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Sustainable Development in Higher Education in Nordic Countries: Exploring E-Learning Mechanisms and SDG Coverage in MOOCs

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Abstract

Purpose: This study has two aims: 1) to explore the extent and types of E-Learning used, as method and tool, to support education for sustainable development (ESD); and 2) to understand the coverage of Sustainable Development Goals (SDGs) in massive open online courses (MOOCs).

Design/methodology/approach: The study extends the morphological box of ESD in higher education by non-formal and informal education, exploring types of blended and online learning, and adding the SDGs as a new criterion. The study subjects are Nordic UN Principles of Responsible Management Education (PRME) members. Through content analysis and thematic coding of reports by higher education institutions (HEIs), different E-Learning methods are identified; furthermore, 30 MOOCS are analyzed.

Findings: HEIs apply a variety of blended and online learning to advance ESD for formal and non-formal education. The MOOCs offered by Nordic HEIs predominantly cover four SDGs (9: Industry, Innovation, and Infrastructure; 13: Climate Action; 11: Sustainable Cities and Communities; and 16: Peace, Justice and strong Institutions), but there is nothing on SDG 2: No Hunger. That is in line with the Nordic countries status as developed economies, where these topics are often framed as political and societal priorities.

Originality/value: This study shows how business schools, especially Nordic UN PRME members, contribute to the SDGs by their MOOC coverage.

Practical implications: Our results suggest that to avoid overlaps and fill gaps in ESD, the offer of open online courses should be orchestrated. Furthermore, HEIs can use our method to analyze their E-Learning courses related to SDGs.

Keywords: E-Learning; blended learning; online learning; higher education; education for sustainable development; sustainable development; SDGs; Agenda 2030; Massive Open Online Course; MOOCs; Nordic Principles for Responsible Management Education

1. Introduction

Contemporary society needs radically expanding and increasing management education, and its effectiveness for advancing sustainability transitions (Markard *et al*., 2012) is ever increasing. This requires academics to pursue continuous exploration of a wide range of questions to understand how to advance sustainability in management education at higher education institutions (HEIs) (Leal Filho *et al*., 2019b; Niedlich *et al*., 2020; Starik *et al*., 2017). Sustainable development is seen as the fourth mission of HEIs (Bien and Sassen, 2019; Ozdemir *et al*., 2020; Trencher *et al*., 2014). This body of research is increasingly embedding a focus on Agenda 2030 and the 17 Sustainable Development Goals (SDGs) (see, e.g., Chankseliani and McCowan, 2020). Such research explores the critical yet "empirically elusive" link between higher education and (inter)national development by drawing on the literature in global higher education and evidence from countries across the globe (Chankseliani and McCowan, 2020).

HEIs are in this study conceptualized as socio-technical systems (Markard *et al*., 2012; Savaget *et al*., 2019), which are called upon to allow students and staff to develop new competencies, that lead to more sustainable practices and, finally to a more sustainable society. For HEIs to contribute to sustainability transitions, it is critical to integrate sustainability in all elements of the HEI: governance, education, research, outreach, and campus operations (Findler *et al*., 2019; Hueske and Aggestam Pontoppidan, 2020; Lozano *et al*., 2015; Velazquez *et al*., 2006). This study focuses on the educational element of HEIs to advance sustainable development. ESD is "key" and "core" to advancing sustainability in higher education (Isenmann *et al*., 2020, p. 1). The essential characteristics of ESD were defined by UNESCO (2005) more than a decade ago. They include a focus on ESD, which is based on the principles and values underlying sustainable development (see Mochizuki and Fadeeva, 2010).

Previous studies have highlighted that E-Learning has been used for education for sustainable development (ESD), especially in the context of life-long learning and adult education (Azeiteiro *et al*., 2015). There is a vast body of literature addressing various questions regarding E-Learning; however, studies focusing on E-Learning tools in higher education dedicated to sustainable development are scarce (e.g., Azeiteiro *et al*., 2015; Lohrmann, 2017). This study seeks to fill this gap in the literature. It explores what E-Learning formats currently contribute to ESD in higher education, especially considering the coverage of the SDGs.

Extending the morphological box for ESD at HEIs (Isenmann *et al*., 2020), this study analyzes the E-Learning offered by Nordic Principles for Responsible Management Education (PRME) members. The first part of the analysis explores the extent and types of E-Learning used, as a method and tool, to support ESD. In the second step, the coverage of SDGs by massive open online courses (MOOCs) is analyzed.

2. PRME and Higher Education Institutions

HEIs that provide management education have been critiqued on a range of issues (Snelson-Powell *et al*., 2016) for failing to strengthen the moral character of graduates (Gioia, 2002) and for failings of their management theory (Ghoshal, 2005). Management education at HEIs has been criticized for not responding to societal challenges related to sustainability (Boyle, 1999; Schoemaker, 2008) and more broadly for not sufficiently embedding responsibility in management education (RME) (Cornuel and Hommel, 2015). Engaging in RME overcomes the profit-maximization focus and

promotes values related to the natural environment, society, and culture among management educators, and learners (Cullen, 2020). Over the last two decades, there has been increasing emphasis on HEIs offering management education acting as strategic agents promoting sustainability transitions and sustainable development (Bizerril *et al*., 2018). In contemporary society, shifting HEIs into a sustainability future is increasingly at the core of debates regarding their future role (see, e.g., Jack, 2019; Leal Filho *et al*., 2019a) Contributing to sustainable development of society is a critical challenge for 21st-century higher education (Lambrechts *et al*., 2013).

HEIs have a distinct social responsibility to educate future leaders and advance public awareness about sustainability (Amaral *et al*., 2015). HEIs play a crucial role in enabling students and faculty to develop new competencies that lead to more sustainable practices and ultimately to a more sustainable society. The United Nations Decade of Education for Sustainable Development (UNESCO, 2015) (running from 2005 to 2014) sought to mobilize educational resources to advance sustainability issues in education. This calls for the comprehensive integration of sustainability issues at all levels of education through inter- and transdisciplinary approaches (e.g., Lambrechts *et al*., 2013; Leal Filho *et al*., 2015)

The PRME initiative was initiated in 2007, not long after United Nations Decade of Education for Sustainable Development began, focusing explicitly on fostering and advancing responsible management education, research, and leadership for socially responsible business (Godemann *et al*., 2014; Haertle *et al*., 2017). Management education provided at HEIs plays a crucial role in ensuring that future decision-makers are capably responsive within organizations to global societal needs (Bizerril *et al*., 2018). Management education, which traditionally is often centered purely on economic factors, must be widened to include social and environmental aspects in decision-making within companies (Nonet *et al*., 2016).

One of the aims of PRME is to support management education institutions to, among other things, adapt teaching methodologies to develop a generation of responsible business leaders (Godemann *et al*., 2014). E-Learning is one such teaching methodology, bringing in new dimensions to traditional education.

3. Understanding E-Learning and Education for Sustainable Development

The morphological box for ESD at HEIs (Isenmann *et al*., 2020) provides a comprehensive system covering all possible opportunities for embedding ESD. It is proposed as a landmark providing orientation for universities while delivering a hands-on tool to systematically analyze ESD implementation of HEIs through a whole institution approach and to identify development opportunities.

3.1. Beyond formal education: blended and online learning

The morphological box for ESD includes four causas. This study is particularly interested causa formalis, which includes the form, design, and further layout of ESD (Isenmann *et al*., 2020). Cause formalis thus includes curriculum integration, credit system, course format, course methodology, and learning type (Isenmann *et al*., 2020). Considering life-long learning in ESD, through MOOCs, this paper adds a new criterion to the causa formalis.

HEIs have numerous ways in which they can provide higher education for sustainable development. Velazquez *et al*.'s (2006) work on sustainable universities defines three categories of education: formal (undergraduate, graduate, and certificate programs); non-formal (conferences and workshops); and informal (family and grassroots movement). The causa formalis embraces learning types into three categories: campus class attendance, blended, and online learning (Isenmann *et al*., 2020). Otto and Becker (2019 p. 4 drawing from Sangrà *et al*., 2012) define E-Learning as "an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning." E-Learning contains both blended and online learning.

The implementation of E-Learning can serve as a central requirement for ESD in higher education in two ways (Isenmann *et al*., 2020). First, embedding E-Learning can function as a strategic tool to strengthen sustainability in higher education. Second, adopting E-Learning provides tools that deliver teaching and learning about sustainable development in new and wide-ranging ways (Otto and Becker, 2019). E-Learning has the capability of breaking down demographic boundaries and bringing together learners and teachers with various disciplinary backgrounds and thus, can support initiatives for advancing global ESD (Altomonte *et al*., 2016; Lohrmann, 2017; Otto and Becker, 2019).

According to Otto and Becker (2019, p. 2), it is not an overstatement "to claim that E-Learning nowadays is ubiquitous and has transformed our way of thinking about teaching and learning." ESD as an E-Learning regime has, more explicitly, been proposed to enable, contribute to, as well as play a role in the transition to sustainable societal patterns (Azeiteiro *et al*., 2015; Barth and Burandt, 2013). This makes the E-Learning and digitalization angle of ESD particularly relevant for scholars engaged in research ESD in higher education.

The growth of, for example, MOOCs, mobile learning, and digital learning has exacerbated the problem of clearly distinguishing and exclusively defining E-Learning challenges (Otto and Becker, 2019). This motivates the first research question: what formats of E-Learning (learning type under formalis) are used for ESD in higher education?

3.2. Extending SDG material: MOOCs as a means for ESD

By materialis (the contents), the morphological box of ESD classifies themes and issues by sustainability dimensions, resources, and spheres of activities. Sustainability course inventories are a method for HEIs, especially, if they participate in sustainability reporting systems (Brugmann *et al*., 2019). Developing an inventory of course content increases awareness of sustainability course offerings and highlights the inherent interdisciplinary features of sustainability (Brugmann *et al*., 2019).

Thus, this study seeks to advance the understanding of materialis in E-Learning, by studying it through the lens of the Agenda 2030 for Sustainable Development, or the SDGs (UN General Assembly, 2015). The SDGs are a call for action to advance sustainability globally with a vision to promote prosperity while protecting the planet. The SDGs can motivate further engagement in ESD (Leal Filho *et al*., 2019a; Shiel *et al*., 2020). Brugmann *et al*. (2019) explore the embedding of SDGs at the University of Toronto, through coding course offerings using a taxonomy of keywords derived from the SDGs. Fröhlich and Kul (2020) develop an SDG teaching map to analyze their business school. Leal Filho *et al*. (2019a) provide a global survey on SDGs in higher education. (Leal Filho et

al., 2019a). However, there is a lack of research on the extent of coverage of SDGs in modes of E-Learning, specifically in MOOCs (Al-Imarah and Shields, 2019).

E-Learning contributes to enhancing equality, as it bridges geographical and socioeconomic borders and therefore, allows for ESD to advance globally. As HEIs are increasingly asked to drive sustainable change in society (Findler *et al*., 2019), this study goes beyond formal courses for students and focuses on MOOCs. They provide an open format beyond the traditional formal education offering to anyone with internet access (Grosseck *et al*., 2019). This includes one-third of the world population (Lohrmann, 2017). In particular, those with low socioeconomic status from non-OECD countries and those with a low educational level can benefit (Lohrmann, 2017). This is in line with the call for easily accessible ESD (Leal Filho *et al*., 2015). Different to conventional online and distance-learning courses, MOOCs are intended to attract "massive" numbers of learners (Perna *et al*., 2014). MOOCs leverage internet technology to offer HEI courses at the global level, to anyone with an internet connection (Al-Imarah and Shields, 2019). This allows them to scale educational content to large numbers of students (Al-Imarah and Shields, 2019) with minimal costs, which is particularly interesting for embedding sustainability in higher education. The number of cumulative MOOC learners reached 110 million (Shah, 2019). MOOCs are an instrument for informal education and life-long learning beyond local, socioeconomic, and educational boundaries (Grosseck *et al*., 2019).

Otto and Becker (2019) highlight that the launch of Agenda 2030 and its 17 SDGs in 2015 created strong momentum for promoting E-Learning. This study also proposes that E-Learning creates opportunity for ESD teaching formats to reach a global audience in time to achieve Agenda 2030. This motivates the second research question: to what extent are the SDGs addressed by MOOCs?

4. Method

The empirical data allow this study to examine the extent and type of E-Learning offerings related to ESD at HEIs. In this section, the use of qualitative thematic and content analysis is addressed. The paper employs NVIVO software for coding. To investigate both research questions, this study conducted a content analysis of selected documents and reports issued by Nordic HEIs and members of United Nations PRME (see Table I and Appendix Tables A.I and A.II). The analysis did not identify E-Learning offers from Iceland.

4.1.Context and data

The Nordic region was chosen for two reasons. First, Nordic countries' commitment to the PRME has been described as "a central driver" to overcome "profit-maximization as a key value within business schools" (Cullen, 2020, p. 764). Previous studies have called for more research on HEIs signed up to the PRME initiative to obtain a better understanding of the ESD learning offerings in order to improve them (Godemann *et al*., 2014). Second, the choice of Nordic countries was motivated by a longstanding perception that they are front-runners in CSR and ecological modernization (see, e.g., Strand *et al*., 2015; Morsing and Strand, 2013). Thus, the Nordic region is a relevant case for considering the advancement of E-Learning embedding sustainability in the Nordic countries.

The empirical data were composed of the following documents of the selected HEIs: 1) annual reports; 2) sustainability reports; 3) PRME Sharing Information on Progress (SIP) reports; and 4)

websites of the 26 Nordic HEIs that are members of the UN PRME for content data on MOOCs. PRME member HEIs are required to publish an SIP report every second year. The SIP reporting cycle is not coordinated across PRME HEIs. This implies that their reporting years vary. The sample consists of Nordic PRME members as of 2018. As the SIP reports inform on responsible management education; these reports form the primary source of the study. If the HEI published a separate and additional sustainability report, this was included as well. The same applies if annual reports were publicly available for the HEI (see Table A.II in the Appendix). This study included materials published in English only.

4.2. Two-stage keyword-driven content analysis

The content analysis followed the principle of thematic analysis and was conducted in two sequential phases. A key word search provided by the NVIVO software identified and quantified certain words (see Table I). The first coding phase, sought to identify formalis learning types and therefore searched for the type and extent of E-Learning. This phase drew on sustainability reports and PRME Sharing Information on Progress (SIP) reports as source data. The keywords concerning E-Learning types drew on Otto and Becker (2019).

The second phase of the coding sought to identify sustainability dimensions of materialis through the lens of the SDGs. Therefore, the SDGs were coded in MOOCs. The keyword search results were reviewed by course title and course description. Subsequently, non-sustainability courses or other educational initiatives were removed from the inventory. For coding courses related to the SDGs, the keywords developed by Brugmann *et al*. (2019) were used and extended to include sustain* and SDG-related key words (see Table I). Each code was manually verified for its context.

Table I. Keywords for coding (extended from Brugmann *et al*. (2019) and Otto and Becker (2019))

Phase 1. Formalis: forms of E-Learning across the sample HEIs	
Digitalization	digital OR “digital learning” OR “E-Learning” OR “digital teaching” OR “online education” OR “online learning” OR “ed-tech” OR “distance learning” OR “learning platforms” OR “blended learning” OR “blended teaching”
MOOC	MOOC OR “online course”
Other Digital Forms	“virtual classroom” OR “digital campus” OR blended OR flip OR technology OR digital
Phase 2. Materialis: SDG coverage in the MOOCs made available through the HEIs	
SDGs	SDG OR “Global Goals” OR “Sustainable Development Goal*”
Sustainability	sustain*
SDG 1: No Poverty	poverty OR income OR distribution OR wealth OR socioeconomic*
SDG 2: No Hunger	agricultur* OR food OR nutrition*
SDG 3: Good Health and Well-Being	health OR wellbeing
SDG 4: Quality Education	educat* OR inclusive OR equitable
SDG 5: Gender Equality	gender OR women OR equal* OR girl OR queer
SDG 6. Clean Water and Sanitation	water OR sanitation

SDG 7: Affordable and Clean Energy	energy OR renewable OR wind OR solar OR geothermal OR hydroelectric
SDG 8: Decent Work and Economic Growth	employment OR growth OR "sustainable development" OR labour OR labor OR worker OR wage
SDG 9: Industry, Innovation, and Infrastructure	infrastructure OR innovation OR industr* OR building*
SDG 10: Reduced Inequalities	trade OR inequality OR "financial market" OR taxation
SDG 11: Sustainable Cities and Communities	cit* OR urban OR resilien* OR rural OR communit*
SDG 12: Responsible Consumption and Production	consum* OR production OR waste OR "natural resources" OR recycl* OR "industrial ecology" OR "sustainable design"
SDG 13: Climate Action	climate OR "greenhouse gas" OR environment OR "global warming" OR weather OR environmental
SDG 14: Life Below Water	ocean OR marine OR water OR pollut* OR "marine conserv*" OR fish
SDG 15: Life on Land	forest OR biodiversity OR ecology OR pollution OR conserv* OR "land use"
SDG 16: Peace, Justice, and Strong Institutions	institution OR justice OR governance OR peace OR rights

5. Results and discussion

The data shown here are based on the coding structure presented in the method section. This section takes stock of and provides an overview of where E-Learning is used as a means to support ESD, analyzing the Nordic HEIs.

5.1. Formalis: Forms of E-Learning for ESD available across HEIs

This study identifies several E-Learning formats distinguished in blended and online learning, that embed sustainability (see Table II). Table II provides an outline of examples of types of E-learning activities, either blended or fully online components. In addition, Table II details the link to ESD embedded in each type of E-learning. While each Nordic HEI uses various forms of E-Learning formats for ESD, the extent of the E-Learning varies from country to country and across the HEIs.

Table II. Overview of E-Learning Formats for ESD

Country	**Type of E-Learning**		**ESD link**
	Blended Learning	**Online Learning**	
Denmark	• SIGMA alliance compact online course: virtual work group phase and individual virtual course phase • Digital platform for case-based teaching		• Course focused on responsible business for societal impact and global virtual management[1] • Case-based teaching material for advancing

[1] See https://www.sigma-alliance.org/activities.

	material (in collaboration with a professional case center) • Co-creation of mini case studies and teaching notes, video case studies for blended learning		responsible management content in course materials • Teaching materials with a responsible management and SDG focus[2]
Finland	• Blending E-Learning and digitalization in teaching • Video assignments • AIM2FLOURISH platform • Student campaign with online and offline activities • Gamification and digitalization		• Integrating responsible management education through digitalization in all spheres of education • Foster creativity and interactive conceptual learning for ESD-related topics[3] • Integrated in strategy and sustainability course[4] • Campaign to challenge extremism by promoting integration and raising awareness • Corporate Responsibility and Ethics course revised based on gamification[5]
-		• Capstone Online course(s): videos and digital content • Sustainability Literacy Test (SULITEST) online tool • Mandatory online course	• SDG related content • Integrated in bachelor-level basic CSR course, supporting sustainability education and assessment of students' performance against the average in Finland and the world[6] • Course in social responsibility

[2] See for example free RME case collection at www.thecasecentre.org/.
[3] See https://www.hanken.fi/en/faculty-staff/teaching-lab/digitalising-teaching-and-learning.
[4] See https://aim2flourish.com/.
[5] See https://onlinelearning.aalto.fi/aol/pilots#theme%20groups.
[6] See https://www.sulitest.org/en/Out-Tools.html.

		(bachelor level) • Virtual summit conference with student participation	• Part of a worldwide course on teaching about global challenges, developing solutions, and presenting the ideas at the virtual conference
Norway	• Teaching methods based on film and simulation		• Developed a CSR pilot teaching tool: Implementing CSR follows a CEO's efforts to develop and implement CSR[7]
Sweden	• Online course developed through regional (Baltic) collaboration		• Developing Contextual Sustainability Education for Future Managers in the Baltic Region, students access information about responsible management and collaborate for sustainability. There are also courses on sustainable development: economic challenges; the firm, the environment, and society; and the consumer, the environment, and society[8]
	• Digital platform for staff to share course materials, films, videos, assignments, cases, and quizzes		• Support active student learning on sustainability and ethical issues
	• Online platform website hub for research, course, and program communication		• Integrate across the university all work and efforts on sustainability
	• Expanding use of technology enhanced learning, integration of digital tools into education programs		• Use of technology can help to reduce carbon footprint in international research and education
	• Establishing a digital campus with		• Technological tools improve dialogue

[7] See https://www.bi.edu/research/business-review/articles/2016/04/using-gamification-to-enhance-csr/.
[8] See https://si.se/en/projects-granted-funding/sustman-developing-contextual-sustainability-education-for-future-managers-in-the-baltic-sea-region/.

a studio for in-house production of podcasts, videos, webinars, and a digital learning specialist		externally and internally in HEIs
	• Business administration program includes two ECTS A-level fully online courses	• Examples of courses: CSR and Business Ethics and Environmental Economics and Sustainable Development
	• SDG impact assessment free online tool	• Used in evaluating how study programs are related to SDGs

In general, the data analyzed for this study indicate that it is primarily at the larger HEIs that the extent of E-Learning for ESD is advancing and increasing in use. In terms of blended learning, each HEI applied several different formats. The development of blended learning types to advance ESD is more diverse and applied across HEIs for both formal and non-formal education.

Our findings show rather broad availability of E-Learning opportunities supporting ESD. In terms of blended learning types, each HEI applied several different formats. The development of blended learning types to advance ESD is more diverse and applied across HEIs for both formal and non-formal education. Within the development of mandatory online E-Learning for formal education to advance ESD, the options are very limited. The SULITEST is an example of a fully digital E-Learning tool developed to advance and measure sustainability literacy. The SULITEST, developed through an international partnership, including the PRME, is used across several Nordic HEIs. The Higher Education Sustainability Initiative, a partnership that includes the between United Nations Department of Economic and Social Affairs, UNESCO, United Nations Environment, UN Global Compact's Principles for Responsible Management Education (PRME initiative, was created in 2012 in the run-up to the United Nations Conference on Sustainable Development (Rio+20).

Furthermore, our findings show, that online learning formats exists in several forms, providing formal education that embeds sustainability as part of a degree program (granting credits), and non-formal education. Formal online learning includes mandatory online courses and digital platform for case-based teaching, videos, and simulation. Non-formal online learning includes capstone online course(s), SDG impact assessment tools, sustainability literacy online surveys, virtual conferences with student participation, and teaching methods based on film and simulation.

Within the development of mandatory online E-Learning for formal education to advance ESD, the options are very limited. While some HEIs include the development of such resources among their performance indicators, others view their extensive offer of online courses as sufficient and do not see the need to create open online courses offered on public platforms. Different attitudes can be observed regarding formalizing online education as well, with some HEIs recognizing MOOCs as part of the formal education program, while others do not.

Finally, the evolution of E-Learning is likely to be greatly advanced by the COVID-19 pandemic. Barreiro-Gen *et al*. (2020) argue that organizations must transform the pandemic protection measures into an opportunity for better sustainable development. It has been argued that as the COVID-19 outbreak evolves, an increasing amount of research into organizations and their sustainability efforts during this period is required (ibid.). For HEIs, this calls for increasing formal and informal education through E-Learning types that advance ESD.

5.2.Materialis: SDG coverage by MOOCs

The data presented in this subsection draws on the content analysis of MOOCs at the selected HEIs (see Table III). No MOOC could be identified for Norwegian PRME member. 60% of the MOOCs offered by Nordic HEIs cover topics related to the SDGs. Furthermore, most of those courses cover more than one SDG.

Table III. Overview of MOOCs in Selected HEIs

	Demark	**Finland**	**Sweden**	**Total**
Number of HEIs	2	6	13	
Number of MOOCs	10	5	15	30
Number of MOOCs related to SDGs	6	4	9	19

In attending to the coverage of SDGs in the MOOCs offered by the Nordic PRME HEIs (see Figure 1), this study shows that the most covered SDGs are 9, 13, 11, and 16, whereas SDG 2 (No Hunger) has not yet been explicitly covered. SDG 9 (Industry, Innovation and Infrastructure) and SDG 13 (Climate Action) are addressed by courses in Denmark, Finland, and Sweden (table IV provides an overview of the titles of the MOOCs offered). In some cases, this study finds that PRME universities collaborated with non-PRME business schools to produce MOOCS on a variety of ESD-related topics. The SUSTBUS project, co-funded by ERASMUS, generated Sustainable Business Models, an open access, online teaching program, including 32 videos (see https://www.nhh.no/en/sustbus/). Their content includes, for example, challenges and opportunities of the circular economy, healthcare innovation related to healthy living and active aging, and digital transformation of business. Courses relating to SDG 13 cover content on environmental law in Europe, carbon-neutral transport, eco-design, and environmental impacts. Thus, the courses complement each other.
Six courses related to SDG 11 (Sustainable Cities and Communities) and five courses related to SDG 16 (Peace, Justice and strong Institutions) are offered by Finish and Swedish HEIs. Courses on SDG 11 address planning and designing cities to achieve a green economy, underpin sustainable development, nature-based solutions for challenges faced by cities, and indicators at the city level, etc. Human rights and governance models of social impact are related to SDG 16.

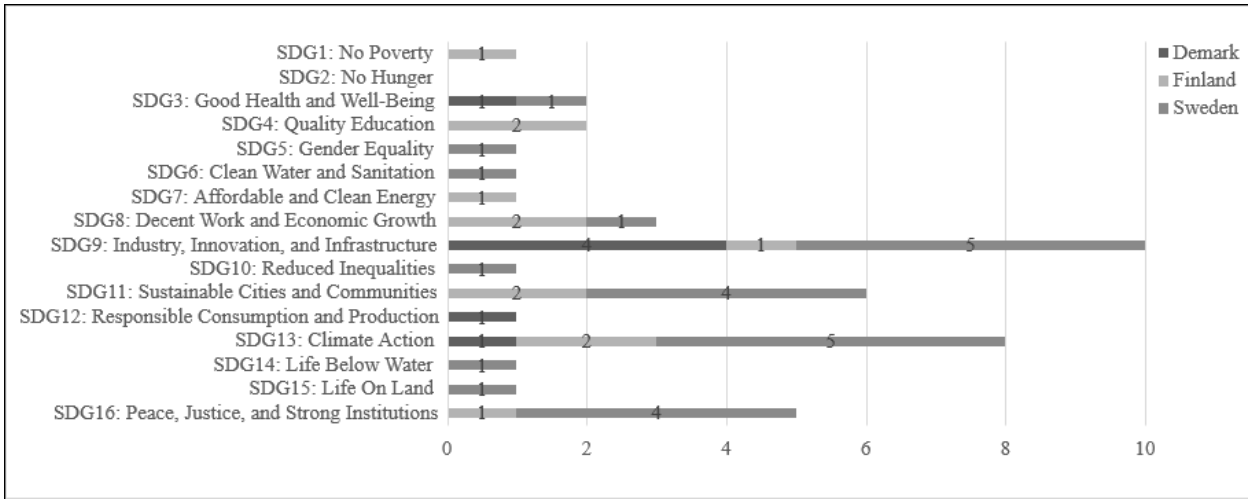

Figure 1. SDGs covered by MOOCs offered by the Nordic PRME HEIs

The results are in line with the Nordic countries being developed economies, where these topics are framed as priorities. As the SDGs are interconnected (one SDG can affect another, etc.), HEIs need to pay careful attention to the embedding of such interconnections (e.g., a positive effect on SDG 9 must ensure that there is not a negative effect on SDG 13). The results show that 12 courses address several SDGs. For example, SDG 6, 9, 11, 13–16; SDG 1, 4, 8, 13, and 16; and SDG 7, 8, 11, and 13. Meanwhile, three to six courses are related to SDG 9, 11, and 13 or to at least two of them.

A global study confirms that SDG 11 and 13 are most often addressed in higher education worldwide (Leal Filho *et al*., 2019a). However, this study reveals that SDG 12 Responsible Consumption and Production) is explicitly covered by only one MOOC in the Nordic countries, which contrasts with Europe, where studies of Portuguese public HEIs and a private German business school showed that SDG 12 was centrally represented in Europe (Aleixo et al., 2020; Fröhlich and Kul, 2020; Leal Filho *et al*., 2019a). This corresponds to a Canadian study with an SDG-focused inventory, which stressed SDG 13, but identified a flaw in considering SDG 6 (Brugmann *et al*., 2019). Furthermore, the differences and similarities in addressing the SDGs highlight how collaboration can enrich the learning content provided to students independently of the format. In addition, the findings of this study suggest that HEIs are embracing critical reflections addressing the fact that SDGs incorporate trade-offs, tensions, and paradoxes (Moratis and Melissen, 2021). Therefore, the findings of this study encourage the HEIs to strengthen the interdisciplinary nature of education that embeds a focus on sustainable development into MOOCs.

Table IV. Titles of MOOCs in Selected HEIs with SDG content

Country	Title	Key SDG coverage

Denmark	• Business Models for Innovative Care for Older People	SDG 3; SDG 9
	• Digital Transformation in Financial Services	SDG 9
	• Social Entrepreneurship	SDG 13
	• Strategic Management and Innovation	SDG 9
	• Sustainable Fashion	SDG 9; SDG 12
	• Sustainable Vikings: Sustainability & Corporate Social Responsibility in Scandinavia[9]	Sustain*
Finland	• Introduction to Humanitarian Logistics	SDG9
	• Organising for the Sustainable Development Goals	SDG 1; SDG 4; SDG 8; SDG 13; SDG 16
	• Climate Action - Solutions for Carbon Neutral Transport	SDG 7; SDG 8; SDG 11; SDG 13
	• Starting Up	SDG 4; SDG 11

[9] It should be noted that this MOOC was captured by the extension of Brugmann et al. (2019) coding model. This study added sustain* as a code.

Sweden	• Circular Economy - Sustainable Materials Management	SDG 9; SDG 13
	• Digital Business Models	SDG 9
	• European Business Law Doing Business in Europe	SDG 8; SDG 13; SDG 16
	• European Business Law Understanding Fundamentals	SDG 10
	• Global Perspectives on Sexual Health and Rights	SDG 3; SDG 5; SDG 16
	• Greening the Economy Lessons from Scandinavia	SDG 9; SDG 11; SDG 13
	• Greening the Economy Sustainable Cities	SDG 9; SDG 11; SDG 13
	• Urban Nature Connecting Cities, Nature and Innovation	SDG 6; SDG 9; SDG 11; SDG 13; SDG 14; SDG 15; SDG 16
	• SEFORÏS insights into challenges	SDG 9; SDG 11; SDG 16

This study demonstrates that extending the materialis of the morphological box of ESD in higher education (Isenmann *et al*., 2020) helps to close the gap on specifying how HEIs address the SDGs (Fröhlich and Kul, 2020). Future research should analyze not only whether the SDGs are covered, but also (1) how they are covered in detail and (2) how the MOOCs address interlinkages between the SDGs. In considering the serious scientific mandate for urgent and large-scale action to reverse catastrophic climate change while driving the transition of high carbon societies to low carbon societies, there is a need for research on coverage of the scope and content of SDG 13 on climate change across HEIs.

6. Conclusion

6.1. Contribution

This study contributes to the literature by extending the morphological box in the following directions. Concerning formalis, the following three points are proposed. First, it is advisable to add non-formal and informal education in addition to formal education drawing on Velasquez *et al*. (2006).

Second, blended and online types of E-Learning used for ESD are specified. Advancing the understanding of E-Learning as a mechanism to enforce HEI sustainability priorities is of particular relevance in the current COVID-19 outbreak (see, e.g., Barreiro-Gen *et al*., 2020) as teaching face-to-face (learning face to face on campus) is highly constrained. This study contributes by providing

an overview of opportunities, which can be used to support ESD through E-Learning. Therefore, E-Learning types used by the Nordic PRME members are explored and synthesized. It is evident from this study that an increasing number of E-Learning types, especially MOOCs, could be advanced to more rapidly spread education that supports global sustainable development. This is in line with the results of previous studies (e.g., Barth and Burandt, 2013).

Our third contribution responds to the call for more analysis on how HEIs contribute to the SDGs (Fröhlich and Kul, 2020). Considering materials, sustainability themes are defined through the SDGs and can serve to advance the contribution of HEIs to Agenda 2030. Empirically, this study contributes to the knowledge on coverage of SDGs across MOOCs offered by Nordic HEIs. There is a predominance toward covering four SDGs (9, 13, 11, and 16), whereas SDG 2 is missing. The findings show that the number of MOOCs offered, that embed sustainability, the scope of SDG coverage can be expanded.

6.2. Avenues for future research

Future research should focus on other regions around the globe and compare the E-Learning types and MOOC content, as well as further examine the approaches and attitudes toward E-Learning and MOOCs for advancement of ESD in different HEIs. Because this study highlights the lack of explicit and implicit courses on topics relating to SDGs and more broadly to a sustainable global society, this study reinforces the recent call for a more systematic efforts to include the SDGs in HEIs (Leal Filho *et al*., 2019a). Following Brugmann *et al*. (2019), SDG 17 was excluded from this study, because it focuses on collaboration to reach the SDGs. However, it can be argued that equipping students with collaborative skills is a learning goal. Therefore, future research could add keywords for such skills or even add competences for education for sustainable development (Wiek *et al*., 2011). Ultimately, HEIs, also need to engage in discussions on the value and limitations of the SDGs for advancing the RME agenda and sustainable development (Moratis and Melissen, 2021).

6.3. Practical implications

The method developed in this study can help practitioners to analyze their E-Learning offerings regarding formalis (formal, non-formal, and informal learning, and types of E-Learning), and materialis (SDGs). Extending the morphological box in these directions enhances understanding about the use of E-Learning and ESD (Isenmann *et al*., 2020).
Furthermore, the empirical findings suggest that HEIs need to consider careful collaborations on MOOCs to avoid duplication of topics and economize resources to attend to SDGs that are less addressed. In addition, the empirical findings indicate that collaboration is required to develop other E-Learning tools (e.g., SULITEST) that can support HEIs to more rapidly advance ESD. Finally, drawing on the COVID-19 experience (Barreiro-Gen *et al*., 2020), HEIs need to advance their menu of fully online E-Learning activities.

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Appendix 1. PRME signatories per Nordic country

Country	HEI
Denmark	Aarhus University, School of Business and Social Sciences
	Copenhagen Business School
Finland	Aalto University, School of Business
	Hanken School of Economics
	HAAGA-HELIA University of Applied Sciences
	JAMK University of Applied Sciences -School of Business
	LUT University
	Oulu Business School
	Turku School of Economics
Iceland	Bifrost University
	Reykjavik University Business School
Norway	BI Norwegian Business School
	NHH Norwegian School of Economics
	NMBU School of Economics and Business
Sweden	Jonkoping International Business School
	Jyväskylä University School of Business and Economics
	Karlstad Business School
	Kristianstad University-Department of Business Administration and Work Science
	Lund University School of Economics and Management (LUSEM)
	Oerebro University School of Business
	School of Business, Society and Engineering—Malardalen University
	Stockholm Business School
	Stockholm School of Economics
	Swedish University of Agricultural Sciences
	The School of Business, Economics and Law, University of Gothenburg
	Umea School of Business and Economics

Table A.I. Representation of PRME Nordic Chapter Universities/Business Schools per country
Source: PRME (2020)

Report type	2018	2019	2020
PRME SIP reports	16	5	2
Annual reports	11	6	0
Sustainability reports	3	1	0
Other report types	1	9	1

Table A.II. Documents analyzed per year of publication