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Embedded SDGs in undergraduate business sustainability programs curricula

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ABSTRACT

The aim of this article was to identify the embedded Sustainability Development Goals (SDGs) in undergraduate business sustainability programs curricula. A purposive sample of 23 programs was analyzed. The sources of data were the secondary data published by the universities about the program curricula, together with the course descriptions. Course descriptions were analyzed. This study revealed that the most aligned SDG is goal 12: responsible consumption and production. The programs were clustered according to the sustainability dimensions of the embedded SDGs in three general clusters. The courses differed in their alignment with the SDGs. This is one of the few studies investigating the degree of alignment between the undergraduate curricula of business sustainability programs and the SDGs.

KEYWORDS

Alignment; business; curriculum; sustainability; Sustainable Development Goals (SDGs); undergraduate

Introduction

The United Nations General Assembly in 2015 formulated 17 Sustainable Development Goals (SDGs) as part of the 2015 development agenda; it is a call to countries for action regardless of economic status, whether low, middle, or high income, to promote prosperity and social and physical well-being. It is a framework for building economic growth, protecting the environment, and addressing such social needs as health, education, social protection, and job opportunities (United Nations, 2023).

The SDGs replaced the Millennium Development Goals that were adopted from 2000 to 2015. SDGs are not binding, but governments should take responsibility for implementing and monitoring them through formulating nationwide action (Eurostat, 2023). Increasingly, organizations must be more committed to the triple bottom line (TBL), which amplifies the business focus of tracing performance from merely financial to environmental and social as well (Abdelgaffar, 2021; Nwagwu, 2020).

This requires all institutions and organizations to make transformative changes and also requires more skilled and knowledgeable people in the areas related to sustainability. Thus, the changes imposed by the SDG agenda are both opportunities and challenges for organizations (Holmes et al., 2022). Universities

play a crucial role in attaining these SDGs and achieving overall success for the 2030 agenda (Holmes et al., 2022; Weybrecht, 2022).

Education was nominated as a key actor to promote sustainable development and corporate social responsibility by the Principles of Responsible Management Education (PRME) of the United Nations in 2007. Eight years later, UN SDGs influenced PRME, guiding the education process and curricular design (Parkes et al., 2017). The SDGs form an effective means of embedding sustainability in the university's curricula and strategies (Mori Junior et al., 2019).

This requires the capabilities of the whole institution, covering different dimensions through research, learning, teaching, governance, and social leadership (Agbedahin, 2019; MacFarlane, 2019). Only then can universities provide their students with the required knowledge and skills (López, 2022).

There is still debate about whether some courses can be delivered within the current curriculum or whether universities should develop a new sustainability-focused curriculum (Anyolo et al., 2018; Hays & Reinders, 2020; Kioupi & Voulvoulis, 2020). Universities around the world have increasingly claimed that they can deliver sustainability-oriented programs and equip their graduates with adequate sustainability-related knowledge and skills

(Fuertes-Camacho et al., 2019; O’Byrne et al., 2015; Perera & Hewege, 2016).

Business schools, too, tend to promote themselves as sustainability-focused institutions. Accordingly, the universities can adopt SDGs as a part of their strategy (Fisher & McAdams, 2015), integrate SDGs with their curricula by teaching SDGs in business subjects, such as management, marketing and economics (Beddewela et al., 2017), and/or adopt specialized degrees in business sustainability as major or minor programs (Nicholls et al., 2013).

Previous studies have examined the degree of alignment between the conventional (not sustainability focused) undergraduate curricula and SDGs (e.g. Chaleta et al., 2021; Leal Filho et al., 2019; Petillion et al., 2019; Rajabifard et al., 2021), or between a particular course (e.g. Arslan & Curle, 2021; Fang & O’Toole, 2023; López, 2022) and the SDGs. A few studies have investigated the degree of alignment between the specialized sustainability programs and SDGs, in which the programs under investigation were master’s degree programs in disciplines other than business (e.g. Kioupi & Voulvoulis, 2020).

Previous studies have rarely examined the differences across undergraduate programs in the degree of curricular alignment with SDGs (e.g. Kioupi & Voulvoulis, 2020). Moreover, the differences in alignment between the disciplines and SDGs have not been examined in many studies (e.g. Chaleta et al., 2021; Rajabifard et al., 2021).

The contribution of the present study is its investigation of the degree of curricular alignment with SDGs for undergraduate business programs specializing in sustainability. It also contributes to global studies, since most studies of this kind focus on studying such programs in a single country. Furthermore, it studies the degree of alignment of sub-business disciplines with SDGs. This being the case, the objectives of this study are:

1. Identifying the degree of alignment between SDGs and business sustainability undergraduate programs curricula,
2. Clustering business sustainability undergraduate programs according to the degree of curricular alignment with SDGs, and
3. Identifying the degree of alignment between the subdisciplines of programs curricula and SDGs.

The rest of this article is divided into five sections. The first is the literature review and conceptual framework, followed by the methodology, the data analysis results and findings, the discussion of the results, and,

finally, a section for the conclusions, study limitations and applications.

Literature review and conceptual framework

The contribution from previous studies can be classified into a set of research streams according to their scope. Some studies have focused on identifying the alignment of SDGs with different courses in different majors within a general specialization, like the alignment with a social studies curriculum courses unit and departments (e.g., Chaleta et al., 2021). Other studies have focused on examining the alignment between SDGs and different subjects belonging to different majors (e.g., Rajabifard et al., 2021). Previous studies have focused on increasing students’ engagement and interest in SDGs through developing the course content (Petillion et al. 2019). The contribution of these studies is limited. The courses of conventional programs, not specialized in sustainability, have been studied, and all the investigated programs were located in one country.

Other studies expanded the scope by investigating the degree of alignment between SDGs and different aspects of academic programs, for example the alignment with class assignments, projects, teaching resources, and the curriculum (e.g. Leal Filho et al., 2019), as well as pedagogy design, students’ experience, graduate outcomes, and institutional leadership and initiatives (Holmes et al. 2022). Leal Filho et al., (2019) and Holmes et al. (2022) investigated universities located in different countries, regions, and continents. The investigated programs were conventional, not specializing in sustainability.

Another group of researchers focused on how to promote the integration of sustainability knowledge in a particular course, whether by adopting innovative teaching methodologies or adopting digital platforms (López, 2022), or by examining the degree of alignment with a particular course syllabus or textbook (Arslan & Curle, 2021). Some of these studies focused on finding the alignment between SDGs and a business course (Fang & O’Toole, 2023), or assessing the impact of launching a sustainability-training course covering the UN 2030 agenda on developing the leaders’ understanding of sustainability issues and improving their mitigating skills with the most urgent sustainability issues (Arruda Filho et al. 2019). All of these studies investigated conventional courses, not focused on sustainability, in a single country.

The last group of researchers studied the degree of alignment between SDGs and sustainability and environmental-oriented programs at the graduate level. The differences between environmental or sustainability-

oriented programs according to their alignment with SDGs were examined (Kioupi & Voulvoulis, 2020). This is one of a few studies investigated masters' programs; but most of studied programs existed in the UK and in some European countries.

The curricula alignment with SDGs

The students positively perceived the inclusion of SDGs in their course learning outcomes (Petillion et al., 2019). Half of the undergraduate social studies courses aligned with SDGs, the most notable SDGs in the curriculum courses being goal 5: Gender equity and goal 10: Reduced inequity, while less-aligned goals were goal 3: Good health and well-being and goal 11: Sustainable cities and communities (Chaleta et al., 2021).

The curricula of the sustainability and environmental masters' programs show high alignment with the SDGs related to environmental issues but no alignment at all with health and well-being, or with transparency and governance-related SDGs (Kioupi & Voulvoulis, 2020). The global study of Leal Filho et al. (2019) showed that 32% of the universities fully integrated the SDGs in teaching. However, 40% of the universities showed partial integration of teaching with the SDGs. The most-addressed SDGs in teaching were goals 4 (Quality education), 11 (Sustainable cities and communities), and 13 (Climate actions).

The previous discussion leads to the view that SDGs showed different degrees of alignment with course programs. Some SDGs have a high degree of alignment, some a moderate degree, while others have a low degree of alignment. The other notable result is that a limited number of SDGs (two or three of them) showed a high degree of alignment.

Proposition 1: Different SDGs aligned in different degrees with business sustainability curricula undergraduate programs

Curricular alignment with SDGs as differing across programs

Previous studies rarely examined the differences between undergraduate programs in the degree of curricular alignment with SDGs. However, some results related to the differences in the alignment with SDGs of the masters' degree curricula were found. For example, the environmental-oriented master's programs show no alignment with collaboration, transparency and governance, and diversity and inclusion. Health and well-being-related SDGs show moderate to low alignment with the environmental and economic

dimensions of the environmental-oriented programs. However, sustainability-oriented master's programs show no alignment with health and well-being, diversity and inclusion, and collaboration, but they do show low to high alignment with environmental and economic dimensions (Kioupi & Voulvoulis, 2020).

Proposition 2: Business sustainability undergraduate programs clustered in different groups according to the degree of curricular alignment with the SDGs

Differences in the alignment of curricular disciplines with SDGs

Not many studies have examined the differences in alignment between disciplines and SDGs (except, e.g., Chaleta et al., 2021; Rajabifard et al., 2021). According to these studies, the social studies departments integrated differently with SDGs. Departments of economics and management integrated better with decent work and economic growth, while other departments better aligned with the goals related to gender equity (Chaleta et al., 2021). Not all undergraduate subjects aligned with the SDGs, and some subjects aligned with more than one SDG; moreover, some university schools show weak alignment with sustainability (Rajabifard et al., 2021). The students learned about SDGs from capstone business courses better than other courses (Fang & O'Toole, 2023).

Proposition 3: Disciplines of business sustainability undergraduate programs differ in their degree of alignment with SDGs

Methodology and methods

Sample of study

This study used purposive sampling by adopting the criteria of defining the academic programs to ensure the inclusion of all available programs in the sample. These criteria were the program's major, the program's academic degree, and the scope of the program's courses (Capponi & Barber, 2020). Accordingly, the following criteria were used to select the programs:

1. The program is specialized in business sustainability. Such programs take many names, such as Managing for Sustainability, Sustainable Management, Management: Business Sustainability, etc.
2. These programs differ from conventional business programs in delivering courses specialized in business sustainability, for example, Management of Sustainable Enterprises, Environmental

Sustainability for Business, Environmental Problem Analysis for Business, etc.

- It should be a major first-degree program. The student may be awarded a bachelor's degree in business sustainability, or a bachelor's degree in science in sustainability management, or a bachelor's degree in business and the environment. Almost all these programs last for three years or thereabouts.

To identify the list of programs according to the above criteria, the following procedures were followed:

- Identifying the list of bachelor programs in business sustainability as a major program, using the website of Bachelorsportal, <https://www.bachelorsportal.com/>, and the list QS World University Ranking by subjects (QS, 2023). Bachelorsportal was the main source of the study sample because it is a database which includes the largest list of universities worldwide. It is a well-organized database with an easy-to-use filtering function. It includes all universities regardless of their rankings. However, the QS database was used to ensure that all the ranked universities were included in the sample list. Also, using these two well-known databases to identify the list of universities was to ensure the inclusion of all available programs in the sample.
- The keyword used for searching programs was sustainability, and the region was identified in the searching field "where to study."
- The filtering function was used to filter the programs, choosing business and management programs.
- All regions were investigated: North America, South America, Europe, Middle East, Asia-Pacific, and Africa.

Table 1 shows the list of investigated programs. All the available programs around the world were studied. Most of them are located in North America and Europe. A very limited number of programs could be found in Asia.

Sources of data and data collection

Table 2 shows the study variables, definitions, and the sources of data. The sources of data were the secondary data published by the universities about the program curriculum and course descriptions. The curricula were used to identify the list of courses; then, the descriptions of the 278 courses in all the curricula were summarized and analyzed.

Content analysis

1. A description of each course was analyzed by searching first for the inclusion of one or more keywords related to each SDG. The keywords belong to each SDG that was traced in the course description, as listed in Table 3. Please see Example (1).

Example (1) how to analyze the course description

University: Oklahoma State University **Course name:** MAGMT 4463 Industrial Ecology for Business

Country: United States

Step 1: Underline the keywords in the course description

Course description: "Provides students with an overview and broad understanding of ecology principles as applied to an industrial setting. The course begins with an overview of general ecological principles such as ecosystem components and structures, biogeochemical cycles, energy flows, and properties of populations. The course concludes with a consideration of industrial ecology principles such as sustainability, pollution prevention, life-cycle assessment and waste minimization."

Step 2: Mapping keywords with SDGs

Keywords	SDG
<u>Biogeochemical cycles</u>	Goal 6: Clean water and sanitation
<u>Energy flows</u>	Goal 7: Affordable and clean energy
<u>Industrial ecology</u>	Goal 12: Responsible consumption and production
<u>Pollution prevention, life cycle assessment, waste minimization</u>	Goal 13: Climate actions
<u>Ecological principles such as ecosystem components and structures, biogeochemical cycles, and properties of populations</u>	Goal 14: Life below water Goal 15: Life on land

2. Next, a summary matrix including the university's name, SDGs, and the list of courses covering SDGs was developed. Table 4 is an example of this matrix.

3. The frequency of courses covering each SDG for each university program was computed.

4. The degree of alignment between the curriculum and each SDG was identified by dividing the number of courses covering a particular SDG to the total number of courses in the curriculum, an approach adopted by Chaleta et al. (2021). The larger the percentage, the better the alignment with SDG. Table 5 shows an example of steps 3 and 4.

5. SDGs were classified into different levels of alignment by using the Microsoft Excel Quick Analysis tool. The adopted function was Color Scale. Cells were shaded to different colors that correspond to

Table 1. List of investigated programs.

Country	University name	Website	Program name
USA	Arizona State University	https://degrees.apps.asu.edu/major-map/ASU00/BABUSSBA/null/ALL/2022#trackgroup	Business (Sustainability)
USA	Bucknell University	https://coursecatalog.bucknell.edu/collegeofmanagementcurricula/areasofstudy/managementandorganizations/#managingforsustainability	Managing for Sustainability
USA	University of Wisconsin–Parkside	https://sustain.wisconsin.edu/sustainability-programs/curriculum-and-courses/bachelors/?lead_source=UW-PKWebsiteReferral&utm_source=UW-PKWebsiteReferral&utm_medium=referral	Sustainable Management
USA	Goshen College	https://www.goshen.edu/academics/sustainability-management/course-listings/	Sustainability Management (Major)
USA	Oklahoma State University	http://catalog.okstate.edu/spears-business/management/business-sustainability-bsba/	Management: Business Sustainability
USA	Western Washington University	https://cbe.wvu.edu/mgmt/business-sustainability	Business and Sustainability
USA	New England University	https://www.une.edu/cas/business/programs/bs-sustainability-and-business/curriculum	Sustainability and Business
USA	University of Pennsylvania	https://esg.wharton.upenn.edu/students/undergrad-enviro-concentration/	Business, Energy, Environment, And Sustainability
UK	University of Warwick	https://warwick.ac.uk/fac/arts/schoolforcross-facultystudies/gsd/prospectivestudents/undergraduate/joinhonours/gsdbusiness/	Global Sustainable Development and Business Studies
UK	University of Exeter	https://www.exeter.ac.uk/study/undergraduate/courses/business/business-environment/	Business and Environment
UK	Regent's University London	https://www.regents.ac.uk/undergraduate/business/ba-hons-business-and-sustainability?gclid=EAlaQobChMli5Gduon8_AlVeYxoCR3wrA36EAAYiAAEgIK7vD_BwE	Business and Sustainability
UK	Staffordshire University	https://www.staffs.ac.uk/course/business-management-sustainability-ba-uceb	Business Management and Sustainability
UK	University of Leeds	https://courses.leeds.ac.uk/a467/environment-and-business-ba#content	Environment and Business
Canada	McGill University	https://www.mcgill.ca/study/2022-2023/faculties/desautels/undergraduate/programs/bachelor-commerce-bcom-major-managing-sustainability	Major Managing for Sustainability
Canada	University of Waterloo	https://uwaterloo.ca/future-students/courses/sustainability-financial-management	Sustainability and Financial Management
Canada	Simon Fraser University	http://www.sfu.ca/students/calendar/2023/spring/programs/sustainable-business/joint-major/bachelor-of-business-administration-or-bachelor-of-environment.html	Sustainable Business Joint Major
Ireland	University College–Dublin	https://www.myucd.ie/courses/sustainability/sustainability-business-economics/	Sustainability with Business and Economics
Germany	Kühne Logistics University	https://www.the-klu.org/degree-programs/choose-your-program/bachelor-in-business-administration/sustainable-management/	Sustainability Management
Hong Kong	The Hong Kong University of Science and Technology	https://sgfn.hkust.edu.hk/curriculum/courses	Sustainable and Green Finance
Switzerland	Sustainability Management School: Business School	https://sumas.ch/lp-bba-in-sustainability-management/?utm_source=google&utm_medium=cpc&utm_campaign=15689796659&utm_content=133007864313&utm_term=bba&gclid=EAlaQobChMI-5iP4oT8_AlVixRCh018wVkeAAAYiAAEgIzR_D_BwE#form	Sustainability Management
Australia	James Cook University	https://www.jcu.edu.au/courses/bachelor-of-business-and-environmental-science	Business and Environmental Science
Sweden	Jönköping University	https://ju.se/en/study-at-ju/our-programmes/bachelor-programmes/sustainable-enterprise-development.html#showmore-Factsandrequirements	Sustainable Enterprise Development
Malaysia	UCSI University	https://www.ucsiuniversity.edu.my/programmes/bachelor-international-and-sustainable-business-honours	International and Sustainable Business

minimum, midpoint, and maximum thresholds (Microsoft, 2024). According to the coloring of the results, the degree of alignment was assigned to one of seven levels. The category levels were identified according to the recommended scale options of Vagias (2006).

The courses aligned with each SDG were classified into subdisciplines for the purpose of identifying the

degree of alignment between the subdisciplines of each curriculum and SDGs, as follows:

1. The subdisciplines list had these headings: sustainable organizational development, sustainable organizational behavior, sustainable human resources management, sustainable operations, and supply chain management, etc.

Table 2. Study variables' definition.

Variable	Definition	Source of data
Embedded SDGs in the curricula or discipline	The top 10% aligned SDGs with curricula or discipline	Published programs curricula Course descriptions
Types of curricula	The clustering of curricula according to number of embedded SDGs in the curricula	Published programs curricula Course descriptions
Curricula discipline (s)	The field of study that the curriculum course belongs to, such as sustainable management, sustainable marketing, sustainable economics, etc.	Course descriptions

Table 3. Example of some keywords used in analyzing course description (source: Reid, 2020).

SDG	Keywords				
SDG1	Poverty	Wealth distribution	Income distribution		
SDG2	Agriculture	Food	Insecurity	Hanger	
SDG3	Health	Well-being			
SDG4	Education	Equitability	Inclusive		
SDG5	Gender	Women	Equality	Inequality	Girl
SDG6	Sanitation	Water			
SDG7	Wind	Solar	Geothermal	Hydropower	Renewable
SDG8	Labor	Worker	Employment	Wage	
SDG9	Infrastructure	Industry			
SDG10	Trade	Inequality	Taxation	Financial market	
SDG11	Urban	Cities	Rural		
SDG12	Production	Consume	Waste	Natural resources	Recycle
SDG13	Greenhouse	Climate	Global warming	Weather	Climate crisis
SDG14	Marine	Water	Fish	Ocean	
SDG15	Ecology	Biodiversity	Forest	Land use	Conserve
SDG16	Peace	Rights	Governance	Justice	Institutions

2. The subdiscipline of each aligned course with a particular SDG was identified.
3. The frequency of courses belonging to each subdiscipline was identified.
4. The frequencies of each course subdiscipline were divided by the number of courses belonging to each discipline under each curriculum heading. The result was the degree of each subdiscipline's alignment with a particular SDG.

The aim of this article was to find the SDGs that the sustainability business curricula most often addressed. Accordingly, the 10% of subdisciplines most aligned with SDGs were identified by using Microsoft Excel Quick Analysis.

The programs' embedded SDGs were clustered according to their adherence to sustainability dimensions. The classification of goals was as follows: the economic dimension is embedded in SDGs 8–10 and 12. The society dimension is embedded in SDGs 1–5, 7, 11, and 16. The environmental dimension is embedded in SDGs 6 and 13–15 (Folke et al., 2016).

Data analysis and findings

The embedded SDGs in business sustainability programs

Table 6 shows the clusters of SDGs according to their alignment with courses in the curricula. All the SDGs

are aligned with the curricula but with different percentages and ranks. The most highly aligned goal is goal 12. Other highly aligned goals are goals 11 and 13. The less highly aligned goals are goals 2, 5, 8, 9, 10, and 15. The moderately well-aligned goals are 7 and 16. The slightly less well-aligned goals are goals 4, 6, and 14. One poorly aligned goal is 17, but the worst aligned goals are 1 and 3.

Clustering program curricula according to the embedded SDGs

Figure 1 shows the clusters of programs according to sustainability dimensions interlinked with the SDGs embedded in curricula courses. The largest number of programs (14 programs) belong to one dimension of sustainability: nine programs belong to the economic dimension; one program belongs to the social dimension; and four programs belong to the environmental dimension.

The second cluster of programs belongs to two dimensions of sustainability. They number seven programs in all, five programs belonging to the economic and social dimensions and two programs belonging to the economic and environmental dimensions. The lowest number of programs (two programs) covered all the dimensions of sustainability.

Most programs belonging to one dimension of sustainability had a single embedded SDG (11 programs),

Table 4. Example 2: summary matrix of the courses and its corresponding SDGs.

University	List of course	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17
Oklahoma state university	Industrial Ecology for Business						Yes	Yes					Yes	Yes	Yes	Yes		
	Business, Government, and Society Management of Sustainable Enterprises											Yes						Yes
	Environmental Sustainability for Business												Yes					
	Management and Ethical Leadership					Yes			Yes		Yes							
	Corporate and Social Responsibility					Yes			Yes		Yes	Yes						
	Economics of the Environment												Yes					
	Environmental Problem Analysis for Business												Yes					
	Environmental Management Practicum for Business												Yes					
	Applied Environmental Standards for Business Managers												Yes					
	Social Issues in the Marketing Environment													Yes				

Table 5. Example 3: how to compute the frequency of courses covered by each SDG and the degree of alignment.

University		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	Total number of courses
Oklahoma state university	Step 3: Frequency of courses covered each SDG				2	1	1	2			2	2	8	1	1	1	1		22
	Step 4: % of courses				2/22	1/22	1/22	2/22			2/22	2/22	8/22	1/22	1/22	1/22	1/22		
					0.091	0.045	0.045	0.091			0.091	0.091	0.36	0.045	0.045	0.045	0.045		

Table 6. Clusters of SDGs according to the percentage of curricula's courses aligned with SDGs.

SDGs	Mean (% of courses)	Degree of alignment ^a
Goal 12: Responsible consumption and production	24.91%	Extremely High
Goal 13: Climate actions	15.81%	
Goal 11: Sustainable cities and communities	9.48%	High
Goal 2: Zero hunger	7.8%	
Goal 8: Decent work and economic growth	6.81%	
Goal 9: Industry, innovation and infrastructure	6.53%	
Goal 10: Reduced inequality	5.43%	Slightly high
Goal 5: Gender equity	5.01%	
Goal 15: Life on land	4.02%	
Goal 7: Affordable and clean energy	3.85%	Moderate
Goal 16: Peace and justice strong infrastructure	3.78%	
Goal 6: Clean water and sanitation	3.01%	
Goal 14: life below water	2.92%	Slightly low
Goal 4: Quality education	2.90%	
Goal 17: Partnership to achieve the goals	2.59%	Low
Goal 3: Good health and well-being	1.95%	
Goal 1: No poverty	1.90%	Extremely Low

^aScale was generated by Microsoft Quick Analysis Coloring Scale.

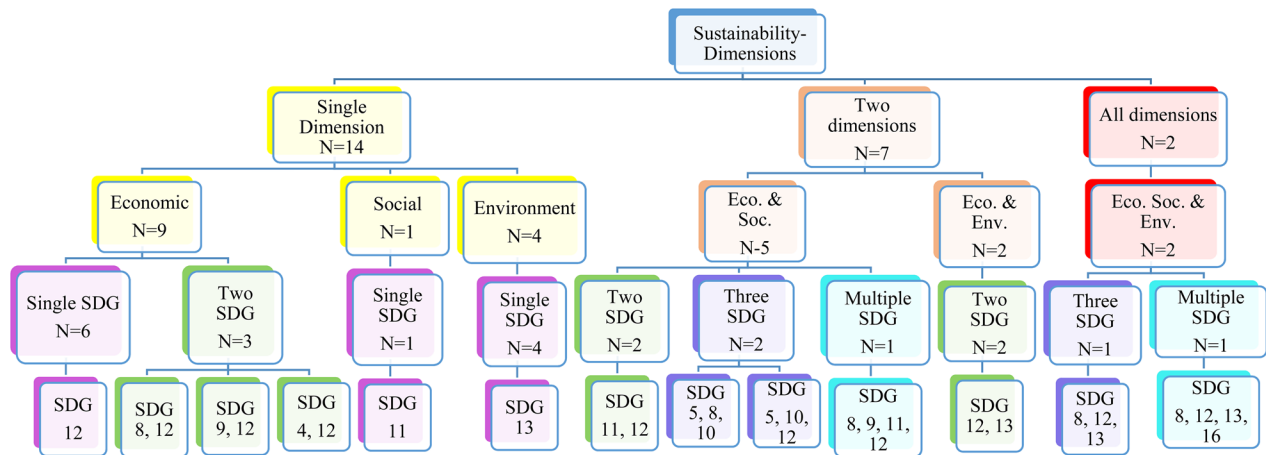


Figure 1. Clusters of programs according to embedded SDGs.

but three programs belonging to the economic dimension had two embedded SDGs. Four programs belonging to two dimensions of sustainability had two embedded SDGs, and two programs belonging to two dimensions of SDGs had three embedded SDGs. One program had multiple embedded SDGs. One program belonging to all the dimensions of sustainability had three embedded SDGs and another program had multiple embedded SDGs.

The courses well aligned with SDGs

Table 7 shows the top 10% of courses regarding the degree of alignment with SDGs. Some courses are well aligned with multiple SDGs (for example, sustainable strategy management course, corporate social responsibility (CSR) course, and environmental management course), while other course are aligned with one SDG (for example, sustainable risk management course and introduction to sustainability management course), or aligned with two SDGs (for example, sustainable legal course, introduction to sustainable economics, and sustainable research methods course). Most of the courses, about eight in number aligned with one or two SDGs, but five courses are well aligned with three or more SDGs. Only one course is well aligned with all the SDGs. Most courses belong to the management discipline; only two courses (an introduction to sustainable economics and a course on energy/alternative energy) belong to the discipline of economics.

Discussion

According to the results in Table 6, all SDGs are aligned with the curricula but with different percentages and ranks of alignment. This indicates the

holistic concern about SDGs shown by the business sustainability programs. The sustainability impact of business institutions is multidimensional; therefore, business institutions must be more intensely committed to the Triple Bottom Line (TBL) (Abdelgaffar, 2021; Nwagwu, 2020).

Goal 12 is the most closely aligned goal with the business curricula. Goals 11 and 13 are also very highly aligned goals. This result is inconsistent with the study by Chaleta et al. (2021), in which the most notable SDGs in the social studies curriculum courses were found to be goal 5 and goal 10. But it is partially consistent with the study by Leal Filho et al. (2019), where the most often addressed SDGs in teaching were goals 4, 11, and 13. This indicates the differences in the alignment of SDGs according to the individual majors of the program. However, some SDGs, like SDG 11 and 13, could be shared across program majors.

The extremely high alignment of SDG 12 is a result that is consistent with the advice that business organizations should take the strongest actions toward more responsible production and consumption. The most influential actions business institutions can take are related to producing products, for such actions are responsible for the greatest impact on the level of economic, social, and environmental sustainability (Tseng et al., 2013). The consumption and production of products are responsible for a large number of environmental problems, ranging from water, air, and soil pollution to increased consumption of resources and negative health impacts (EU Science Hub, 2023).

As shown in Figure 1, the programs belong to different clusters: six general clusters according to sustainability dimensions and ten subclusters according to the number of SDGs. Accordingly, each program has its own learning outcomes, skills, and knowledge, which will affect the curricular alignment

Table 7. Top 10% of courses regarding the degree of alignment with SDGs as generated by Microsoft quick analysis.

Courses	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG16	Total
Sustainability strategy management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
corporate social responsibility (CSR)		Yes		Yes			Yes	Yes		Yes	Yes	6
Environmental Management		Yes	Yes	Yes					Yes	Yes		5
Sustainable Organizational Behavior		Yes			Yes		Yes				Yes	4
Sustainable Organizational Development and innovation	Yes					Yes					Yes	3
Sustainable legal Introduction to Sustainable Economics							Yes	Yes		Yes	Yes	2
Sustainability Research Methods	Yes					Yes						2
Sustainable Risk Management						Yes						1
Sustainable International Business Management						Yes						1
Introduction to Sustainability Management								Yes				1
Sustainability Marketing Management									Yes			1
Energy/Alternative Energy					Yes							1

with the SDGs (Kioupi & Voulvoulis, 2020). The largest number of programs (fourteen programs) belong to one dimension of the sustainability cluster; nine programs belong to the economic dimension cluster. The most frequent SDG is 12; as discussed earlier, the most influential actions taken by business institutions are related to producing products, which is responsible for the greatest impact on economic, social, and environmental sustainability (Tseng et al., 2013).

The second cluster of programs is that belonging to two dimensions of sustainability (seven programs). Five programs belong to the economic and social dimensions. The SDGs that are more frequent in the subclusters of economic and social-oriented programs are goals 5, 8, 10, and 12. These goals are interrelated. Gender inequity is the silent feature in the workplace that obliges policies to be formulated to overcome gender inequality (Sobering, 2016). There is a positive relationship between gender equity and growth (Amin et al., 2015); women's businesses provide a range of necessary services in rural areas (Tillmar et al., 2022). Inequality in the income of a population is not only socially dangerous but also adversely affects

production in modern societies (Ziyaviddinova, 2019). An organization's inequality footprint adversely affects the economic benefits that otherwise would reach widely into society (Riaz, 2015). Accordingly, through providing students with more focused learning, concern about these goals from some programs is consistent with business requirements.

Table 7 shows that most courses, eight altogether, are aligned with one or two SDGs. However, five courses are well aligned with three or more SDGs. Only one course, as noted above, is well aligned with all SDGs. This indicates a systematic and holistic concern about SDGs shown in the curricula of business sustainability programs (Agbedahin, 2019; Cicmil, et al., 2017; Sáez de Cámara et al., 2021; Sonetti et al., 2019).

Conclusion, limitations, and implications

This is one of a few studies that have examined the degree of curricular alignment between the bachelor's degree business programs that specialize in sustainability and the UN's SDGs. Several aspects have been examined, such as the differences between the

programs and the curriculum subdisciplines. This study targeted all the available programs in many different countries and regions. Course descriptions of all the curricula were analyzed and the content analysis techniques for course descriptions were adopted.

The main results of this study were as follows: SDG 12 is extremely highly aligned, and SDGs 11 and 13 are highly aligned with the curricula. The programs were clustered according to the sustainability dimensions of the embedded SDGs, falling into three general clusters and six subclusters. Some courses were aligned with multiple SDGs, and other courses were aligned with one or two SDGs.

This study can help academic decision makers to design the business sustainability curriculum more wisely. They can identify the general mode of the program that they intend to design by using [Figure 1](#). For example, they can choose the economic-focused sustainability program. Under this program mode, they have two options, one of which is to adopt a single SDG. If they choose a single SDG, then SDG 12 is the one to recommend. Next, they can identify which courses are best aligned with the program SDG by matching the chosen SDG with the courses in [Table 7](#).

To foster the students' sustainability knowledge and skills related to SDGs 11, 12, and 13 (highly aligned SDGs) requires a pedagogy that fosters the students' ability to think critically and encourages them to make responsible and ethical decisions. One of the recommended pedagogies for sustainability is the reflection pedagogy. According to this pedagogy, the instructor can use a reflective writing-learning session. After a discussion session of a sustainability topic, the students would be encouraged to explore the relationship between SDGs and business practices and to what extent the student believes in such practices (Ayers et al., 2020). Moreover, adopting simulation pedagogy (for example, adopting a game simulation adopting a prisoner's dilemma analysis), and using value and purpose reflection exercises may be helpful.

The results of this study are interesting for UNESCO. UNESCO supports countries in achieving their national sustainable development strategies through its specialization in education, culture, and science. UNESCO contributes directly to eight SDGs (SDGs 4, 5, 6, 11, 13, 14, 15, and 16) (United Nations, 2020). The decision makers of UNESCO can rely on the results of this study in their future recommendations for business schools to achieve a better alignment of SDGs with business sustainability programs. On the other hand, this study provides UNESCO decision makers with feedback about the extent of sustainable business curricula contribution in achieving the UNESCO mission.

The high alignment of business sustainability curricula with SDGs 11 and 13 indicates for a significant contribution in achieving the UNESCO mission.

The results of this study are helpful for academics and researchers who are concerned about tracing the progress of universities' adoption of the UN sustainability development agenda, particularly the items belonging to the UN and other global institutions. Furthermore, this study represents a major contribution to the body of research related to sustainability-education researchers and academics; it stands as a benchmark study, since it is the first study that has examined the degree of alignment with SDGs among the undergraduate business sustainability programs. The conceptual framework of this study could be adopted by future researchers.


Despite the significant contribution of this study, it has some limitations. This study covered all the available first-degree programs specializing in business sustainability, which total 23. In the future, the number of programs is expected to increase, so it is recommended to repeat this study again with a larger sample size. This study focused on one dimension of sustainability education, namely, curriculum design, so future studies can investigate pedagogy design, the students' experiences, the graduates' outcomes, and the institutional leadership. This study is based solely on public course descriptions. Accordingly, future studies can investigate students' experience by using a different methodology such as students' opinion survey. It is also recommended to conduct comparative studies across different sustainability majors, such as studying the differences between business-oriented and non-business-oriented programs.

Conducting more in-depth analysis for the cases that show a high alignment with SDGs would also be fruitful, for example, analyzing other aspects, such as the impact of this alignment on the program sustainability ranking (such as the QS sustainability ranking), students' awareness of sustainability issues, or the factors affecting the degree of alignment of SDGs, and get feedback from industry professionals about the quality of the graduate students in terms of their sustainability-related knowledge and skills.

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