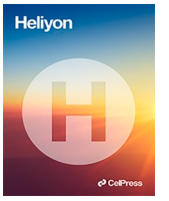
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Research article



Integrating sustainability into higher education challenges and opportunities for universities worldwide

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A R T I C L E I N F O

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A B S T R A C T

This paper undertakes a comprehensive investigation into incorporating sustainability within higher education, aligning with the United Nations' Sustainable Development Goals (SDGs). Utilizing quantitative and qualitative research methods, our study delves into the status quo, methodologies, and impacts of sustainability education across a spectrum of international and local settings, with a specific lens on the United Arab Emirates. Our analysis spans various topics, from best practices in sustainability integration and educational frameworks to the influence of global initiatives like the Impact Ranking on promoting SDG-aligned transformations within academic institutions. Highlighting case studies from the UAE, we provide concrete evidence of successful sustainability strategies and interventions. These are juxtaposed with a global overview that uncovers the varying challenges and opportunities present in implementing sustainability education worldwide. Among our key findings is the essential role of interdisciplinary approaches and the critical need for active faculty involvement in fostering sustainability education. Drawing from a rich compilation of data and narratives, the paper presents a set of strategic recommendations designed to enhance the efficacy and reach of sustainability education. These recommendations are informed by the challenges observed and the success stories identified during our investigation. Ultimately, our research underscores the indispensable role that higher education plays in preparing future generations to navigate and address the complexities of sustainability challenges effectively.

1. Introduction

The United Arab Emirates (UAE) government, in a brave move to transition the nation to a knowledge-based, diverse, and sustainable economy, launched UAE Vision 2030 in 2010. This forward-thinking vision provides a detailed blueprint for achieving sustainable economic growth, fostering social progress, protecting the environment, and uplifting the living standards of its citizens and residents. It encompasses an array of initiatives across key sectors such as infrastructure, tourism, renewable energy, education, and healthcare. Aligned with the Sustainable Development Goals (SDGs) set by the United Nations, this vision underscores the UAE's dedication to sustainable development and its commitment to ensuring a prosperous future for its inhabitants. The UAE has recently emphasized integrating sustainable development within higher educational institutions. This initiative has seen sustainability becoming a cornerstone of institutional operations, community outreach, evaluation mechanisms, reporting practices, and stakeholder engagement. The goal is to enlighten students on how their decisions and actions impact society and the environment. Reflecting global trends, there has been a surge of interest in incorporating sustainable development principles into academic curricula at all

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educational levels in the UAE [1].

Education in the UAE is a platform for promoting sustainable awareness and practices among the populace. Over the last decade, considerable research has focused on embedding sustainability in higher education. However, adapting to rapid societal evolution remains a challenge. Studies highlight the critical role of educators in guiding educational systems toward sustainable outcomes, critiquing the perpetuation of unsustainable learning models and practices. While UAE universities have begun to weave sustainability into their course offerings, there is still a need to enhance the capacity of academic staff to deliver curricula that effectively address global sustainability challenges.

The integration of sustainable development into the curricula of higher education institutions is gaining increasing recognition in the UAE. Many universities incorporate sustainable practices in their operational and research activities and directly into their teaching methodologies. Despite these efforts, the rapid pace of societal change poses a considerable challenge to the sector. Academia plays a vital role in fostering sustainable decision-making, and there is a pressing need for educational systems to evolve to avoid perpetuating unsustainable behaviors and practices. As universities in the UAE steadily infuse sustainability into their curricula, there remains a gap between the current capabilities of academics and the requirements for addressing sustainability issues on an international scale. Interdisciplinary pedagogical approaches, explored and utilized in higher education for over fifty years, are essential for effectively integrating sustainability into teaching and learning processes [2].

A widely held consensus is that sustainable development must be central to university curricula, supported by extensive research initiatives. Emphasizing research and development is essential for fostering sustainability and social welfare within educational institutions, contributing to a vibrant campus culture. Even as universities in the UAE increasingly integrate sustainable practices into their academic offerings and operations, keeping stride with the rapid evolution of society presents an ongoing challenge. This reinforces the critical role of academia in steering students toward sustainable decision-making and fostering an ethos of sustainability [3]. In the UAE, economic diversification is vital for achieving sustainable development and aligning with the UN SDGs. Consensus-driven decision-making is considered crucial for harmonizing foreign policy with these goals. Performance metrics for tracking and monitoring progress are essential in the public sector. With a suite of policies and initiatives like the UAE Vision 2021 and the UAE Energy Plan 2050, which aim to foster a resilient, diversified economy and increase the proportion of clean energy, the UAE showcases its robust commitment to fulfilling the SDGs [4].

This robust framework of policies and initiatives not only underscores the UAE's dedication to sustainable development but also sets a precedent for educational institutions worldwide, as illustrated by the diverse range of master's programs in sustainability detailed in Table 1.

Table 1 provides a comprehensive overview of master's programs in sustainability and related fields. Spanning continents, these programs reflect the international commitment to equipping students with the innovative tools and critical thinking skills necessary for environmental and social challenges. From the nuances of new mobility to the broad strokes of global sustainability, each institution

Table 1
The top universities' programs in sustainability.

University	Program	Location	Duration	Study Mode
Kaunas University of Technology	MSc Sustainability Management	Kaunas, Lithuania	1.5–2 years	On-Campus
Rome Business School	International Master in Sustainability & Circular Bioeconomy	Rome, Italy	1 year	On-Campus
Sustainability Management School (SUMAS)	Online Master in Sustainable Hospitality Management	Gland, Switzerland	1–1.5 years	Online
Leuphana University of Lüneburg	Master of Science in Sustainability	Lüneburg, Germany	2 years	On-Campus
The University of Manchester	MSc Sustainable Business	Manchester, UK	1 year	On-Campus
Sustainability Management School (SUMAS)	Master of Science International Management Business and Sustainability	Gland, Switzerland	1–1.5 years	On-Campus
University College Dublin	MSc Engineering Management (CMD)	Dublin, Ireland	2 years	On-Campus
University of Groningen	MSc Society, Sustainability and Planning	Groningen, Netherlands	1 year	On-Campus
BI Norwegian Business School	MSc in International Business and Marketing	Asker, Norway	2 years	On-Campus
University of Exeter	MSc in Global Environment and Sustainability	Exeter, UK	1 year	On-Campus
Technical University of Applied Sciences Lübeck	MSc in New Mobility - Micromobility	Lübeck, Germany	1.5 years	On-Campus
EADA Business School Barcelona	Online Master in Sustainability and Business Innovation	Barcelona, Spain	1 year	Online
Griffith University	Global Master of Arts in Climate Change & Global Sustainability	Southport, Australia	1.5 years	On-Campus
Yale University	Master's Degree in Global Forestry	New Haven, CT, USA	2 years	On-Campus
Chalmers University of Technology	MSc in Innovative and Sustainable Chemical Engineering	Gothenburg, Sweden	2 years	On-Campus

offers a unique vantage point into the multifaceted nature of sustainability studies. The diversity of locations and modes of study — ranging from on-campus engagements in Germany to online programs based out of Spain — underscores the global reach and the accessible nature of these educational endeavors. The duration of these programs varies, reflecting the depth and intensity of the curricular offerings. These institutions educate future leaders on sustainability and serve as catalysts for change, fostering a culture of responsible stewardship of our planet's resources.

Universities across the UAE offer a range of programs dedicated to this vital endeavor. Table 2 illustrates the diversity and breadth of sustainability-focused academic offerings available in the region. These programs, spanning various disciplines, are designed to equip students with the knowledge and skills necessary to address global sustainability challenges. From master's degrees in sustainable design and water and environmental engineering to MBAs with concentrations in sustainability and corporate responsibility, the programs reflect an interdisciplinary approach, aligning with the nation's commitment to sustainable development. Additionally, Table 2 includes information on the degree level, duration of the program, and institutional rankings, offering a comprehensive overview of the sustainability education landscape in the UAE.

Table 3 presents the core details of the sustainability-related courses provided by various universities across the UAE. Each program is distinct, focusing on multiple aspects of sustainability and environmental science, demonstrating the region's multifaceted nature of sustainability education. The duration for each program is standardized at four years. While some universities have received global rankings from QS and Times Higher Education (THE), others are yet to be ranked, indicating their nascent stage in these specific programs or a focus on local and regional impact over international recognition. Here is a summary of the available undergraduate programs in sustainability studies in the UAE.

With programs ranging from environmental health to sustainable and renewable energy engineering, the UAE's higher education institutions are equipping students with the necessary knowledge and skills to address the environmental challenges of the 21st century. The diverse offerings highlight an integrated approach to sustainability, encompassing the scientific and technical aspects and the field's health, management, and educational dimensions. The presence of globally ranked universities among these institutions signals the UAE's commitment to high-quality education and international standards, positioning the country as a hub for sustainability education in the region. By investing in such a broad spectrum of sustainability-related programs, the UAE fosters a new generation of leaders and innovators who will be instrumental in locally and globally driving sustainable development.

In conjunction with the UAE's strategic sustainability and renewable energy initiatives, these educational programs underscore a national strategy prioritizing environmental stewardship and sustainable living. As a result, the UAE is not only contributing to the global discourse on sustainability. Still, it also sets a practical example of integrating sustainability into the fabric of society through education and development policies.

This paper has undertaken a thorough examination of how sustainability is woven into higher education curricula worldwide, with a focused lens on the UAE. It offered an insight into the UAE's strategic goals for sustainable development and highlighted various successful programs and initiatives that enhance sustainability education. Furthermore, the paper navigated through the challenges and prospects for deepening sustainability education in the UAE, suggesting avenues for its fuller integration into academic programs. It also underscored the critical role of collaboration and partnership in realizing sustainability objectives within higher education and beyond.

Table 2
Top 14 universities in UAE offering Master of Sustainability Studies course.

University Name	Program Title	Degree Level	Duration	Ranking
The British University in Dubai	Master of Science in Sustainable Design of the Built Environment	Master's	Two Years	QS Rank: NA; THE Rank: NA
Khalifa University	Master of Science in Water and Environmental Engineering	Master's	Two Years	QS Rank: 211; THE Rank: 201
Heriot-Watt University Dubai	Sustainable Urban Management MSc	Master's	Two Years	QS Rank: 301; THE Rank: 351
Khalifa University	Master of Engineering in Health, Safety and Environmental Engineering	Master's	Two Years	QS Rank: 211; THE Rank: 201
Khalifa University	Master of Science in Sustainable Critical Infrastructure	Master's	Two Years	QS Rank: 211; THE Rank: 201
Manipal Academy of Higher Education	M.Des - Sustainable Design	Master's	Two Years	QS Rank: NA; THE Rank: NA
Middlesex University Dubai	MBA Sustainability and Corporate Responsibility	MBA	Two Years	QS Rank: NA; THE Rank: NA
Sorbonne University Abu Dhabi	Master in Environmental Sustainability Law and Policies	Master's	Two Years	QS Rank: NA; THE Rank: NA
Middlesex University Dubai	MA Global Governance and Sustainable Development	MA	Two Years	QS Rank: NA; THE Rank: NA
Skyline University College	MBA Concentration in Sustainable Development	MBA	Two Years	QS Rank: NA; THE Rank: NA
United Arab Emirates University	Master of Science in Environmental Sciences	Master's	Two Years	QS Rank: 284; THE Rank: 251

Table 3
Top 6 universities in UAE offering Bachelor of Sustainability Studies course.

University	Program	Duration	QS Ranking	THE Ranking
American University of Sharjah	Bachelor of Science in Environmental Sciences	Four years	811	349
Jumeira University	Bachelor of Science in Environmental Health	Four years	NA	NA
Jumeira University	Bachelor of Science in Healthcare Management	Four years	NA	NA
United Arab Emirates University	Bachelor of Education in Health and Physical Ed	Four years	347	284
University of Sharjah	Bachelor of Science in Sustainable & Renewable Energy Eng	Four years	NA	NA
Zayed University	Bachelor of Science (BS) in Environmental Science	Four years	1000	NA

2. The need for sustainability education in higher education

Reflecting a global trend towards embracing sustainability, the UAE is a prominent example of this worldwide movement towards sustainable development goals. With numerous policies and programs to promote sustainability, the UAE has also demonstrated a solid commitment to achieving sustainable development goals. They include programs like the UAE Vision 2021, which seeks to build a sustainable and diversified economy, and the UAE Energy Plan 2050, which aims to raise the share of clean energy in the nation's overall energy mix. Institutions of higher learning in the UAE have been integrating sustainable practices into their operations, research, and teaching. Making sure academics know that it is necessary to present pertinent courses that address sustainability issues on a global scale is still a challenge. It is commonly acknowledged that interdisciplinary approaches are crucial for integrating sustainability across the curriculum. Higher education is essential to promote sustainability and equip future graduates to handle sustainability concerns. Universities may provide students with the knowledge, skills, and attitudes they need to become responsible, active citizens who can handle challenging sustainability concerns by incorporating sustainability into the curriculum [5].

Using sustainable campus operations and practices, higher education institutions can reduce their environmental effect and encourage sustainable behavior among students, employees, and the general public. University-based research can also assist in resolving sustainability-related issues and guiding practices and policy. To build a sustainable future, graduates must be educated on sustainability and equipped with the information, values, and skills necessary to address sustainability issues. Graduates with a background in sustainability can promote sustainable practices and behaviors, support sustainability policies and initiatives, and contribute to sustainable development in their professions and communities. Ultimately, accomplishing the SDGs and building a sustainable future depends on higher education's role in sustainability promotion. Many higher education institutions worldwide are at different stages of sustainability education right now. While some universities and colleges have been quicker to implement sustainable practices, many have begun integrating sustainability into their research, operations, and curricula. Yet, there is a rising understanding of the significance of integrating sustainable development into higher education institutions, and many institutions have pledged to sustainability in several different ways [6].

Fig. 1 presents the distribution of sustainability-related programs across various universities within the UAE. These programs span multiple disciplines, reflecting a holistic approach toward environmental stewardship, energy management, and sustainable development. The graph captures the essence of a burgeoning trend wherein academic institutions are not only repositories of knowledge but active cultivators of sustainable practices. In light of the UAE's strategic national agendas, the alignment of educational offerings with the nation's sustainable development goals becomes increasingly pronounced. This alignment signifies a deliberate and structured endeavor to weave sustainability principles into the fabric of educational curricula, thereby fostering an academic atmosphere attuned to the imperatives of ecological conservation and sustainable living. Through such educational frameworks, the UAE aspires to mold individuals who are not merely passive observers but proactive participants in the global sustainability dialogue, armed with the knowledge and ethos to instigate transformative change within their spheres of influence.

According to a 2019 Association for the Advancement of Sustainability in Higher Education (AASHE) report, approximately 1000

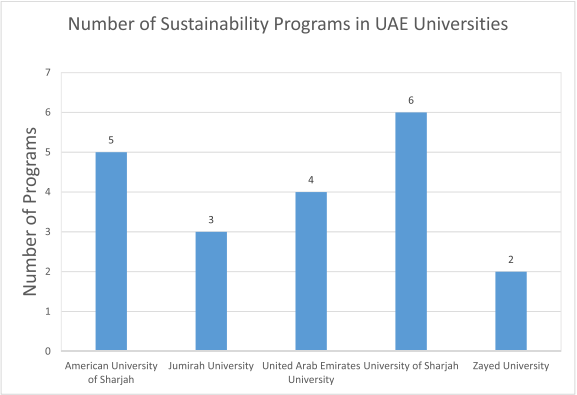


Fig. 1. Sustainability-related academic programs in UAE universities.

institutions across 40 countries have committed to advancing the SDGs through outreach, education, and research. In addition, a 2020 Global Consortium for Sustainable Outcomes assessment found that sustainability was a strategic objective for 70 % of higher education institutions questioned in 11 different countries. Even with advancements, there are still issues with incorporating sustainability into higher education. There is sometimes opposition to changing from established academic frameworks, and many institutions have a shortage of funding, staff expertise, and student involvement. Nonetheless, initiatives, including faculty development programs, sustainability-focused accreditation requirements, and interdisciplinary approaches to sustainability education, are being implemented to solve these difficulties [7].

3. The changing role of higher education

The role of higher education institutions has been changing in response to the growing need for sustainable development. In the past, higher education was primarily focused on providing students with technical skills and knowledge for their chosen fields. However, the increasing global environmental and social sustainability challenges have redefined higher education's role. Higher education institutions are now recognized as significant forces in advancing sustainable development. Universities and colleges have a special place where they may educate people, research, and work with their local communities to develop solutions to sustainability problems. As a result, higher education institutions are urged to get more involved in spreading sustainability. The move toward interdisciplinary and collaborative approaches to teaching and research has been one of the most critical transformations in the function of higher education institutions. Complex sustainability issues necessitate interdisciplinary cooperation for effective resolution. As a result, a lot of universities are dismantling old-fashioned academic silos and creating multidisciplinary research centers and programs to encourage collaboration and creativity [8].

The greater emphasis on experiential learning and community engagement is another significant change. Many higher education institutions are introducing opportunities for service learning and community involvement into their curriculum to provide students with first-hand experience with actual sustainability concerns. Institutions of higher learning are actively encouraging sustainability within their operations. Many institutions are embracing sustainable practices, such as energy-efficient buildings, environmentally friendly transportation, and sustainable food systems, to lessen their environmental impact and set an example for their communities. Globalization has significantly impacted institutions of higher learning all around the world. Higher education institutions were forced to adjust to a new reality. They were increasingly required to play a more global role as people, goods, capital, and information began to flow more freely across national borders in the 1990s [9].

The rising demand for higher education among students from many nations was one of the key factors contributing to the globalization of higher education. Several causes, such as the expanding significance of knowledge-based economies, the rising demand for skilled workers, and the increased importance of international education to prepare for a globalized world, all contributed to this demand. Higher education institutions started to create new projects and programs in response to this need to draw students from various nations. They included combined degree programs, international exchange programs, and online learning opportunities that let students study from anywhere. The growing significance of international research collaborations was another factor in the globalization of higher education. Higher education institutions had to develop new strategies to facilitate international research collaborations as the world got more interconnected and scholars from many nations started collaborating more closely. As a result, new research institutes and centers were founded, and fresh funding models for international research partnerships were created [10].

Finally, the growing significance of internationalization in the world economy also contributed to the globalization of higher education. Companies and organizations needed employees who could function well in many cultural contexts and were thoroughly aware of the global marketplace as they became increasingly globally oriented. Higher education institutions had to modify their curricula and programs to suit this increasing need for graduates with foreign experience and intercultural competency.

Several key factors contributing to its expansion influence the growing globalization of education. Economic globalization has heightened the need for a workforce with knowledge and transferable skills across borders, making globalized education essential for preparing individuals for the global economy. Additionally, there has been a notable increase in student mobility, with many choosing to study at universities beyond their home countries, driving the growth of international student exchange programs and the establishment of university branch campuses abroad. Technological advancements have played a significant role, enabling universities to collaborate across national boundaries, share resources, and offer online courses to a global student body, thereby enhancing the accessibility of education. The realm of research has also become increasingly globalized, with cross-border collaborations between scientists fostering a more interconnected global research community. This environment allows students to gain invaluable experience in participating in international research projects and working effectively with peers from diverse cultural backgrounds. Furthermore, the pressing need to address global challenges such as poverty, illness, and climate change calls for a unified response, underlining the importance of education in equipping students with the understanding and skills necessary to tackle these issues and collaborate across cultural and geographic divides. Together, these elements underscore the multifaceted drivers behind the globalization of education, highlighting its pivotal role in preparing students for a globally interconnected world.

Hence, higher education institutions increasingly embrace internationalization to broaden their worldwide influence and raise the caliber of education they provide. To collaborate on research, provide joint degree programs, and exchange teachers and students, many higher education institutions are forging partnerships with universities and research organizations worldwide. More institutions are allowing their students to study abroad, allowing them to encounter different cultures and gain knowledge from various viewpoints. Institutions actively recruit international students to study on campuses, resulting in a diverse and inclusive student body that improves everyone's learning ability. Institutions are ensuring that students are ready to work and compete in a globalized environment by integrating international viewpoints into their curricula, providing courses on global concerns, and offering these courses.

Institutions emphasize the importance of language learning by giving immersion programs and language courses to aid students in acquiring the language skills required for employment and study abroad [11].

4. Global and UAE Perspectives on education for sustainable development

Education is pivotal in advancing sustainable development globally and within the UAE. As the world increasingly recognizes the importance of sustainable growth, education systems are evolving to meet this challenge by integrating sustainability principles into curricula, research, and campus operations. This section explores the global context of Education for Sustainable Development (ESD) and the specific efforts and initiatives undertaken by the UAE.

4.1. Efforts to promote sustainability in education: Global and UAE initiatives

Globally, education is recognized as a crucial lever for achieving sustainable development. Initiatives such as the UNESCO Global Action Programme on ESD aim to reorient education systems to help people develop the knowledge, skills, values, and behaviors needed for sustainable futures. Countries worldwide, including the UAE, are adopting these frameworks to tailor their educational systems toward sustainability goals.

The UAE largely relies on education to promote sustainable growth. The UAE has taken various actions to include sustainability in HEIs, research, and activities. Several colleges in the UAE have started incorporating sustainable methods into their daily operations, research, and instruction. Yet, these programs still need to be expanded in scope and effectiveness. The UAE has identified three crucial objectives in its Vision 2021 to achieve sustainable development: social development, economic development, and environmental preservation. The Vision 2021 also emphasizes the importance of education in achieving these goals. The UAE government has taken several steps to enhance education for sustainable development (ESD) nationwide. The UAE favors the SDGs, a worldwide blueprint for sustainable development. The SDGs have received strong support from the government through several measures, most notably their inclusion in school curricula.

The UAE has created a thorough framework for encouraging sustainability at all educational levels, from primary schools to universities, in education. A national strategy for education for sustainable development (ESD), which intends to include sustainability in the educational system, has been created by the nation's Ministry of Education. A set of standards for teaching sustainability across all subject areas and fostering a sustainable culture in schools are part of the approach. The UAE has also launched several programs to encourage sustainability in institutions of higher learning. To support sustainability research, promote sustainable behavior at universities, and create sustainable curricula, the Departments of Education and Climate Change and Environment have teamed up.

With numerous initiatives to include sustainability in its programs and daily operations, the Higher Colleges of Technology (HCT) in the UAE have been at the forefront of sustainability education. The UAE government has also tried to improve sustainability in other industries, especially the energy industry. By 2050, the nation wants to produce 50 % of its energy from renewable sources, which is a tall goal. The UAE founded the Masdar Institute of Science and Technology, concentrating on research in renewable energy, sustainable technology, and environmental sustainability. In addition to these initiatives, the UAE has hosted several important conferences and events with a sustainability focus, like the World Future Energy Conference and Abu Dhabi Sustainability Week. These conferences bring together international leaders and experts to debate potential solutions to sustainability concerns and best practices.

One of the most important conferences in the UAE, the Abu Dhabi Sustainability Week, brings together decision-makers, specialists, and executives to talk about sustainable development. The occasion includes an education session where the contribution of education to the accomplishment of sustainable development goals is covered. The education forum promotes dialogue between educators and decision-makers about successfully integrating sustainable development into educational curricula.

The Higher Colleges of Technology is one of the top HEIs in the UAE, and it has incorporated sustainable development into its curriculum. The HCT developed the sustainability city, which works to integrate sustainability into the college's educational offerings, research, and day-to-day operations. The sustainability city aims to generate graduates who are qualified to take on leadership roles in achieving sustainable development in the United Arab Emirates and all around the world. Zayed University in Abu Dhabi has adopted comparable measures to support sustainability education among its students. The institution founded the Sustainability Science Program (SSP), which offers undergraduate and graduate studies in sustainable development. The SSP focuses on interdisciplinary education and research that blends science, policy, and practice to improve sustainable development.

The United Arab Emirates University (UAEU) in Al Ain is another HEI that has included sustainability in its academic programs. The university established a center for the environment and water, which seeks to enhance sustainable development through outreach, education, and research programs. To solve environmental issues, the CEW focuses on developing cutting-edge, multidisciplinary research and educational initiatives.

4.2. UAE's sustainability vision and goals for 2030

Vision 2030 is a long-term plan that defines the objectives of the UAE's future. According to the vision, by 2030, the UAE intends to rank among the best nations in the world for economic growth, sustainable development, and quality of life. The three main focuses of the strategy are social development, economic development, and environmental sustainability. Under the social development pillar, the UAE aims to provide its citizens with high-quality healthcare and education, to ensure social inclusion and equality, and to safeguard its cultural heritage. The country aspires to a 90 % happiness rate among its citizens by 2030 and a good standard of life and overall well-being. The economic development pillar's primary goals are to diversify the economy and reduce the country's

dependency on oil. The UAE seeks to establish a thriving, knowledge-based economy supported by investments in infrastructure, entrepreneurship, and innovation. The government intends to lead the globe in industries including logistics, aerospace, and alternative energy, in addition to becoming a regional hub for trade and banking. Under the environmental sustainability pillar, the UAE seeks to set the standard for ecologically responsible growth and protection. The country aspires to increase the use of sustainable business practices, boost renewable energy sources, and reduce its carbon impact. Along with lowering waste and pollution, the UAE strives to preserve its ecosystems, natural resources, and biodiversity.

5. Integrating sustainability into higher education curricula

The methodological approach of this research is grounded in a multi-dimensional analysis of how sustainability is being integrated into higher education curricula. This includes an examination of best practices, the adherence to the UN's SDGs, the influence of rankings on institutional behavior, and the practical experiences of universities worldwide and specifically within the UAE. A systematic literature review has been conducted to identify and synthesize best practices from peer-reviewed journals, educational reports, and case studies. This review established a foundational understanding of the effective methods utilized by higher education institutions to weave sustainability into their curricula. A content analysis assessed how the UN's SDGs are reflected in current curricular designs. We analyzed course descriptions, program outlines, and strategic documents from diverse universities to determine the presence and depth of SDG integration. A mixed-methods approach has been utilized to explore the emergence and influence of the Times Higher Education (THE) Impact Ranking. Through quantitative data analysis and qualitative interviews, we evaluated the impact of this ranking on university strategies toward sustainability. An exploratory research design was adopted to gather insights into the challenges and benefits of sustainability integration. This involved comparative case studies, cross-sectional surveys, and interviews with academic leaders and educators in various international and UAE universities.

5.1. Methodology for implementing UN's SDGs guiding principles in higher education

Those Goals Higher education institutions have a significant impact on how these initiatives are implemented, which is essential for supporting sustainable development on a worldwide scale. These guiding principles stress the value of cooperating with all interested parties, such as the commercial sector, civic society, and academia. Incorporating sustainable development practices and ideas into higher education institutions' operations, research, and curriculum can help implement SDGs. To do this, interdisciplinary learning must be encouraged, collaboration with other institutions and groups must be established, and teachers and students must be given the tools they need to be change-makers. Higher education institutions can also help attain the SDGs by researching and generating information supporting sustainable development principles and policy decisions. Higher education institutions can link their activities with international sustainability goals and help create a more just and sustainable society by following the UN's SDGs Implementation Guiding Principles [13].

For instance, Norway has committed to putting the SDGs into action and has made tremendous strides in incorporating them into higher education. The National Action Plan for the implementation of the SDGs, which the Norwegian government unveiled in 2017, contains several recommendations and actions aimed at attaining the targets by the year 2030. Acknowledging the connections between the SDGs, considered a comprehensive and integrated agenda, is one of the fundamental tenets of the Norwegian approach. In their efforts to support the SDGs, higher education institutions are encouraged to encourage multidisciplinary and cross-sectoral collaboration. The Norwegian government also highlights the significance of incorporating participants from many sectors and participating in partnerships and communication with the larger population. Universities in Norway have also made substantial efforts to include sustainability and the SDGs in their research and curricula. For instance, the University of Bergen has created a sustainability strategy explaining its SDG goals and commitments. A Center for Climate and Energy Transformation has also been formed at the institution to advance multidisciplinary study and research in climate change and sustainable energy. To include sustainability in all facets of the university's operations and activities, the Norwegian University of Science and Technology (NTNU) has created a comprehensive plan for sustainability and the SDGs. This strategy comprises several actions and targets. To prepare professionals in sustainable development and renewable energy, NTNU also offers a Master's degree program in sustainable energy.

Another nation that has invested significantly in integrating sustainable development into higher education is Japan. A policy aimed at integrating sustainable development into higher education was created by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2007. As a result, many universities in Japan have created departments or centers devoted to sustainability research, created interdisciplinary courses on sustainable development, and incorporated sustainability education into various academic fields, including business, engineering, and architecture. In addition, Japanese universities have been working aggressively to address sustainability issues in different areas through research and partnerships with businesses and the government. One effort aiming to develop methods for identifying and analyzing nanoparticles in the environment is the "University Consortium for Field-Flow Fractionation". Another example is the "Smart Campus Initiative," which combines cutting-edge technology and renewable energy to reduce carbon emissions on college campuses. These initiatives demonstrate both Japan's commitment to sustainability in higher education and the efforts made by educational institutions to turn forth graduates who can help achieve the goals of sustainable development [14].

South Korea has concentrated on incorporating sustainability into higher education to fulfill the SDGs. The nation's government has launched several initiatives and programs to encourage sustainability and green growth, including the founding of the Environmental Research Institute for Higher Education inside the Ministry of the Environment in 2014. The institute seeks to develop a viable network of educational and research institutions in South Korea while advancing environmental research and teaching. Universities in

South Korea have also made various efforts to include sustainability in their operations and curricula. For instance, Korea University built an eco-campus and a hostel to support environmentally friendly behaviors and lower carbon emissions. Seoul National University has also developed a "Sustainability Centre" to create sustainable programs and solutions.

South Korea has also promoted international cooperation and partnership to further sustainable development. The government founded the Korea International Cooperation Agency (KOICA) to offer other nations development aid, including educational and training initiatives for sustainable development. With these initiatives, South Korea is advancing its efforts to meet the SDGs and advance sustainability in higher education nationally and internationally.

Growing awareness of the significance of including sustainable development in higher education institutions has been observed in the UAE. Many institutions now include sustainable practices in their operations, research, and teaching. For instance, the Abu Dhabi-based Masdar Institute of Science and Technology's research, instruction, and outreach initiatives all center on sustainability. Graduate degrees are available from the institute in various fields, including sustainable chemicals and materials, critical infrastructure, and renewable energy [15].

5.2. Best practices for integrating sustainability into higher education curricula

Integrating sustainability into higher education curricula is becoming increasingly important globally. Sustainability should be incorporated into all courses, not just environmental or sustainability-focused programs. This approach ensures that students in all majors understand the importance of sustainability in their respective fields. Cooperation among academicians from various faculties and fields might result in a more comprehensive and integrated approach to sustainability education. Involving students in experiential learning: Students can better comprehend and apply sustainable ideas and practices through hands-on, real-world experiences. Universities should promote and encourage research on themes linked to sustainability since it may enlighten and enhance sustainability practices and courses. Introducing environmentally friendly policies and practices in areas like energy usage, waste management, and transportation can help universities set an example for sustainable practices on campus. Working with neighborhood stakeholders and local communities is essential for universities to identify and address regional sustainability issues. Sustainable practices in university operations: Universities should work to include sustainable practices in their daily operations, including campus planning, purchasing, and financial administration [12].

A comprehensive strategy incorporating all facets of university life, from instruction and research to administration and community involvement, is needed to integrate sustainability into curricula for higher education. By implementing these best practices, universities can better equip students to handle sustainability issues and contribute to a more sustainable future.

Several international institutions stand as exemplary case studies in integrating sustainability into higher education, each showcasing unique approaches and strategies:

Arizona State University in the USA is recognized globally for its leadership in sustainability education. The university has woven sustainability across its curriculum through its ASU Global Institute of Sustainability, impacting all colleges, programs, and disciplines. This transformative effort includes a range of undergraduate and graduate degrees in sustainability, alongside executive education and professional development programs for sustainability professionals. In Sweden, Lund University prioritizes sustainability in its campus operations, research, and educational programs. Offering a wide array of sustainability-related courses and degree programs, including a Master's in sustainable development, Lund University also emphasizes sustainable campus operations. Its facilities feature solar panels and green roofs, embodying the institution's commitment to sustainability. The University of British Columbia in Canada has dedicated itself to embedding sustainability within its academic offerings and campus operations. The university fosters sustainability through the UBC Sustainability Initiative in academics, research, and partnership activities, introducing multidisciplinary programs such as the Bachelor of Applied Science in Environmental Engineering and the Master of Land and Water Systems. Additionally, the Sustainability Scholars Program engages students in hands-on sustainability research. Wageningen University in the Netherlands is renowned for its environmental and sustainability research. The university offers an extensive range of sustainability-focused undergraduate and graduate programs, including Environmental Sciences and International Land and Water Management. It is also home to the Wageningen Environmental Research center, which conducts pioneering studies on biodiversity and sustainable agriculture. The University of Cape Town in South Africa has embraced a holistic approach to sustainability, establishing a dedicated institute to advance sustainability across its operations and curriculum. Offering master's programs focused on climate change and sustainable development, UCT also implements eco-friendly initiatives on campus, such as solar panel installations and rainwater harvesting systems. These institutions exemplify the diverse ways sustainability can be integrated into higher education, serving as models for developing comprehensive, interdisciplinary approaches to sustainability education.

5.3. The emergence of the Impact Ranking

The Times Higher Education (THE) Impact Rankings were introduced in 2019 to evaluate how well universities contribute to meeting the UN's SDGs. The index evaluates how well institutions execute on several metrics that show their contributions to the SDGs, including their research, outreach, and stewardship initiatives. Universities worldwide are being aggressively encouraged by the ranking to contribute to the SDGs. The rating allows colleges to highlight their sustainability initiatives and motivates them to improve. Universities worldwide have improved their sustainability practices by using their rankings as a standard for sustainability. In addition to inspiring healthy rivalry among colleges, this ranking encourages them to take their sustainability obligations seriously. Also, the rating pushes colleges to create cutting-edge strategies for sustainability by pointing out areas where they need to improve. By doing this, universities can position themselves as pioneers in sustainable development and contribute to transforming their local regions and

the global community [16].

Including 1420 universities, a record number in the most recent edition of THE University Impact Rankings 2021 demonstrates a growing tendency among universities worldwide to support the UN's SDGs. This shows that colleges are actively working to achieve the SDGs and are acknowledging how important it is to address issues like climate change, poverty, and inequality. The many universities that participated in the ranking also hints at a growing interest in and involvement with sustainable development among universities and a trend toward this topic taking center stage in the higher education landscape. Rankings are a tool for universities to evaluate their sustainability efforts and pinpoint areas for development. The rise in the number of universities listed suggests that more establishments prioritize sustainability and social effects in their operations and mission [17].

5.4. The challenges and benefits of adopting new strategies in universities across the globe and in the UAE

Integrating sustainability into higher education curricula faces several challenges globally. One of the most significant challenges is the lack of awareness and understanding among educators and students about sustainability and its relevance to their academic fields. The difficulty of defining sustainability in a way that is relevant to all disciplines makes this challenge much more challenging. Another difficulty is that teachers lack the technical know-how to include sustainability in their curricula. This involves the requirement for interdisciplinary knowledge and abilities and a lack of knowledge about the available resources and teaching strategies. However, significant adjustments to teaching strategies and materials are needed to include sustainability in curricula for higher education, which can be difficult for teachers to implement and involve a considerable time and money commitment [18,19].

Also, there are not enough resources or institutional support for sustainability projects in higher education. Since implementing sustainable practices and programs can be expensive, many institutions put other budgetary priorities ahead of sustainability. Progress can also be hampered by a lack of governmental incentives, laws, and rules promoting higher education sustainability. Additionally, incorporating sustainability into curricula for higher education necessitates a mindset shift, which can be challenging for some teachers and students who may not view sustainability as an essential component of their education. This problem is worsened by the lack of consideration regarding sustainability in certification and testing procedures, which may deter institutions from prioritizing sustainability programs. This can make it difficult to convince stakeholders that sustainability investments are worthwhile and to prove the success of these programs. To overcome these obstacles, policymakers, instructors, students, and other stakeholders must collaborate to create and implement sustainable practices in higher education institutions [20,21].

Integrating sustainability into higher education courses faces several challenges that span conceptual, resource-related, attitudinal, organizational, collaborative, and sociocultural dimensions:

A key hurdle is the lack of comprehensive understanding and recognition of sustainability's importance. This gap in comprehension exists among both educators and students, making the incorporation of sustainability concepts into the curriculum a complex endeavor. Educators must fully grasp and convey the significance of sustainability to foster a conducive learning environment. Resource constraints further complicate this integration. Adequate planning and execution of sustainability initiatives demand substantial time, financial investment, and expertise—resources many institutions may find scarce. This scarcity can impede the development and implementation of comprehensive sustainability projects.

The resistance to change among faculty poses another significant barrier. Academics accustomed to traditional teaching methods may resist revising curricula or introducing new sustainability-focused content, thus hindering curricular innovation. Lack of institutional support also emerges as a critical obstacle. Without the backing and commitment from university leadership and

Table 4
Challenges of integrating sustainability in designing curriculum.

challenge	Frequency
Need balance between different approaches	19
Importance of Instructor role	19
Requires long-term partnerships	17
Required adaptive approach	16
Need balance between organizations	15
A lack of collaboration	14
A difficult concept for understanding	13
Narrow range for addressing sustainability problems	13
Cultural differences	12
Need specific guidance	12
Financial constraints	12
A lack of human resources	11
Need preparations	10
Environmental restriction	9
Difficulty to applying traditional programs	8
Health and safety issues	7
Taking a lot of time and effort	6
Complexity of teaching	6
Need ownership	6
Difficulty in in-depth study	2
Assessment difficulty	1

administration, sustainability initiatives may struggle to secure necessary funding and attention, limiting their scope and impact. The necessity for interdisciplinary collaboration adds to the complexity of integrating sustainability into higher education. Effective sustainability education requires contributions from multiple disciplines, yet the absence of established interdisciplinary frameworks can stifle these collaborative efforts.

Table 4 provides a structured overview of the challenges and weaknesses identified after applying novel teaching approaches in a study centered on sustainability education. It lists 21 distinct challenges, each accompanied by a frequency count reflecting how often each challenge was reported during the research. At the top of the table, we observe that the most prevalent challenges call for a balanced interplay between different teaching methods and the crucial role of the instructor. These issues are marked as most frequent and suggest areas that demand urgent attention for educators aiming to improve and fine-tune their pedagogical approaches.

On the other hand, the table also records challenges like assessment difficulties and the complexities of in-depth study as being less frequent. Nonetheless, their inclusion in the table signals that these challenges, albeit less common, represent significant obstacles to effectively integrating new teaching methods and warrant careful consideration. This table outlines a concise and systematic compilation of the challenges encountered in the educational landscape when introducing innovative teaching strategies. When discussed in the paper, this table will catalyze examining possible approaches to navigate these challenges, ultimately contributing to a learning atmosphere that supports the dynamic goals of sustainability in education.

The integration of sustainability into higher education curricula worldwide presents numerous opportunities that extend far beyond the classroom, influencing global challenges, institutional competitiveness, market demands, innovation, and institutional reputation:

Incorporating sustainability into educational programs equips students to confront and address pressing global challenges such as social injustice, environmental degradation, and climate change. By weaving sustainability principles throughout higher education curricula, institutions prepare graduates with the crucial knowledge and skills to devise and implement solutions to these complex problems. Enhancing an institution's competitiveness in the global educational landscape is another significant opportunity. As the demand for graduates versed in sustainability grows, institutions prioritizing sustainability within their curricula can attract a larger pool of students, faculty, and resources, including funding from partners and sponsors keen on supporting sustainability initiatives. Meeting the evolving needs of the job market is a critical advantage. With businesses and organizations increasingly seeking to embed sustainability into their operations, universities that offer sustainability-focused education can become key providers of skilled graduates ready to fulfill these new workforce requirements. The drive for innovation is inherently linked to the inclusion of sustainability in educational curricula. By encouraging multidisciplinary collaboration and creative problem-solving, sustainability education paves the way for developing new products, services, and technologies that support sustainable practices and solutions.

Lastly, embracing sustainability can significantly enhance a university's reputation. Institutions recognized for their commitment to tackling global sustainability challenges can attract more students, faculty, and investments, positioning themselves as leaders in the pursuit of a sustainable future. Together, these opportunities underscore the transformative potential of integrating sustainability into higher education, highlighting the pivotal role that academic institutions play in shaping a more sustainable and equitable world.

Table 5 delineates the strengths or benefits derived from applying innovative teaching strategies within the scope of a sustainability education-focused study. It organizes 22 distinctive benefits and enumerates their frequency, as reported in the study. Foremost in the table, 'Foster Deep Learning' and 'Design Thinking/Decision' emerge as the most frequently observed benefits, each with the highest frequency of 10. This preeminence suggests these areas might be profoundly impacted by the teaching approaches used, indicating

Table 5
Benefits of integrating sustainability in designing curriculum.

Benefit	Frequency
Critical Thinking	1
Tangible results (publications)	2
Increased Competencies	2
Active Learning/Engagement	3
Develop Design/Planning Ability	4
Collaboration Skill	4
Reflective/Quality Communication	4
Motivation	5
Problem-Solving	6
Environmental Awareness	6
Team-Based Skills	6
Attain Local Knowledge	7
Get Used to Practical Skill	7
Analysis Skill	8
Diversity/Cross-Cultural	8
Broaden Perspective	8
Sustainability Literacy	8
Flexibility in Planning/Design	9
Understanding/Use ESD Approach	9
Develop Responsibility	9
Design Thinking/Decision	10
Foster Deep Learning	10

they are critical outcomes of educational interventions.

Other notable benefits, such as 'Develop Responsibility' and 'Understanding/Use ESD Approach,' display a significant presence, with frequencies of 9. These benefits are vital for students' holistic understanding and application of sustainability principles and reflect the effectiveness of the teaching methodologies in imparting essential skills and competencies. In contrast, 'Critical Thinking,' although foundational to education, shows a lower frequency, suggesting a potential area for further methodological enhancement. Despite its lesser frequency, the inclusion of this benefit highlights its recognized importance in educational settings [VV]. This table methodically summarizes the positive outcomes associated with adopting new pedagogical techniques. When interpreted in the paper, the table will not only underscore the strengths of the teaching approaches evaluated. Still, it will also foster a dialogue about the educational significance of these benefits in nurturing students capable of engaging with sustainability challenges.

6. The UAE experience: success stories

With a number of initiatives and programs, the UAE has shown a significant commitment to advancing sustainability education in higher education institutions (HEIs). The Masdar Institute of Science and Technology, which is dedicated to sustainable development and provides graduate-level programs in clean energy, environmental sciences, and sustainable technologies, is another effective program. The institute offers a distinctive, research-driven educational experience and supports entrepreneurship and innovation in the sustainability sector.

Another significant occasion that promotes sustainability education and awareness is the Abu Dhabi Sustainability Week. The annual gathering of specialists, business executives, and policymakers discusses opportunities and challenges related to sustainable development. The seven-day event also features student participation initiatives like the Young Future Energy Leaders program, which equips young leaders to spearhead sustainability campaigns in their neighborhoods.

In the UAE, the drive towards sustainability education is met with a wealth of opportunities for expansion and enhancement. This commitment is mirrored in various sectors, presenting a unique environment for the growth of sustainability education:

Collaboration with industry plays a pivotal role, as the UAE's emphasis on sustainable development aligns with the interests of many businesses that invest in sustainability initiatives. Partnerships between higher education institutions and corporations can facilitate the development of innovative sustainable solutions, providing students with valuable real-world experience and potential employment opportunities. Adopting a multidisciplinary approach is essential to address the complex nature of sustainability challenges. Universities in the UAE have the opportunity to pioneer interdisciplinary programs that integrate sustainability with various academic disciplines, such as engineering, business, and social sciences. This approach encourages a holistic understanding of sustainability, equipping students with the diverse skills needed to tackle these challenges effectively. Leveraging technology is another avenue for advancing sustainability education in the UAE, a nation known for its technological prowess. By incorporating cutting-edge technologies into their curricula, such as renewable energy and smart city solutions, higher education institutions can offer students insights into the technological aspects of sustainability practices.

The UAE's status as a hub for global education, hosting campuses of numerous international universities, offers fertile ground for international collaborations. Such partnerships can foster sustainability projects, facilitating the exchange of knowledge, expertise, and best practices on a global scale. Government support for sustainability in the UAE is robust, with numerous policies and programs to foster sustainable development. Higher education institutions can align their sustainability efforts with national priorities, working closely with government bodies to contribute to the country's sustainability objectives. This collaboration ensures that the educational sector is fully integrated into the broader national strategy for sustainable development.

7. Results

At the outset of our examination of the integration of sustainability within higher education curricula, we focused on a singular, illustrative case: the investigation into the landscape of campus sustainability assessment tools. This exploration unveils a vast and diverse collection of instruments, each uniquely developed across different global contexts. Such a wide array of tools signifies the international commitment to embedding sustainability into higher education and reflects the nuanced approaches that various institutions have taken to meet this objective. By delving into these assessment tools, we aim to understand how sustainability metrics and frameworks are operationalized within academic settings worldwide. This focus provides a critical lens through which we can evaluate the efficacy of sustainability integration in higher education curricula. The development and adoption of these tools across a spectrum of geographic and cultural landscapes highlight the universal recognition of sustainability as an imperative educational agenda.

Furthermore, this case approach allows us to map out the evolution of sustainability assessment tools over time, showcasing the dynamic nature of this field. From early initiatives aimed at creating foundational frameworks for sustainability assessment to more recent endeavors that leverage technology and global data for comprehensive evaluations, the progression of these tools mirrors the growing sophistication and urgency of sustainability education itself. Therefore, exploring campus sustainability assessment tools is a cornerstone of our analysis. It provides a structured overview of how sustainability efforts are quantified and evaluated within universities. It also offers insights into the broader sustainability trends in higher education, including the challenges faced and the innovative solutions proposed. Through this lens, we gain a deeper understanding of the pivotal role that higher education institutions play in advancing the global sustainability agenda, underpinned by a commitment to creating a sustainable future through informed, strategic educational practices.

The analysis identified a range of tools designed to evaluate and enhance sustainability practices within higher education

institutions. The Assessment Instrument for Sustainability in Higher Education (AISHE), developed by the Dutch Foundation for Sustainable Higher Education, emerged as an early effort in 2009, aiming to offer a comprehensive framework for global sustainability assessment in educational settings. With a citation count of 30, AISHE underscores the foundational role of such tools in advancing sustainability education [22]. Similarly, tools like the Adaptable Model for Assessing Sustainability in Higher Education (AMAS) and the Assessment System for Sustainable Campus (ASSC) reflect regional initiatives from Chile and Japan, respectively, highlighting the diverse geographic spread of sustainability assessment efforts. ASSC boasts the highest citation count among the tools analyzed, with 170 citations indicating its significant impact and widespread adoption.

The emergence of the Graphical Assessment of Sustainability in University (GASU) in 2011, with the highest citation count of 174, points to the growing importance of visual and graphical representation in communicating sustainability efforts and outcomes. GASU, alongside tools such as the Green Metric World University Rankings (GM) and the Pacific Sustainability Index (PSI), demonstrates the shift towards more globally oriented, comparative, and competitive frameworks for sustainability assessment. The introduction of recent tools, like GM and the People & Planet Green League (P&P) in 2019, underscores the ongoing evolution and refinement of sustainability assessment methodologies, catering to the growing demand for transparency, accountability, and measurable progress in sustainability within the higher education sector.

Each tool encapsulated within Table 6 offers unique insights and methodologies for embedding and evaluating sustainability practices, reflecting the multifaceted nature of sustainability in higher education. The variance in citation counts further illuminates the differing levels of engagement and recognition among the academic and institutional communities, providing a proxy for the tools' influence and utility. This comparative analysis highlights the significant strides made toward institutionalizing sustainability in higher education. It underscores the critical need for continuous development and adaptation of assessment tools to meet evolving sustainability goals and challenges.

8. Conclusion

Incorporating sustainability into higher education curricula within the United Arab Emirates reflects a commitment to fostering sustainable development and equipping future generations with the skills and knowledge to address pressing environmental challenges. Initiatives such as the Abu Dhabi Sustainability Week, alongside the efforts of Masdar Institute and Zayed University, underscore the region's dedication to sustainability education. The UAE government's ambitious sustainable development standards further reinforce the imperative to embed sustainability within academic programs, to cultivate a resilient and informed populace. Despite these endeavors, the integration of sustainability into higher education faces obstacles, including gaps in understanding and appreciation of sustainability concepts, a shortage of trained personnel and resources, and the need for interdisciplinary educational frameworks. However, these challenges also unveil opportunities for growth and innovation in sustainability education in the UAE. Enhanced cooperation among academic institutions, strategic industry partnerships, and significant investment in faculty development are pivotal avenues for advancing this agenda.

For successful integration, educational stakeholders and industry partners must collaborate closely, crafting a coherent strategy and action plan. This approach should include establishing robust mechanisms for monitoring and evaluating progress toward

Table 6
Comparative overview of key campus sustainability assessment tools.

No	Tool Name	Main Developer(s)	Origin	Year	Citation Count
1	Assessment Instrument for Sustainability in Higher Education (AISHE)	Dutch Foundation for Sustainable Higher Education	Global	2009	30
2	Adaptable Model for Assessing Sustainability in Higher Education (AMAS)	Francisco Urquiza Gomez et al.	Chile	2014	25
3	Assessment System for Sustainable Campus (ASSC)	Sustainable Campus Management Office of Hokkaido University	Japan	2013	170
4	Campus Sustainability Assessment Framework Core (CSAF Core)	Sierra Youth Coalition (SYC)	Canada	2009	48
5	Graphical Assessment of Sustainability in University (GASU)	Global Reporting Initiative	Global	2011	174
6	Green Metric World University Rankings (GM)	University of Indonesia	Global	2019	39
7	People & Planet Green League (P&P)	People & Planet	UK	2019	69
8	Pacific Sustainability Index (PSI)	Roberts Environmental Center of Claremont McKenna College	USA	2011	83
9	Sustainability Assessment Questionnaire (SAQ)	University Leaders for a Sustainable Future	Global	2009	25
10	Sustainability Tracking, Assessment and Rating System for Colleges and Universities (STARS)	Association for the Advancement of Sustainability in Higher Education	North America	2019	69
11	Sustainable University Model (SUM)	HEIs	Global	2016	27
12	Sustainability in Higher Education Institutions (SusHEI)	HEIs	Portugal	2013	16
13	Greening Universities Toolkit (Toolkit)	Africa, Asia-pacific, Europe, Latin America, and North American universities	Global	2013	134
14	Unit-based Sustainability Assessment Tool (USAT)	Swedish/Africa International Training Program	Swedish/ Africa	2009	75
15	Assessment Standard for Green Campus (ASGC)	Chinese Society for Urban Studies	China	2019	57

embedding sustainability into curricula. Such collaborative efforts are vital for advancing sustainable development goals and nurturing leaders well-prepared to confront sustainability issues with insight and innovation. Beyond the confines of academia, the pursuit of sustainability goals necessitates broad-based partnerships that span the public sector, business communities, civil society, and local populations. These alliances are instrumental in pooling resources, fostering collective action, and disseminating knowledge, catalyzing effective and sustainable solutions to environmental, social, and economic challenges. Through collaboration, educational institutions can play a central role in promoting sustainable practices, influencing policy development, and addressing societal needs. Engagement in research, community service, and experiential learning through these partnerships offers students and educators a deeper understanding of sustainability challenges. It prepares them for practical application in their future careers. However, the success of such alliances hinges on mutual trust, clear communication, and a shared commitment to sustainability goals, underscored by transparent and accountable practices.

Data availability

No data was used for the research described in the article.

CRediT authorship contribution statement

Ahmed G. Abo-Khalil: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

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

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