Proposed educational approaches to enhance research partnerships between universities and the private sector to support sustainability

Associate Professor: Heba tawfiqe abu Eyadah

ORCID: https://orcid.org/0000-0002-2650-0885

Heba_chimist@hotmail.com

University of Jordan

Associate Professor : ANAS ADNAN ODIBAT

ORCID: https://orcid.org/0000-0003-4071-9039
Anas.odibat1@gmail.com

International Islamic University

Abstract

This study aimed to enhance understanding of ways to improve research collaboration between universities and the private sector to support sustainability. It analyzed relevant educational literature and previous studies during the 2024/2025 academic year, providing a comprehensive vision that contributes to strengthening research partnerships between academic institutions and companies. Through this analysis, the study presents an innovative vision for practical educational approaches that can contribute to improving and expanding the scope of university-business collaborations in various fields, particularly those that support environmental and economic sustainability.The primary advantage of this study lies in its reliance on an analytical approach, which provides a systematic framework for understanding the evolution of research collaborations between academia and industry. The analytical approach relies on a thorough examination of existing literature to identify gaps and obstacles hindering research partnerships, as well as identifying factors that contribute to the success of such collaborations. The study began with a comprehensive review of previous research and studies on university-private sector research collaborations. The available literature was analyzed to identify current trends, opportunities, and challenges facing such collaborations, including examining past experiences in various countries and overcoming them. Through this review, a proposed vision was developed that reflects the researchers' vision of how to

enhance university-private sector collaboration to achieve global sustainability goals. This vision aims to provide strategic educational solutions that enhance integration between academic research and industrial innovation, with a focus on areas that support sustainable development, such as renewable energy, environmental conservation, and economic development. This vision is not limited to theory alone; it also aims to develop practical, implementable mechanisms, contributing to a tangible impact at both the academic and industrial levels. The study also recommends developing joint funding strategies between universities and the private sector to support sustainability-related research and to encourage the private sector to invest in green research through funding programs supported by the government or international institutions..

Keywords: Educational approaches, research partnerships, partnership, private sector, sustainability

1.1 introduction

In light of the contemporary challenges facing modern societies, strengthening university-private sector partnerships has become a key approach to achieving sustainable development. These partnerships have become essential in many fields, including green innovation, technology, and information. Many experts point out that universities are key drivers of scientific research and development, while the private sector can provide the resources and practical applications that make this research feasible.

These partnerships offer numerous opportunities that can positively impact the sustainability of projects and institutions. Through university-private sector collaboration, researchers can achieve applicable scientific results, while the private sector benefits from innovative research ideas that can contribute to improving its performance and increasing its competitiveness in the market. In this context, recent studies have emphasized the importance of integrating academic and commercial efforts to achieve sustainability goals.

One recent study addressing this topic is "A Study on the Impact of University-Industry Collaboration on Green Innovation of Logistics Companies in China," conducted by a team of researchers from Xi'an University of Technology. The study showed that university-

industry collaborations in China played a significant role in promoting environmental innovation, reflecting the potential for collaboration in areas with sustainable environmental impact (Fei Bu et al., 2025).

On the educational front, school leaders' understanding of public-private collaboration mechanisms in IT is an important factor contributing to improving the quality of education in resource-constrained public schools. A study titled "School Principals' Understanding of Managing Public-Private Partnerships Related to Information Technology in Resource-Constrained Public Secondary Schools" demonstrated the importance of these partnerships in improving learning environments and supporting innovation (Olusegun & Nthontho, 2025).

Strengthening university-private partnerships requires providing an institutional framework that supports these initiatives by developing effective mechanisms, organizing joint events, and creating specialized training programs. Through these measures, cooperation between the two parties can be enhanced, contributing to achieving sustainability goals across various sectors.

1.2 Research Problem:

In our current era, societies face environmental, economic, and social challenges that require innovative and sustainable solutions. University-private research partnerships are one of the most important tools that can contribute to achieving these solutions. Through collaboration between academic institutions that possess theoretical knowledge and the private sector, which possesses practical capabilities and resources, significant progress can be achieved in the fields of technological and environmental innovation, contributing to advancing sustainability

These partnerships contribute to developing effective environmental solutions, increasing the competitiveness of the private sector through the application of research findings, and enhancing academic capacity to produce scientific research with applied value. Numerous studies have demonstrated the importance of these partnerships in achieving sustainability goals. For example, Fei Bu et al.'s (2025) study confirmed that university-industry collaborations in China had a positive impact on promoting green innovation, while

Olusegun & Nthontho's (2025) study demonstrated the importance of partnerships in improving learning environments by integrating information technology into public schools with limited resources

Despite the growing importance of these partnerships in supporting sustainability, many universities and the private sector still face challenges in achieving effective research partnerships that contribute to achieving these goals. Therefore, this study aims to answer the following main question: What are the proposed educational approaches to enhance research partnerships between universities and the private sector to support sustainability? From this main question, a number of sub-questions emerge that aim to clarify the concepts and standards related to research partnerships and sustainability:

- What is the concept of research partnerships?
- What are the most important sustainability pillars that enhance research partnerships?
- What are the proposed educational methods for enhancing research partnerships between universities and the private sector to support sustainability?

1.3 Study Objectives:

This study aims to:

• Identify the concept of research partnerships.

• Identify the most important sustainability pillars for enhancing research partnerships.

• Develop proposed educational approaches to enhance research partnerships between universities and the private sector to support sustainability.

1.4 Significance of the Study:

The importance of the study is divided into two axes:

Practical and Applied Importance:

• It is hoped that this study will benefit decision-makers by focusing on consolidating the principles of sustainable development, particularly in universities, by strengthening partnerships with the private sector to build a sustainable knowledge society as a focal point for change and improvement.

• It is hoped that the study's recommendations will benefit curriculum developers and decision-makers, highlighting the need to educate universities and communities on the importance of producing and employing knowledge, not merely using it to sustain and enhance the digital environment in the age of artificial intelligence.

• Theoretical and Intellectual Importance of the Study:

• It is hoped that this study will represent a scientific contribution to its topic, which, according to the researchers, is a pressing need in our current era and is among the literature libraries need.

• It is hoped that this study will provide scientific and research horizons for other researchers to delve into this field, seeking to achieve the desired development and adding new knowledge to educational thought and scientific research to bring about the desired positive change.

1.5 Study Methodology:

This study adopted an analytical, inductive approach with a developmental character, based on a theoretical approach through systematic review of specialized literature and previous studies relevant to the field of study. The scientific and theoretical content was analyzed to build a comprehensive cognitive framework around the concepts and ideas associated with the research topic. A critical analysis of previous studies was also conducted to identify research gaps and extrapolate findings that could contribute to answering the study's questions, leading to the presentation of well-considered scientific recommendations that support the development of relevant future practices.

1.6 Study Limits

- Temporal Limits: Previous studies (2024-2025).

- Thematic Limits: Focusing on the role of partnerships and sustainability.

1.7 Study terms:

- Research Partnerships:

Research partnerships are collaborations between academic institutions (universities) and private sector organizations or companies with the aim of achieving practical research results. These partnerships aim to integrate the theoretical knowledge produced by universities with the applied capabilities of the private sector, leading to the development of innovative solutions and practical practices in various fields (Fei Bu et al., 2025). Research partnerships are also a means of achieving integration between higher education and market demands, contributing to tangible results in innovation and knowledge application.

- **Private Sector:**

The private sector refers to institutions and companies operating in the commercial market for profit, including small and large companies operating in various industrial and commercial sectors. The private sector possesses financial and technical resources that can be exploited to apply the results of scientific research. Partnerships between universities and the private sector are an important tool for leveraging these resources to apply scientific knowledge on the ground (Olusegun & Nthontho, 2025).

- **Sustainability:**

Sustainability refers to the ability of environmental, social, and economic systems to continue to meet the needs of present generations without compromising the ability of future generations to meet their own needs. Sustainability involves conserving natural resources, minimizing negative environmental impacts, and balancing economic growth with environmental protection. Collaboration between universities and the private sector is one way to achieve sustainability through the application of innovative research in areas

such as renewable energy, waste management, and environmental protection (Fei Bu et al., 2025).

1.8 Previous studies

Partnerships between universities and the private sector are a key factor in achieving sustainable innovation across various fields. By reviewing previous studies, we can observe how these partnerships contribute to enhancing environmental, social, and economic performance. This study aims to explore the findings of these studies by providing a comprehensive overview of the most important trends and research focused on improving university-industry collaboration to achieve sustainability.

No.	AUTH's, Year	Study title	Methodology	Field	Main result	Main recommendations
1.	Bu et al., 2025	Impact of University–Industry Collaboration on Green Innovation of Logistics Enterprises in China	Hierarchical regression analysis	Logistics and green innovation	University–industry collaboration enhances social capital and dynamic capabilities, leading to improved green innovation.	Strengthen slack resources and develop joint training programs
2.	Orlando et al., 2025	University–Business R&D Collaborations and AI	Mixed-methods (large dataset and curvilinear analysis)	Open innovation and R&D	Collaborations enhance innovation, but AI's impact on creativity is non-linear and may hinder engagement.	Balance digital skills development and carefully integrate AI tools.
3.	Zhou et al., 2025	Enhancing Green Innovation through University–Industry Collaboration and AI in China	Dynamic panel analysis (GMM)	Regional innovation systems	University embeddedness significantly improves green innovation performance, surpassing AI's direct impact.	Strengthen absorptive capacity at human and institutional levels.
4.	Stephen & Aigbavboa, 2025	Enhancing Academia–Industry Partnerships for	Comparative analysis and case studies	Sustainable construction	Policy support, local material use, and contextual	Integrate digital tools, foster cross-border collaboration.

		Sustainable Building in Sub-Saharan Africa			adaptation drive successful partnerships. University embeddedness significantly improves green innovation performance, surpassing AI's direct impact.	
5.	Siqueira et al., 2025)	Technology Transfer as an Enabler for Sustainable Entrepreneurial Universities	Network analysis and qualitative case study	Technology transfer in higher education	Most sustainable patents stem from individual researchers with public funding, lacking institutional alignment.	Establish institutional guidelines to foster sustainable technology transfer.
6.	Barrett & Crowley, 2025	Offshore Renewable Energy SMEs' Innovation Interactions	Multiple case studies	Offshore renewable energy	Human expertise and adaptive practices are central to successful triple helix collaborations	Support strategic alliances and reduce bureaucratic barriers.
7.	Domingues et al., 2025	Impact of Project-Based Learning on Student Knowledge Exchange	Applied educational study	Higher education and sustainability	Project-based learning significantly enhances students' sustainability knowledge, skills, and attitudes.	Embed project-based learning into formal curricula.
8.	Nguyen et al., 2025	Higher Education as a Driver of Green Innovation and Entrepreneurship	Systematic literature review (PRISMA)	Green innovation and entrepreneurship	Universities act as knowledge hubs, but a gap persists between green innovation and entrepreneurship translation.	Enhance university support systems and foster industry collaborations.
9.	Siraj et al., 2025	Partnership Model for Simulation-Based Health Education	Scoping review	Health education and training	No effective partnership model currently exists between universities and NPOs for simulator distribution	Develop partnership funding, implementation, and evaluation frameworks
10.	Lawrence et al., 2025	Understanding Tension	Qualitative multi-case	University–industry	v	Manage tensions through

		Between Industry and Higher Education	study	partnerships		transparency, shared language, and long-term investment
11.	Bai et al., 2025	Role of Collaborative Governance in Unlocking Private Investment	Autoregressive distributed lag (ARDL) model	Private investment in green projects	Good governance positively affects private sector investment in the short and long term.	Issue green bonds, promote ICT-driven transformation
12.	Gui et al., 2025)	Contractual Governance in Urban Sewage	Literature analysis and research model	Urban sewage public–private partnerships	Administrative efficiency enhances risk allocation, responsibility sharing, and overall project performance.	Optimize contractual governance and clarify accountability

1.9 Comment on previous studies

Previous studies share a clear similarity in their focus on the importance of university-private sector collaborations in promoting sustainability and achieving sustainable innovation across various sectors. For example, Fei Bu et al.'s (2025) study highlights the role of university-industry collaborations in promoting green innovation in the logistics sector, which aligns with many other studies that emphasize the need for academic knowledge to interact with the applied resources of the private sector. Studies such as Stephen & Aigbavboa (2025) also indicate that partnerships in sustainable construction can significantly contribute to achieving environmental, social, and economic goals.

Despite these similarities, the proposed study, "Proposed Educational Approaches to Enhance Research Partnerships between Universities and the Private Sector to Support Sustainability," stands out in its focus on educational approaches that foster these partnerships. While many previous studies, such as Zhou et al. (2025) and Nguyen et al. (2025), rely on analytical methodologies or systematic reviews to study the impact of university-private sector collaborations, the proposed study focuses on how to develop educational curricula and training programs that support university-private sector collaborations and equip students with the skills necessary to implement these partnerships in the future. This pedagogical

perspective makes the proposed study unique, offering practical, applicable solutions that can be implemented in an educational context.

The proposed study also differs from some previous studies in that it focuses on the educational and pedagogical aspects, seeking to prepare graduates capable of dealing with the challenges of research partnerships with the private sector. While other studies, such as Gui et al. (2025) and Bai et al. (2025), focus on the economic and technical aspects of these partnerships, the proposed study aims to improve academic and research competencies through interactive educational programs. This distinguishes the proposed study from others in providing effective pedagogical solutions for integrating sustainability into education.

Ultimately, the proposed study is distinguished by its ability to bridge the gap between technical and economic research on the one hand, and academic education on the other, by presenting innovative pedagogical mechanisms that enhance cooperation between universities and the private sector through education and training. Unlike previous studies that focused solely on practical and technical aspects, this study offers implementable pedagogical solutions that contribute to the development of the next generation of professionals who can contribute to enhancing sustainability through these partnerships.

1.10 Study results

Results of the first question: What is the concept of research partnerships?

From the perspective of researchers in various previous studies, research partnerships are considered an innovative and effective model for integrating academic knowledge with practical applications in the private sector. Scientific research at universities typically focuses on theoretical aspects that may sometimes be far removed from market or industry requirements. Therefore, research partnerships promote collaboration between these academic institutions and industrial enterprises, aiming to bridge the gap between scientific research and practical applications.

Through these partnerships, the private sector can benefit from advanced research conducted by universities, enabling them to implement innovative solutions in production and development processes. In return, universities can obtain the necessary funding and resources

they need to implement scientific research projects. In this context, Fei Bu et al.'s (2025) study indicates that university-industry collaboration in China is not limited to knowledge transfer, but also extends to enhancing the dynamic capabilities and social resources that contribute to green innovation. This type of collaboration contributes to improving environmental performance in many industrial fields.

On the other hand, researchers in Siqueira et al.'s study note that (2025) Technology transfer between universities and the private sector is a key driver of sustainable innovation. Research partnerships enable academic institutions to translate theoretical research into practical applications that contribute to improving environmental and social sustainability. This collaboration enhances the competitiveness of the private sector through the use of cutting-edge research that can lead to improved operational processes and reduced environmental costs.

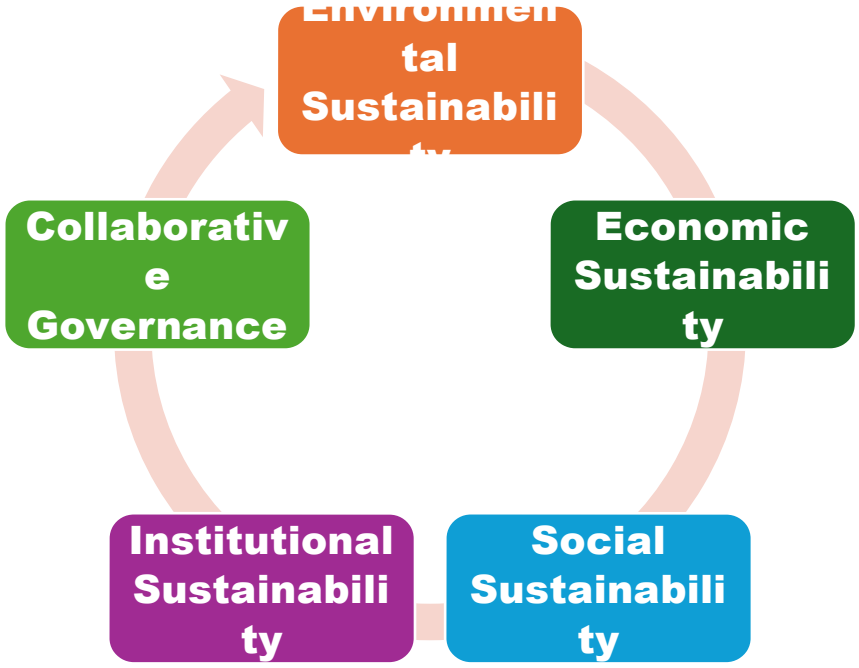
Moreover, researchers in Nguyen et al. (2025) highlight the role of universities as vital knowledge centers that promote green innovation and sustainable entrepreneurship. Although universities are a major source of knowledge and innovation, the challenge lies in how to effectively transfer this knowledge to the private sector. Therefore, research partnerships are a tool for bridging the gap between academic research and market needs.

In general, research partnerships can be defined as strategic collaborations aimed at integrating academic research with industrial applications. These collaborations are not merely theoretical but include a range of practical activities that enable universities to transfer their knowledge to the private sector in a way that contributes to sustainable innovation, improves environmental efficiency, and enhances industrial competitiveness.

Results of the second question: What are the most important pillars of sustainability that enhance research partnerships?

Sustainability is a multidimensional concept that involves the balance between environmental, economic, and social factors. When applied to research partnerships, particularly those between universities and the private sector, several key pillars of sustainability play a crucial role in enhancing these collaborations. These pillars ensure that such partnerships are not only

productive but also contribute to long-term societal benefits. Based on previous studies, the most important pillars of sustainability that enhance research partnerships include:



1. **Environmental Sustainability:**

   One of the primary pillars that drives research partnerships is the commitment to reducing environmental impact and promoting green innovation. As highlighted by Fei Bu et al. (2025), university–industry collaborations in green innovation, particularly in logistics, have demonstrated significant positive effects on environmental performance. These partnerships often focus on sustainable technologies and practices, such as energy-efficient systems, waste reduction, and resource conservation, which ultimately contribute to environmental preservation. The integration of environmental considerations into research partnerships ensures that innovations are not only beneficial in the short term but also contribute to the long-term health of the planet.

2. **Economic Sustainability:**

   Economic sustainability in research partnerships is critical to ensuring that the outcomes of these collaborations are viable and can continue to provide value over

time. Research partnerships between universities and the private sector help bridge the gap between scientific discovery and commercial application, thereby enhancing economic growth. As evidenced in studies like "Nguyen et al. (2025)", universities serve as knowledge hubs, fostering entrepreneurship and innovation. The economic aspect of sustainability emphasizes the importance of creating solutions that are both cost-effective and scalable. By promoting innovation that leads to marketable products or services, these partnerships contribute to the economic resilience of industries and regions.

3. **Social Sustainability:**

   Social sustainability is equally important in fostering long-lasting and impactful research collaborations. This pillar focuses on ensuring that the benefits of research are equitably distributed and that the outcomes contribute positively to society. Research partnerships often aim to address pressing social issues, such as health inequalities, education gaps, and social equity. For instance, the work of Siraj et al. (2025) on partnerships in simulation-based health education emphasizes how collaborations can bridge gaps in health education and reduce disparities. Social sustainability in research partnerships is also reflected in the development of inclusive practices, community engagement, and capacity-building in underrepresented sectors.

4. **Institutional Sustainability:**

   A strong institutional framework is essential for the continuity and effectiveness of research partnerships. This pillar involves establishing clear governance structures, aligned goals, and robust mechanisms for collaboration between academic institutions and private-sector organizations. According to studies like "Bai et al. (2025)", effective governance and strategic alignment are crucial for unlocking private investment and ensuring the long-term success of collaborative projects. Institutional sustainability also includes the establishment of policies and guidelines that support sustainable technology transfer and innovation, ensuring that the knowledge generated is not only applied but also protected and nurtured for future generations.

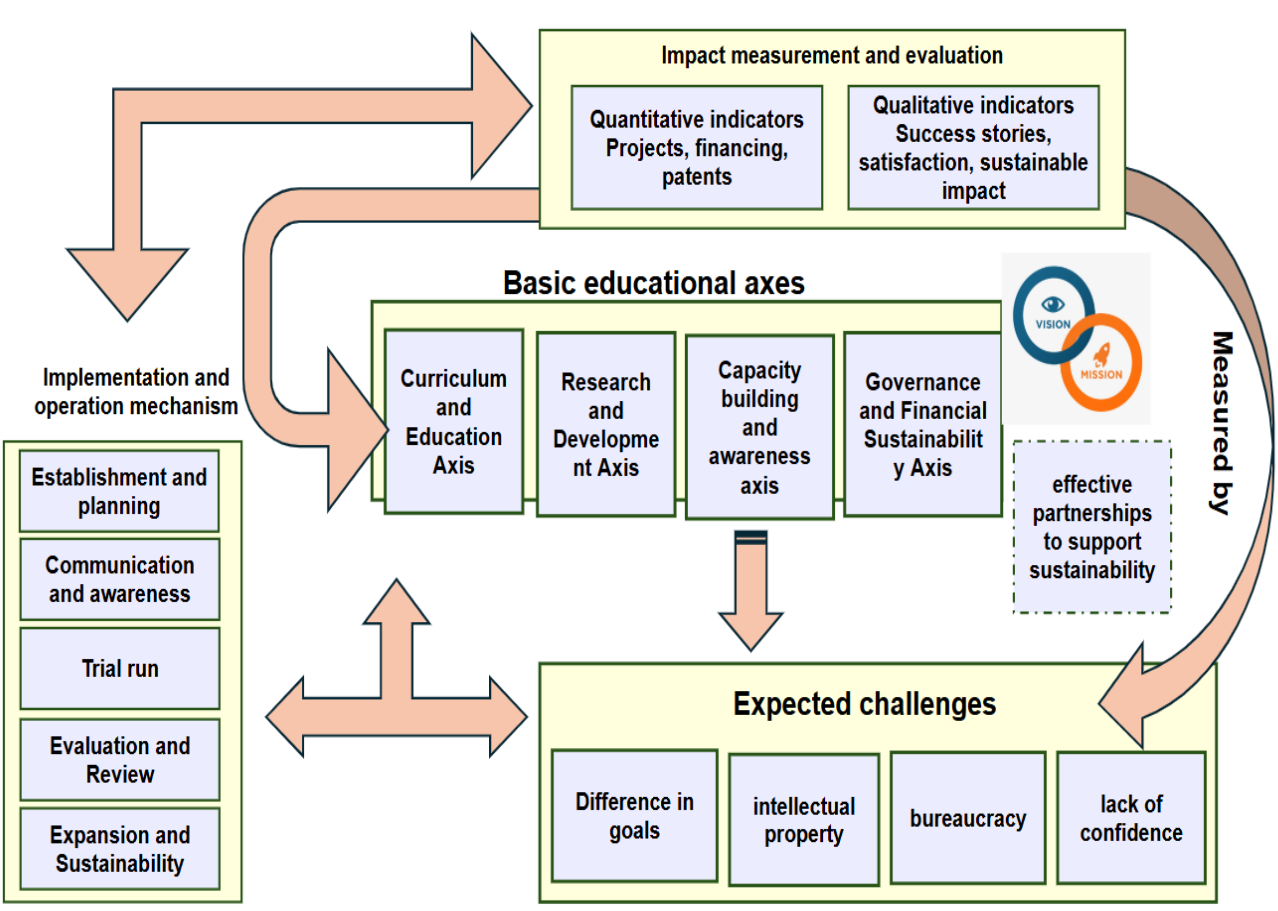
5. **Collaborative Governance:**

Collaborative governance is an essential pillar that facilitates cooperation between universities, the private sector, and other stakeholders. Effective collaborative governance helps to streamline decision-making, allocate resources efficiently, and align the interests of all parties involved. Studies like "Barrett & Crowley (2025)" emphasize the importance of reducing bureaucratic barriers and supporting strategic alliances, which are fundamental for ensuring that research partnerships thrive in a competitive, fast-paced environment. This collaborative approach fosters trust and accountability, which are critical for the long-term success of sustainable partnerships.

In conclusion, the most important pillars of sustainability that enhance research partnerships are environmental, economic, and social sustainability, supported by strong institutional frameworks and collaborative governance. These pillars ensure that the outcomes of such partnerships not only meet immediate goals but also contribute to sustainable development over time. By focusing on these pillars, universities and the private sector can create research collaborations that address global challenges while fostering innovation and economic growth.

Results of the third question: What are the proposed educational methods for enhancing research partnerships between universities and the private sector to support sustainability?

Strengthening research partnerships between universities and the private sector relies on developing innovative pedagogical approaches that contribute to improving cooperation between the two parties. By integrating academic education with the needs of the private sector, sustainable outcomes can be achieved that benefit society and the environment. In this context, various pedagogical approaches are proposed that aim to support sustainability and strengthen these partnerships in line with current challenges.



Proposed educational approaches to enhance research partnerships between universities and the private sector to support sustainability

VISION	MISSION
Vision	**message**
Universities should be essential incubators for innovation and scientific research directed towards achieving sustainability	To build an integrated educational model that facilitates and stimulates the creation and development of research partnerships between universities and the private sector,

goals through effective and sustainable partnerships with the private sector.	to address global sustainability challenges and transform knowledge into practical solutions and applications.

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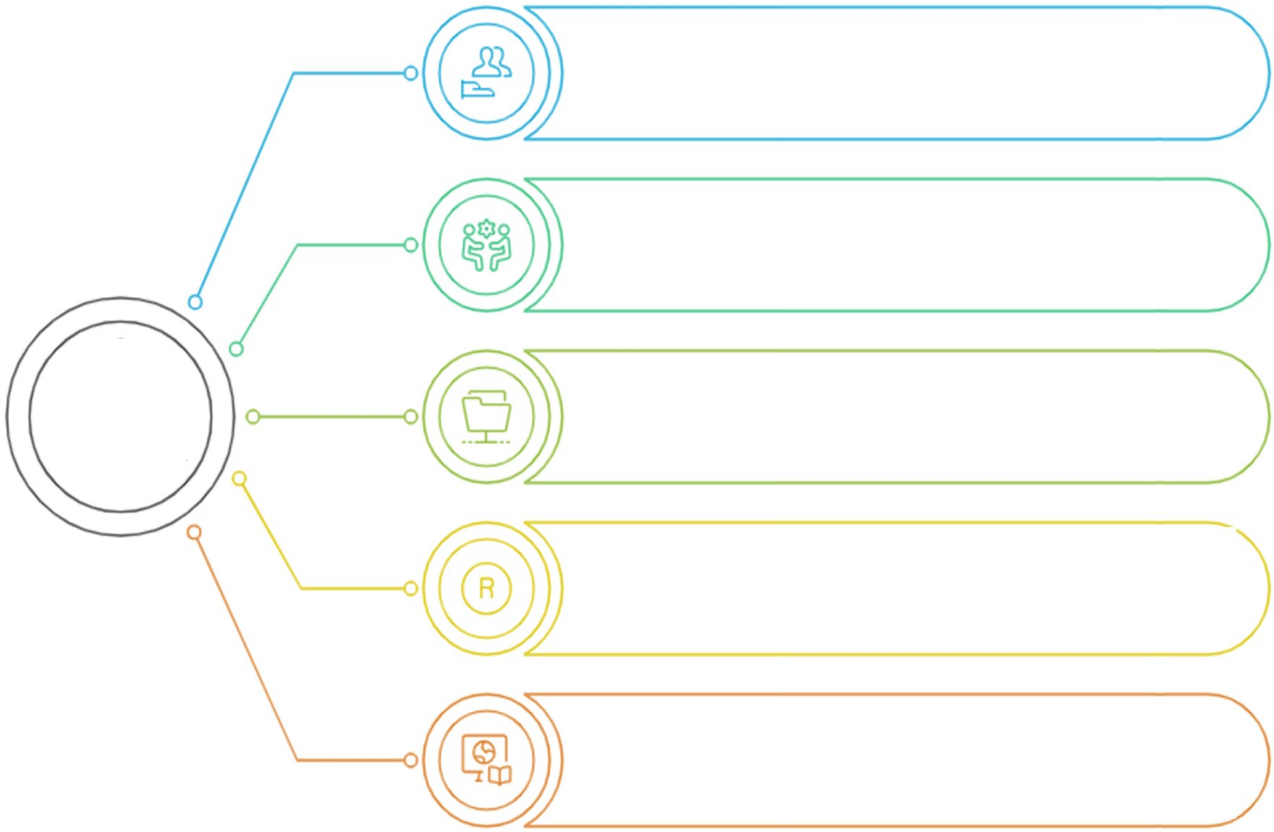
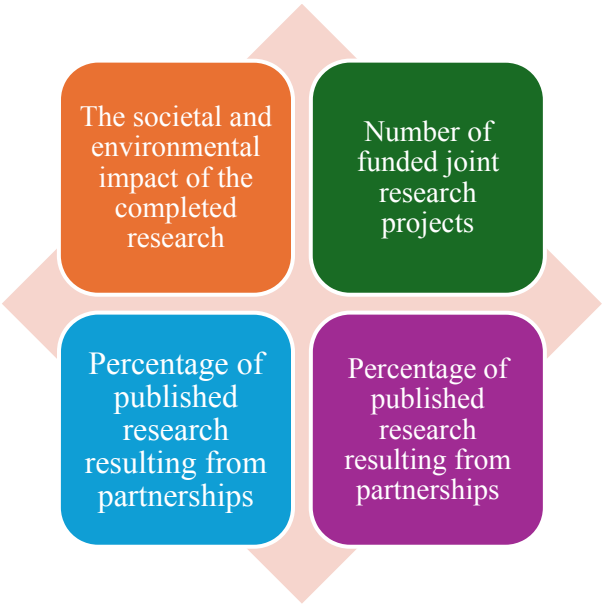


Main axes			
Curriculum and Education Axis	**Research and Development Axis**	**Capacity building and awareness axis**	**Governance and Financial Sustainability Axis**
• Integrating the concepts of sustainability and research partnerships into university curricula. • Developing graduate programs specializing in sustainable research partnerships. • Involving students in	• Launching joint research projects with societal, environmental, and economic impact. • Establishing joint incubators and innovation centers between universities and the private sector.	•Organizing joint training programs for researchers and academic and industrial cadres. •Promoting a shared research culture through workshops and knowledge platforms.	• Establish flexible legislative frameworks that ensure clear roles and responsibilities. • Enhance transparency and accountability in the management of shared resources. • Establish sustainable

research projects with the private sector from the early stages of their studies.	• Stimulating the publication of joint research in prestigious journals and linking it to sustainability indicators.	• • Raising awareness of the importance of applied research and its role in sustainable development.	financing mechanisms through long-term partnerships.

Measurement and impact indicators



1.11
Recommendations:

- It is recommended to develop joint training programs between universities and industrial institutions, focusing on green innovation and sustainable technology. Such programs help build students' skills and provide them with the applied knowledge needed by the private sector to achieve sustainability goals.
- Universities should focus on strengthening research partnerships with the private sector in the fields of green innovation and renewable energy. Developing joint research that contributes to finding sustainable environmental solutions can yield significant benefits for both the academic and industrial sectors.
- Mechanisms should be established to enable smoother and more effective technology and knowledge transfer between universities and industrial institutions. Directing academic

institutions to develop technology transfer models that are more aligned with market needs will contribute to maximizing the benefits of scientific research in the private sector.

- It is recommended to establish strategic partnerships with industries focused on environmental innovation, such as renewable energy and sustainable agriculture. By enhancing collaboration in these areas, universities can offer innovative solutions that contribute to achieving sustainable development.
- It is recommended to develop joint funding strategies between universities and the private sector to support research focused on sustainability. The private sector can be encouraged to invest in green innovation research through funding programs supported by governments or international institutions.

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