educational systems and their outcomes can facilitate initiatives toward meeting the SDGs by connecting to transformations that emphasize: health, well-being and demography; energy decarbonization and sustainable industry; sustainable food, land, water and oceans; sustainable cities and communities; and the digital revolution for sustainable development.<sup>19</sup>

<sup>17</sup> Jeffrey D. Sachs, Guido Schmidt-Traub, Mariana Mazzucato, Dirk Messner, Nebojsa Nakicenovic, and Johan Rockstrom, "Six Transformations to Achieve the Sustainable Development Goals," *Nature Sustainability* 2, no. 9 (2019): 805-814.

<sup>18</sup> Sachs, Schmidt-Traub, Mazzucato, Nakicenovic, and Rockstrom, "Six Transformations".

<sup>19</sup> Sachs, Schmidt-Traub, Mazzucato, Nakicenovic, and Rockstrom, "Six Transformations".

**Figure 2: Contributions of each SDG Transformation towards the 17 SDGs**



In addition to approaches that suggest education as advancing sustainability transformations, education has also been proposed as a way to highlight the relevance of the SDGs in global and local contexts. Specific linkages can be made between education and each of the other SDGs<sup>20</sup>, suggesting that education is a dynamic force in the pursuit of sustainability (Table 5). These linkages suggest that education plays many roles in driving individual and collective abilities to achieve the SDGs across scales and contexts, including: (1) developing, transferring, and expanding knowledge and awareness related to sustainability; (2) influencing attitudes and behavior change; (3) fostering essential skills; and (4) analyzing and addressing challenges by developing viable visions for just, equitable, and sustainable futures.

**Table 5: Connections between SDG 4 and the other SDGs**

SDG	Connection to SDG 4 and Education
1: No poverty	Education is critical to lifting people out of poverty
2: Zero hunger	Education plays a key role in helping people move towards more sustainable farming methods, and in understanding nutrition
3: Good health and well-being	Education can make a critical difference to a range of health issues, including early mortality, reproductive health, spread of disease, healthy lifestyles and well-being
5: Gender equality	Education for women and girls is particularly important to achieve basic literacy, improve participative skills and abilities, and improve life chances

<sup>20</sup> UNESCO, *Global Education Monitoring Report*.

6: Clean water and sanitation	Education and training increase skills and the capacity to use natural resources more sustainably and can promote hygiene
7: Affordable and clean energy	Educational programmes, particularly non-formal and informal, can promote better energy conservation and uptake of renewable energy resources
8: Decent work and economic growth	There is a direct link among such areas as economic vitality, entrepreneurship, job market skills and levels of education
9: Industry, innovation and infrastructure	Education is necessary to develop the skills required to build more resilient infrastructure and more sustainable industrialization
10: Reduced inequalities	Where equally accessible, education makes a proven difference to social and economic inequality
11: Sustainable cities and communities	Education can give people the skills to participate in shaping and maintaining more sustainable cities, and to achieve resilience in disaster situations
12: Responsible consumption and production	Education can make a critical difference to production patterns (e.g. with regard to the circular economy) and to consumer understanding of more sustainably produced goods and prevention of waste
13: Climate action	Education is key to mass understanding of the impact of climate change and to adaptation and mitigation, particularly at the local level
14: Life below water	Education is important in developing awareness of the marine environment and building proactive consensus regarding wise and sustainable use
15: Life on land	Education and training increase skills and capacity to underpin sustainable livelihoods and to Education and training increase skills and capacity to underpin sustainable livelihoods and to conserve natural resources and biodiversity, particularly in threatened environments
16: Peace, justice and strong institutions	Social learning is vital to facilitate and ensure participative, inclusive and just societies, as well as social coherence
17: Partnership for the goals	Lifelong learning builds capacity to understand and promote sustainable development policies and practices

The literature suggests a strong relationship connecting education broadly, and higher education specifically, to the pursuit of the SDGs. Responding to the recognition of the pivotal role that higher education can play in facilitating efforts to pursue the SDGs, this paper endeavors to understand how research links higher education and the U.N. sustainable development goals. To meet this objective the following research questions were posed:

1. What are the characteristics of research concerning the connection between higher education and the U.N. Sustainable Development Goals?
2. How can research, teaching, and learning in higher education accelerate the pursuit and achievement of the U.N. Sustainable Development Goals?

### III. Methods

This paper sought to understand what research suggests about how teaching and learning processes in higher education are addressing the sustainable development goals. In order to achieve this objective, a systematic literature review was utilized to survey the existing literature on higher education and the U.N. SDGs. Systematic literature reviews offer an effective method for surveying the existing literature on a specific topic and synthesizing the information to derive new insights.<sup>21</sup> Peer-reviewed articles in English were searched for in the research article database Scopus. Articles published beginning in 2016, (considering the ratification of the SDGs by the UN in late 2015) through early 2020 were considered. The following search string was utilized in order to collect the relevant literature connected to the topic:

TITLE-ABS-KEY ( ( "higher education" AND ( "sustainable development goal\*" OR "sdg" ) ) ) AND ( EXCLUDE ( PUBYEAR , 2015 ) OR EXCLUDE ( PUBYEAR , 2013 ) OR EXCLUDE ( PUBYEAR , 2009 ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) )

This search yielded an initial sample of  $n=126$ . After the articles were collected, criteria were developed in order to assess inclusion or exclusion of each article. These criteria reflected the primary concepts of the two main topics of this paper: higher education and the U.N. sustainable development goals (Table 6).

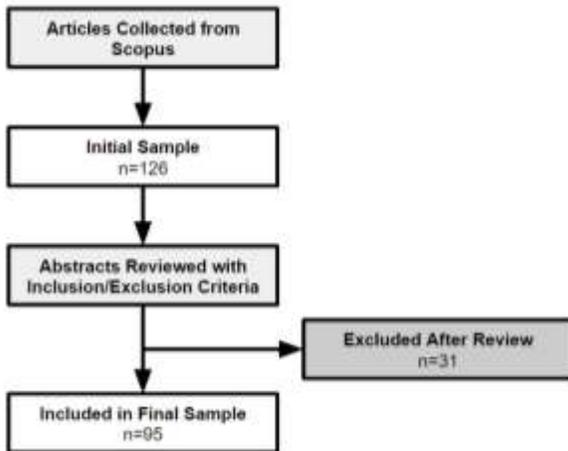
**Table 6: Inclusion and Exclusion Criteria to Determine Review Sample**

Criteria	Higher Education	Sustainable Development Goals
Inclusion	Higher education is the context for, or primary focus of, the research	The UN SDGs are mentioned as a focus of the research, or a rationale for the research that is further elaborated upon
Exclusion	Higher education is only mentioned in connection to the main topic or is briefly mentioned as a factor in meeting the SDGs	Sustainable or development goals are used in the sense of meaning something growing and enduring in the long-term, or SDGs were only mentioned as a background to the research

Using the criteria, abstracts for each article were reviewed to determine if the article would be included in the final sample. Articles needed to meet the inclusion criteria for both higher education and the UN SDGs in order to be included, yielding a final sample of  $n=95$  (Figure 3).

<sup>21</sup> Arlene Fink, *Conducting Research Literature Reviews: From the Internet to Paper* (Sage Publications, 2019).

**Figure 3: Systematic Literature Review Process**



After the final sample was reached, bibliometric statistical data were gathered. This included the following information for each article: publication year, journal title, and author's affiliated country. This descriptive data was supplemented by a qualitative analysis of the keywords for each article, which were coded to match one of the 17 UN SDGs based on the description of each SDG.

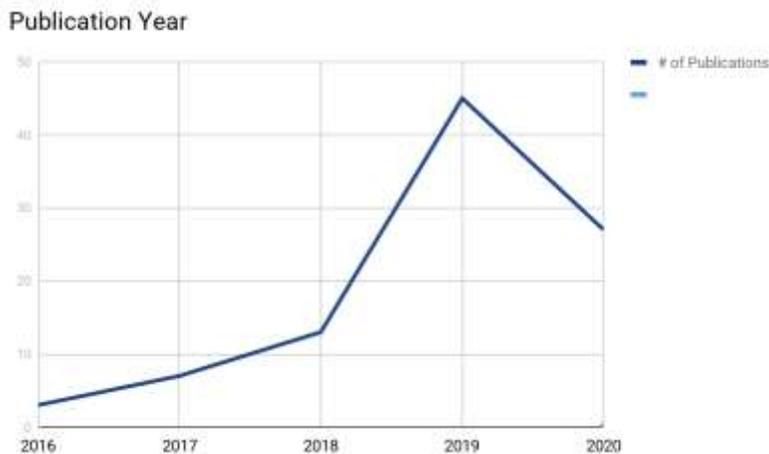
#### **IV. Discussion**

Data from the systematic literature provided a descriptive and qualitative understanding of research connecting higher education to the UN SDGs. This section presents the results, before discussing the findings in the broader context of teaching and learning related to sustainability in the following section.

##### *Publication Year*

Articles were collected from a publication range of 2016-2020 to gather research conducted after the ratification of the UN SDGs in late 2015. The results (Figure 4) demonstrate that initial research was slow to progress, but has since accelerated as the SDGs are implemented as a guiding set of objectives into higher education institutions and the role of higher education is increasingly recognized.

**Figure 4: Publication Year**



### Journals

While the articles have been published in a wide-range of journals ( $n=39$ ), they have been concentrated in a few primary outlets. A majority of the articles (51.57%) have been published in two journals: *Sustainability* ( $n=33$ ) and the *International Journal of Sustainability in Higher Education* ( $n=16$ ). Other journals in the sample are often focused on a specific content area that relates to a specific SDG that forms the focus of a certain research article (Table 7).

**Table 7: Publication Journal Titles**

Journal Title	# of Publications
Sustainability	33
International Journal of Sustainability in Higher Education	16
International Journal of Management Education	5
Higher Education	4
Cleaner Production	3
<i>All Other Journals</i>	34

### Geographic Context

Authors of the articles were affiliated with higher education institutions in 38 countries. These countries were primarily located in Western Europe, with some loci of research activity in parts of North America, Asia, and Africa (Table 8).

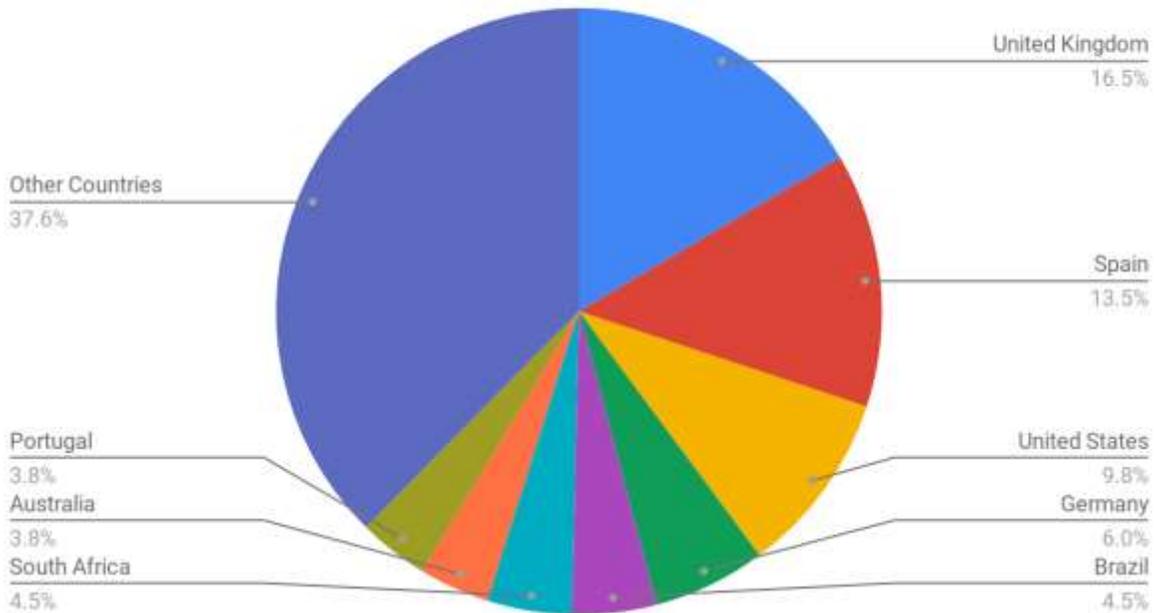
**Table 8: Affiliated Author Regions**

Region	# of Author Affiliations
Western Europe	75
North America	16
Asia	16
Africa	11
Latin America and the Caribbean	8
Oceania	5
Middle East	2

Within these regions, several countries stand out as areas of the most concentrated research activity. Specifically, the United Kingdom ( $n=22$ ), Spain ( $n=18$ ), and the United States ( $n=13$ ) were the countries with the greatest amount of author affiliations. However, these affiliations were distributed across a wide range of countries (Figure 5).

**Figure 5: Affiliated Authors by Country**

**Affiliated Authors by Country**



**Keywords**

The keywords for each article were analyzed using descriptive statistics to understand the most common themes of the research. Unsurprisingly, the most common terms related specifically either to higher education or the SDGs (Table 9).

**Table 9: Keywords**

Higher Education		Sustainable Development Goals	
<i>Keyword</i>	<i>n</i>	<i>Keyword</i>	<i>n</i>
Higher education	42	Sustainable Development Goals	44
Education for sustainable development	29	Sustainable Development	18
Universities	18	Sustainability	16

Beyond the keywords related to higher education or the Sustainable Development Goals, there were  $n=352$  keywords, composing a total sample of  $n=519$ . However, despite this multitude of topics, few keywords emerged as relevant in more than a few instances. The other keywords with a relatively high prevalence were: interdisciplinarity, critical thinking, competences, employability, and sustainability literacy.

**Sustainable Development Goals**

The keywords for each article in the final sample were coded to determine which of the

17 SDGs the article was most closely linked to. This analysis helped to illustrate how higher education institutions are addressing, and contributing to the pursuit of, the SDGs. Articles that focused solely on higher education and its relation to the SDGs generally were coded as addressing SDG 4 concerning quality education. The results suggest that the majority of articles relate to SDG 4 and the broad connection between higher education and the SDGs. However, SDG 8 (Decent work and economic growth), SDG 9 (Industry, innovation and infrastructure) and SDG 11 (Sustainable cities and communities) also were addressed in several instances. There were also several SDGs that were not addressed in any of the articles: SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 3 (Good health and well-being), SDG 6 (Clean water and sanitation), SDG 14 (Life below water), SDG 15 (Life on land) (Table 10).

**Table 10: Sustainable Development Goals Addressed in Article Keywords**

SDG	Description	# of Articles
1	No poverty	0
2	Zero hunger	0
3	Good health and well-being	0
4	Quality education	57
5	Gender equality	1
6	Clean water and sanitation	0
7	Affordable and clean energy	1
8	Decent work and economic growth	17
9	Industry, innovation and infrastructure	5
10	Reduced inequalities	1
11	Sustainable cities and communities	4
12	Responsible consumption and production	3
13	Climate action	1
14	Life below water	0
15	Life on land	0
16	Peace, justice and strong institutions	1
17	Partnership for the goals	1

## V. Discussion

By analyzing the data gathered from a systematic literature review of research related to higher education and the SDGs, this paper determined several insights for advances in this area. Responding to the first research question concerned with the characteristics of research

on this topic, this paper produced a profile of common features of the work linking these areas. The review and analyses suggest that research connecting higher education and the SDGs is an emerging topic, with studies primarily conducted in Western Europe. These studies often focus not on furthering specific SDGs, but integrating the SDGs into higher education policies, teaching and learning practices, and research. They also commonly comment on how to utilize higher education to advance collective abilities to meet the SDGs.

While these results are promising for suggesting strong connections between higher education and the SDGs, new directions may also help to make this link stronger and enhance its capacity to contribute to sustainability transformations. As the UN SDGs represent a global vision for achieving sustainability to be implemented locally, the finding that research connecting higher education to the SDGs is primarily occurring in a few concentrated areas (e.g., Western Europe) is troubling. Determining pathways to implement teaching and learning focused on the SDGs, and conducting and disseminating research on these processes, is necessary to facilitate increased capacity in other geographic regions to pursue the SDGs.

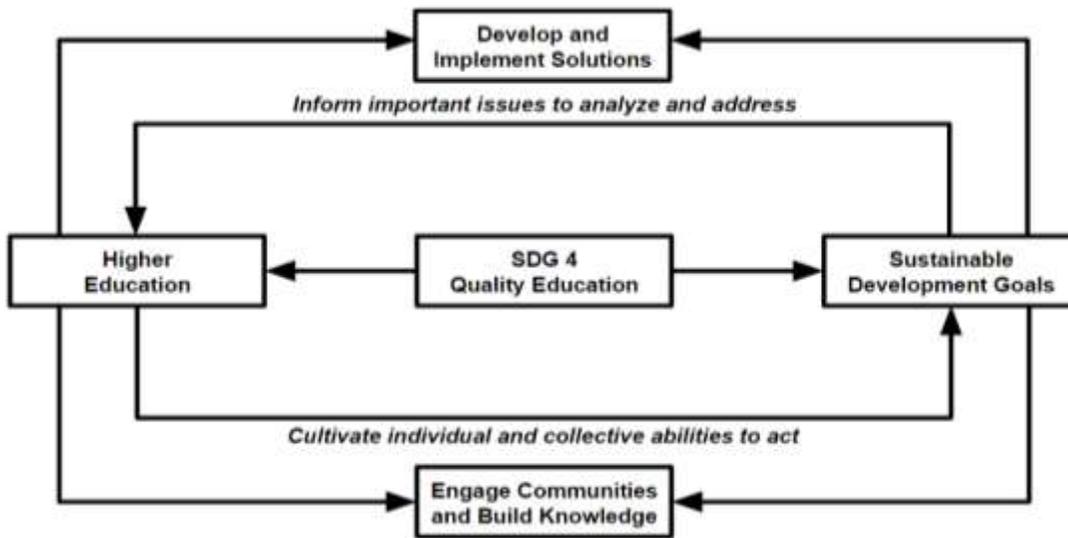
Another problematic finding is that the vast majority of research is focused on general implementation of sustainability and the SDGs into higher education, rather than focusing on teaching and learning about specific goals. Advancing more targeted educational efforts that build knowledge and skills around specific goals, especially those related to environmental conservation as well as social justice and well-being, will enable greater efficacy for students to individually and collectively address a variety of issues.

More work also needs to be done to diversify areas of focus concerning the themes and approaches of these teaching and learning processes, as suggested by the keyword analysis. Linking broader processes of connecting higher education and the SDGs to specific practices and perspectives, such as interdisciplinarity, critical thinking, sustainability competencies, or employability skills, will broaden and strengthen the body of research. It will also ensure that progress is made in not only helping to facilitate the pursuit of the SDGs, but in determining strategies for doing so in engaging and effective ways.

In regards to the second research question, concerned with how higher education can accelerate achieving the SDGs, this paper provides several implications for these efforts. First, higher education can facilitate the pursuit of the SDGs by creating opportunities to learn about their universal vision, approaches and mechanisms to addressing them, and the problems and potential solutions related to each of the 17 SDGs. This will entail respecting diversity not only of the issues pertinent to sustainability, but also towards the stakeholders seeking to enact these solutions as well as the contexts that they operate within. Second, higher education is a primary force in building the human capital that is essential to envision and create equitable, prosperous, and sustainable futures. Third, higher education can engage communities in tackling the wide-range of topics described in the SDGs by facilitating the co-production of knowledge and approaches that are inclusive, integrative, and adaptive, in order to address sustainability challenges. Finally, higher education can orient learners to take seriously the mounting complexity and uncertainty of sustainability challenges and inspire individual and collective action to pursue the SDGs with boldness, critical thinking, creativity, collaboration, and compassion.

The ways in which higher education and the SDGs influence each other and compel advances in both areas are diverse and significant. Developing a more nuanced and comprehensive conception of how these forces interact to shape knowledge, abilities, and attitudes for the creation of sustainability solutions is essential to fostering stronger connections between higher education and the SDGs (Figure 6).

**Figure 6: Connections between Higher Education and the Sustainable Development Goals**



The figure shows that SDG 4 helps to bridge higher education and the SDGs in a mutually reinforcing process of pursuing sustainability objectives. As identified in the literature and the analyses of this paper, higher education can play a critical role in advancing efforts to meet the SDGs by cultivating the knowledge, skills, and attitudes to act. But the vision of the SDGs also contributes to higher education policy, practice, and research discourse by offering a standardized set of key issues related to sustainability, human development, environmental vitality, and social-economic prosperity. Together, the forces and aspirations of higher education and the SDGs can converge to engage communities and build knowledge as a foundation for developing and implementing solutions in diverse contexts across local and global levels. Continuing to analyze, assess, and advance teaching, learning, and research approaches in higher education by integrating concepts connected to sustainability will prove to be imperative in meeting the challenge of achieving the SDGs.

## VI. Conclusion

This paper has demonstrated the strong link that connects teaching, learning, and research in higher education to the SDGs. This emergent field of research has made progress in charting these connections and furthering their ability to lead to positive outcomes for local and global communities. Yet this research has been produced by a primarily homogenous set of countries with a limited set of focuses. In order to advance the ability of higher education to contribute to pursuing the SDGs, teaching, learning, and research in this area must become more dynamic and diverse by expanding to new regions and more targeted inquiry on specific issues and goals. This will require openness, flexibility, and collaboration between experts in education and sustainability, as well as the inclusion of perspectives of stakeholders across a range of contexts and interests. Building this educational infrastructure and activity to its full capacity remains a challenge for the fields of higher education and sustainability. But by more closely linking these endeavors and recognizing how they can shape and benefit each other, the ambitions of the SDGs might become more tangible. Education has a central role to play in enacting the vision of the SDGs, but constructing this sustainable future will require patience, practicality, perseverance, and participation from a wide population. In other words, it will require that we teach each other how to care and why to act so that together we can learn to craft a better world for all.

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