

Research Article

Transforming Higher Education in Sierra Leone – A Path to Sustainable Development

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Abstract

This paper examines the critical role of higher education in driving sustainable development in Sierra Leone, guided by Transformative Learning Theory (TLT) and Sustainable Development Theory (SDT). The study investigates challenges within the higher education system, such as inadequate funding, outdated curricula, and limited research capacity, and presents a comprehensive framework for transformation. These obstacles hinder the effectiveness of higher education institutions (HEIs) in contributing to national development. The paper highlights innovative teaching methods, such as Problem-Based Learning (PBL) and experiential education, as strategies to foster critical thinking, problem-solving skills, and leadership capabilities among students. By aligning academic programs with the Sustainable Development Goals (SDGs) and emphasizing interdisciplinary research and industry collaboration, HEIs can play a pivotal role in Sierra Leone's socio-economic progress. Drawing on successful models from universities such as Aalborg, the University of Malaya, and the University of Cape Town, the study demonstrates how interdisciplinary research and industry partnerships can drive innovation and development. The findings underscore the need for coordinated efforts from academia, industry, government, and international partners to transform Sierra Leone's higher education system into a driver of sustainable development. The paper concludes that, while challenges persist, the integration of transformative learning and sustainable development principles can enable HEIs to equip graduates with the skills necessary to address the country's most pressing socio-economic and environmental issues.

Keywords

Higher Education, Sustainable Development, Transformation, Research Collaboration, And Socio-economic Progress

1. Introduction

Higher education is central to the social and economic development of any nation, particularly those aspiring to meet global development challenges such as poverty eradication, inequality reduction, and environmental sustainability. [1] In Sierra Leone, higher education institutions (HEIs) have a pivotal role to play in nurturing human capital, fostering innovation, and driving economic growth. [2, 3] These institutions can serve as hubs for intellectual exploration, skill ac-

quisition, and knowledge dissemination, which are vital for equipping individuals to navigate the complex global landscape of the 21st century. [4]

However, the higher education landscape in Sierra Leone is fraught with challenges that impede its ability to contribute optimally to sustainable development. These challenges include inadequate funding, infrastructure deficits, outdated curricula, limited research capacity, and a lack of alignment with

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industry needs. [5] The struggle to align the education system with the country's aspirations for sustainable development highlights the need for a comprehensive transformation that transcends traditional education models. The Transformative Learning Theory and Sustainable Development Theory provide theoretical foundations to guide this transformation. [6]

2. Theoretical Framework

2.1. Transformative Learning Theory

Transformative Learning Theory (TLT), first introduced by Jack Mezirow in 1978, is one of the most significant frameworks in adult learning theory. [7] It emphasizes how individuals can change their perspectives through critical reflection, which in turn leads to personal and social transformation. [8] This process of learning goes beyond the acquisition of information; it entails a fundamental shift in the way individuals see themselves and the world around them. [9] Mezirow's theory suggests that learning is not simply about accumulating knowledge but is an evolving process of re-examining previously held beliefs, assumptions, and worldviews, leading to a transformation in how individuals approach problems and challenges. [10, 11]

The core of transformative learning lies in critical reflection, where individuals examine their existing frames of reference—often developed over time through cultural, social, and personal experiences—and evaluate their validity. According to Mezirow, this process of reflective discourse enables individuals to engage in what he coins as "*meaning-making*" by questioning the assumptions that shape their beliefs, values, and behaviors. [12] In doing so, learners challenge established perspectives, leading to the development of more inclusive, discriminating, and reflective ways of thinking. [13] This shift in perspective is particularly transformative when it leads to changes in behavior and the development of new problem-solving strategies.

Another essential aspect of Transformative Learning Theory is the importance of disorienting dilemmas—events or experiences that challenge an individual's existing belief systems. These dilemmas often serve as catalysts for transformation because they force individuals to reassess their understanding of the world and engage in deeper critical thinking. [14] By facing and addressing these dilemmas, learners are encouraged to engage in dialogue, consider alternative viewpoints, and develop more comprehensive solutions to complex problems. [15]

2.2. Application in Sierra Leone's Higher Education System

In the context of Sierra Leone's higher education system, Transformative Learning Theory offers a critical framework for rethinking how universities prepare students to address

the country's socio-economic and environmental challenges. [16] Given the complex, multifaceted problems that Sierra Leone faces—including poverty, environmental degradation, and underdeveloped infrastructure—traditional methods of rote learning and memorization are insufficient. Instead, students must be equipped with the ability to critically evaluate situations, explore alternative solutions, and adapt to the rapidly changing global and local landscapes. [17]

Transformative learning is especially relevant in Sierra Leone because it encourages critical thinking and experiential learning, both of which are crucial for fostering innovative solutions in fields such as agriculture, healthcare, energy, and governance [18]. In these areas, simply imparting technical knowledge is not enough. [19] Students must learn how to apply that knowledge in real-world contexts, critically evaluate their approaches, and be willing to adjust their methods based on reflective insights. [20]

For example, teaching strategies such as Problem-Based Learning (PBL)—where students are tasked with solving real-world problems—provide a practical application of transformative learning principles. [21] In PBL environments, students collaborate on interdisciplinary projects, use critical reflection to question assumptions, and engage in iterative problem-solving that leads to deeper learning. This approach helps students develop the skills necessary to confront the complex problems of sustainable development and become agents of change in their communities.

Flipped classrooms and experiential learning are additional pedagogical approaches aligned with Transformative Learning Theory [22] In a flipped classroom, students are introduced to new content outside the traditional classroom (through reading materials, videos, or online content) and then apply what they have learned in interactive, collaborative in-class activities [23] This method promotes active learning and allows students to engage with real-world scenarios that challenge their understanding and assumptions. For example, in the context of environmental sustainability, a flipped classroom might involve students researching current climate policies outside of class and then engaging in debates, case studies, or problem-solving exercises during class sessions to propose improvements or alternatives. [24]

Similarly, experiential learning, where students engage in hands-on projects or internships related to their field of study, provides opportunities for reflection and transformation. [25] By immersing students in real-world challenges—whether through community-based projects, fieldwork, or industry partnerships—Sierra Leone's higher education institutions can foster the development of critical consciousness. Students exposed to the practical complexities of issues such as deforestation, water resource management, or renewable energy can reflect on their experiences, challenge their preconceptions, and develop creative, sustainable solutions [26] This form of learning empowers students not just to absorb information but to apply it in transformative ways that have a direct impact on their communities. [27]

Mezirow's theory also emphasizes the importance of dialogue. [28] and discourse as a means of fostering transformation. In Sierra Leone's universities, fostering an environment of open dialogue—where students and faculty can critically discuss socio-economic and environmental issues—is vital. Such discourse allows students to explore diverse perspectives, engage in reflective thinking, and collaboratively develop new insights that can lead to transformative action. Whether addressing climate change, economic inequality, or health disparities, creating spaces for critical dialogue can inspire students to become active participants in shaping the future of their country.

2.3. Sustainable Development Theory

Sustainable Development Theory is grounded in the notion that development must balance economic growth, social equity, and environmental sustainability. [29]. It asserts that achieving long-term prosperity requires integrating these three pillars of sustainability into policies and practices. [30]

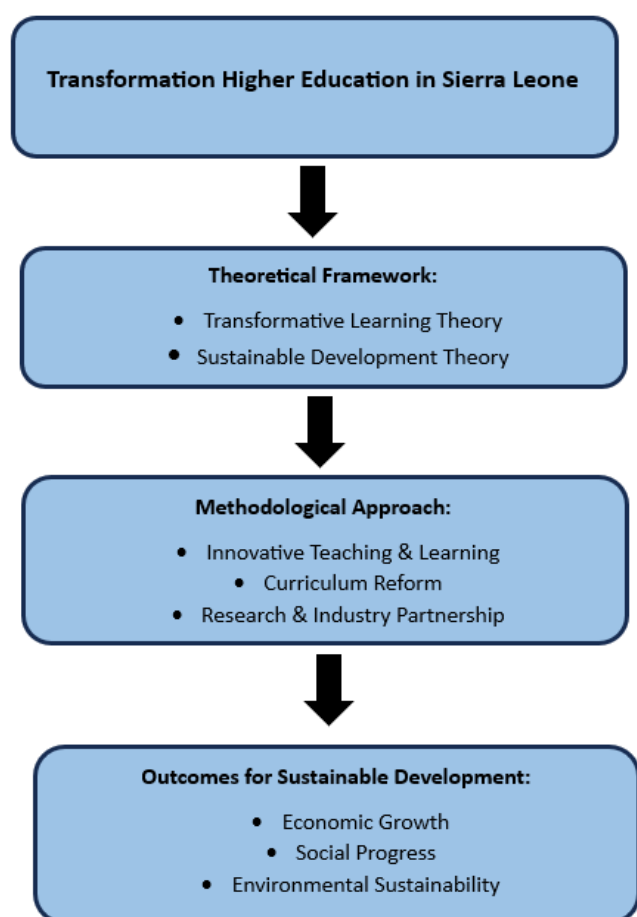


Figure 1. Transformation framework.

The framework, Figure 1, begins with the transformation of higher education, supported by a theoretical foundation grounded in Transformative Learning Theory and Sustainable

Development Theory. The methodological approach focuses on Innovative Teaching & Learning, Curriculum Reform, and Research & Industry Partnerships. These elements are designed to drive outcomes aligned with Sustainable Development, targeting Economic Growth, Social Progress, and Environmental Sustainability. The flow of arrows in the framework illustrates the progression from theoretical foundations to practical methods and ultimately to the desired outcomes.

In the realm of higher education, Sustainable Development Theory provides a framework for designing curricula that not only focus on academic knowledge but also incorporate sustainable practices. [31] Higher education institutions, according to this theory, are seen as engines of sustainable development that can promote innovation in renewable energy, environmental conservation, and social justice. [32] In Sierra Leone, aligning HEIs with the SDGs—such as Goal 4 (Quality Education), Goal 8 (Decent Work and Economic Growth), and Goal 13 (Climate Action)—can help drive the country's sustainable development agenda. [33]

2.4. Research Questions

To guide this study and explore how higher education can contribute to sustainable development in Sierra Leone, the following research questions are posed:

- 1) RQ1: How can higher education institutions in Sierra Leone integrate transformative learning principles to enhance their contribution to sustainable development?
- 2) RQ2: What are the main barriers within Sierra Leone's higher education system that prevent alignment with sustainable development goals, and how can these be addressed?
- 3) RQ3: How can interdisciplinary research and industry partnerships within Sierra Leone's higher education institutions foster innovation and contribute to national socio-economic development?

2.5. Methodological Approaches

This study employs a comprehensive desktop research approach to examine the challenges and opportunities within Sierra Leone's higher education system. By integrating both qualitative and quantitative secondary data, the study aims to provide a holistic understanding of the educational landscape and its alignment with sustainable development goals. A mixed-methods design is adopted, combining data from diverse sources to facilitate a thorough investigation and enhance the validity of the findings.

The quantitative component draws from *statistical* reports, educational databases, and government publications relevant to higher education in Sierra Leone, covering aspects such as student enrollment, funding allocation, infrastructure, and academic performance. Reputable sources, including UNESCO, the Ministry of Education etc., provide data reflecting current trends and resource availability. The qualita-

tive component involves a review of academic journals, policy documents, case studies, and reports from international organizations, including insights from scholarly articles, policy analyses, and expert commentaries focusing on sustainable development, educational reforms, and transformative learning practices.

The integration of qualitative and quantitative data strengthens the credibility of the findings and provides a robust foundation for recommendations aimed at transforming Sierra Leone's higher education system in line with sustainable development objectives.

3. Contextual Analysis

The higher education system in Sierra Leone reflects a complex mix of opportunities and challenges. In recent years, the number of students accessing tertiary education has gradually increased. [34] However, the accessibility of education remains inequitable, particularly for marginalized groups, such as rural communities and women. [35] This disparity not only affects access but also undermines the inclusive growth objectives that are integral to sustainable development. [36]

Furthermore, the state of infrastructure across higher education institutions remains a major concern. [37] Insufficient classroom spaces, outdated facilities, and limited access to modern technology inhibit the ability of these institutions to provide a conducive learning environment. [38] The quality of education, while showing improvement in some institutions, continues to vary widely, with many HEIs struggling to offer up-to-date curricula that meet contemporary labor market demands. [39] As a result, graduates often find themselves inadequately prepared for the challenges of the job market.

3.1. Challenges

The higher education system in Sierra Leone faces numerous obstacles that hinder its ability to contribute effectively to sustainable development. These challenges include systemic issues such as inadequate funding, outdated curricula, limited research capacity, and infrastructure deficits. Addressing these barriers is essential for transforming the sector and aligning it with national socio-economic goals.

3.2. Inadequate Funding

One of the most pressing challenges facing higher education in Sierra Leone is inadequate funding. [40] The government's budget allocation to higher education institutions is insufficient to meet the demands for modernization, infrastructure development, and research expansion. [41] This financial constraint also affects the availability of scholarships, limiting access to higher education for many talented but underprivileged students. [42]

The shortage of funding also affects the ability of HEIs to offer competitive salaries for faculty and staff, leading to brain drain as qualified professionals seek better opportunities abroad. [43] The resultant shortage of qualified teaching staff further hampers the quality of education provided, perpetuating a cycle of underperformance that stymies efforts to align higher education with sustainable development goals.

3.3. Outdated Curricula

A significant barrier to aligning higher education with sustainable development is the presence of outdated curricula that are not responsive to the rapidly changing socio-economic environment. Many HEIs continue to offer courses that are irrelevant to the current job market, leaving graduates ill-prepared to meet the demands of emerging industries such as renewable energy, information technology, and agribusiness. [44]

The lack of interdisciplinary courses, experiential learning opportunities, and industry partnerships further compounds this issue. Without continuous curriculum reviews and stakeholder consultations, higher education institutions are unable to equip students with the necessary skills to contribute effectively to national development goals. [45]

3.4. Limited Research Capacity

Sierra Leone's higher education institutions struggle with limited research capacity, largely due to inadequate funding and infrastructure. This stifles the production of knowledge that is critical to addressing local challenges such as public health, environmental conservation, and poverty alleviation. [46] The absence of a strong research culture, combined with insufficient incentives for impactful research, further diminishes the sector's ability to contribute meaningfully to sustainable development. [47]

The lack of collaboration between academia, industry, and government is a missed opportunity to create synergies that could lead to innovative solutions for pressing national challenges. [48] The absence of strong industry partnerships restricts knowledge transfer and hinders the development of technologies and services that can propel the country toward sustainable development.

4. Role of Higher Education in Sustainable Development

4.1. Economic Growth

Higher education institutions have a critical role to play in driving economic growth by fostering human capital development, research, innovation, and entrepreneurial capacities. [49] Within the framework of Sustainable Development Theory, HEIs in Sierra Leone can support the development

of skills relevant to emerging sectors such as renewable energy, agribusiness, and technology. [50] By equipping students with knowledge and expertise in these areas, HEIs can help diversify the economy and reduce its vulnerability to external shocks.

Additionally, Transformative Learning Theory supports the adoption of innovative teaching methodologies that encourage students to engage in real-world problem-solving. For instance, problem-based learning (PBL) and experiential learning can be integrated into the curriculum to prepare students for the workforce and foster an entrepreneurial mindset. [51] Establishing strong linkages between academia and industry is essential for promoting knowledge transfer and fostering a workforce capable of addressing the demands of a dynamic labor market. [52]

4.2. Social Progress

Higher education institutions also play a crucial role in advancing social progress by promoting critical thinking, ethical values, and cultural awareness. [53] In a country like Sierra Leone, where issues such as gender inequality and youth unemployment are pervasive. [54] HEIs have the potential to be transformative forces in society.

Transformative Learning Theory posits that education should empower individuals to question and challenge societal norms. [55] By integrating courses on gender studies, civic engagement, and leadership into the curriculum, HEIs can foster a socially responsible and engaged citizenry. [56] Such reforms would enable students to actively participate in policy formulation and decision-making processes, fostering a culture of accountability and transparency in governance. [57]

4.3. Environmental Sustainability

Sierra Leone's unique environmental challenges, including deforestation, climate change vulnerability, and biodiversity loss, necessitate the incorporation of environmental sustainability into higher education. [58] HEIs, guided by Sustainable Development Theory, can offer programs in environmental sciences, conservation biology, and sustainable resource management. [59] These programs can equip graduates with the knowledge and skills needed to address environmental challenges while promoting the country's long-term sustainability.

Transformative Learning Theory further supports the development of sustainability consciousness among students. By adopting sustainable practices within campuses, HEIs can serve as models for surrounding communities, creating a ripple effect that extends beyond the academic sphere.

5. Best Practices and Case Studies

The successful integration of higher education reforms through Transformative Learning Theory and Sustainable Development Theory in various global contexts offers valuable

insights for the potential transformation of Sierra Leone's higher education system [60]. By examining the cases of the University of Malaya, Aalborg University, and the University of Cape Town, this section outlines best practices and relevant approaches that can serve as models for Sierra Leone's higher education institutions.

5.1. A Whole-Institution Approach to Sustainability

The University of Malaya has become a leading example of how sustainability can be embedded across all facets of higher education, from curriculum design to research initiatives and campus operations. [61] The institution's comprehensive adoption of Sustainable Development Theory ensures that the curriculum aligns with key Sustainable Development Goals (SDGs), including responsible consumption, environmental protection, and social equity. This holistic approach involves the active participation of all faculties and departments in integrating sustainability practices. [62]

The university introduced the Green Office program, which engages students, faculty, and staff in sustainable practices, providing a practical application of Transformative Learning Theory. [63] This initiative fosters critical reflection on individual and institutional consumption patterns, encouraging participants to develop solutions for sustainability challenges. Furthermore, the establishment of interdisciplinary research centers at the University of Malaya focuses on addressing both local and global sustainability issues, such as reducing urban waste. The Green Office program has been widely recognized as a model for sustainability across Southeast Asia, with other universities replicating the initiative. [64]

Relevance to Sierra Leone: Higher education institutions (HEIs) in Sierra Leone could implement a similar whole-institution approach by embedding sustainability across curricula and operational practices. Engaging students through community-based programs, such as addressing deforestation or waste management, would enhance their practical understanding of sustainability while contributing to local development goals. [65]

5.2. Problem-Based Learning (PBL) for Sustainable Development

Aalborg University is internationally renowned for its implementation of Problem-Based Learning (PBL), an instructional method rooted in Transformative Learning Theory, which emphasizes critical thinking, interdisciplinary collaboration, and real-world problem-solving. [66] The university's curriculum is entirely structured around PBL, where students work in groups to solve complex problems related to their fields of study, such as renewable energy, urban sustainability, and environmental preservation. [67]

Aalborg's PBL model encourages close partnerships with

industries, allowing students to collaborate on projects with practical applications. This connection with industry ensures that students engage with relevant challenges, co-developing solutions alongside companies and local governments. The PBL model has also led to innovations in wind energy and sustainable urban planning, directly addressing pressing sustainability issues. [68]

Relevance to Sierra Leone: Sierra Leone universities could adopt PBL in fields such as environmental science, engineering, and urban planning. By engaging students in solving real-world issues like waste management or sustainable agriculture, HEIs can produce graduates who are equipped to address local development challenges with innovative, context-specific solutions.

5.3. Environmental Humanities South Initiative

The University of Cape Town (UCT) has demonstrated a strong commitment to sustainability and social justice through its Environmental Humanities South Initiative, which uniquely combines environmental education with community engagement. UCT's curriculum integrates Sustainable Development Theory by encouraging students to engage with the interconnectedness of environmental degradation, economic development, and social equity in Southern Africa. [69]

The initiative adopts Transformative Learning Theory by involving students in community-based research projects. For example, students work directly with local communities to document the effects of climate change on traditional farming practices. [70] This collaborative approach not only empowers students but also enables communities to co-develop solutions that are sustainable and locally relevant. The program also emphasizes the cultural dimensions of sustainability through the use of storytelling and traditional knowledge systems. [71] The Environmental Humanities South Initiative has strengthened partnerships between UCT and marginalized communities, leading to sustainable farming and resource management practices. [72]

Relevance to Sierra Leone: Sierra Leone's HEIs could replicate this model by partnering with rural communities to address climate change's impact on agriculture. Through community engagement, students can learn practical sustainability skills while leveraging traditional knowledge to co-create solutions that address environmental and socio-economic challenges.

These case studies from the University of Malaya, Aalborg University, and the University of Cape Town demonstrate the successful integration of higher education reforms grounded in Transformative Learning Theory and Sustainable Development Theory. The innovative strategies implemented by these institutions—such as whole-institution approaches to sustainability, problem-based learning, and community-based projects—illustrate how higher education can drive real-world change. These best practices are directly applicable

to Sierra Leone's context, where HEIs can play a pivotal role in addressing local development challenges while contributing to the broader goal of sustainable development.

By adopting these approaches, Sierra Leone's higher education institutions can align their curricula and operations with national development goals, fostering a generation of graduates equipped to solve the country's socio-economic and environmental challenges. Interdisciplinary research, industry partnerships, and a focus on sustainability should become core missions of HEIs in Sierra Leone, enabling them to contribute more effectively to the country's sustainable future.

6. Discussion

The findings from this study highlight the critical role that higher education institutions (HEIs) in Sierra Leone must play in advancing the country's sustainable development goals (SDGs). Drawing from Transformative Learning Theory and Sustainable Development Theory, this discussion addresses the core research questions of the study: the integration of transformative learning principles, the barriers preventing alignment with sustainable development, and the role of interdisciplinary research and industry partnerships in fostering innovation.

6.1. Integrating Transformative Learning Principles in Sierra Leone's Higher Education Institutions (RQ1)

In Sierra Leone, higher education institutions (HEIs) need to redefine their curricula to integrate transformative learning principles alongside Education for Sustainable Development (ESD) strategies to prepare students for the complex challenges of the 21st century. Education, as a central driver of sustainable development, must be restructured to incorporate systems thinking, interdisciplinary approaches, and sustainability competences. [73] Transformative Learning Theory (TLT) posits that true learning involves not only acquiring knowledge but also critically reflecting on one's assumptions, perspectives, and values to transform behavior. [74] (This theory is particularly relevant to the context of higher education in Sierra Leone, where traditional didactic methods dominate the classroom. It aligns closely with the goals of ESD, which aims to empower learners with the knowledge, skills, and attitudes necessary to promote sustainability. In the context of Sierra Leone, universities should adopt *participatory pedagogies* that allow students to critically assess societal challenges such as environmental degradation, poverty, and climate change. [75, 76] By fostering problem-solving skills and critical consciousness, students can be better equipped to navigate the complexities of sustainable development in their local and global contexts.

Problem-Based Learning (PBL), for instance, is an effective method that aligns with TLT by immersing students in

problem-solving activities where they apply theoretical knowledge to practical situations. Research from the University of Maribor, for example, demonstrates how collaborative learning can effectively prepare students to address sustainability challenges - fostering collaboration between Universities regarding regional sustainability initiatives). [77] Universities in Sierra Leone can similarly adopt PBL methods to develop projects addressing local issues, such as urban waste management, climate change adaptation, or sustainable agriculture. This approach not only equips students with the technical skills required for sustainable development but also instills in them the critical consciousness necessary to reflect on and challenge existing socio-economic structures.

Additionally, the integration of flipped classrooms and experiential learning can promote active engagement with sustainability topics. [78] A flipped classroom model—where students engage with lecture materials outside of class and use in-class time for active problem-solving—encourages deeper understanding of sustainability concepts. For example, a flipped classroom on climate resilience could have students study international climate policies on their own and apply that knowledge to develop local strategies for mitigating Sierra Leone's vulnerability to climate change.

Experiential learning, through community-based projects and internships, allows students to directly apply their knowledge in ways that benefit their communities. [79] Such initiatives not only prepare students to become professionals in their respective fields but also contribute directly to socio-economic development, embodying the core principles of Sustainable Development Theory. [80]

6.2. Barriers Preventing Alignment with Sustainable Development Goals (RQ2)

Vasiliki Kioupi and Nikolaos Voulvoulis (2022) emphasizes that “Education for Sustainable Development (ESD)” is often hindered by institutional barriers, including inadequate funding, outdated curricula, and limited interdisciplinary collaboration. [81] These same barriers are prevalent in Sierra Leone's higher education system, preventing full alignment with the SDGs. These challenges resonate with the findings from the University of Maribor's collaborative sustainability efforts, where the absence of sufficient resources and engagement from industries hindered progress on regional sustainability initiatives. [82]

Inadequate Funding is perhaps the most significant challenge. Without sufficient resources, universities struggle to update curricula, invest in research, or modernize their infrastructure to support ESD initiatives. The lack of funding also affects the availability of professional development opportunities for faculty, further hindering the integration of modern teaching practices like transformative learning. [83] Mezirow's theory emphasizes that transformative learning requires a shift in pedagogical approaches, which is difficult to achieve without investment in training and resources for fac-

ulty. [84]

Moreover, outdated curricula continue to impede the alignment of HEIs with the SDGs. The current curricula in many institutions focus on rote learning and fail to address contemporary issues such as climate change, renewable energy, or sustainable urban development. [85] Many HEIs in Sierra Leone continue to rely on traditional, rote-learning methods that do not equip students with the critical thinking and problem-solving skills necessary for addressing contemporary challenges. [86] This gap between academic offerings and real-world needs leaves graduates underprepared to address the complex socio-economic challenges facing the country. A transformation of curricula that incorporates interdisciplinary approaches—as highlighted in the University of Maribor case—as well as that of Aalborg University. [87] would better equip students to engage with sustainability issues from multiple perspectives. Updating curricula to incorporate interdisciplinary courses that address environmental, social, and economic sustainability is essential for preparing students to contribute effectively to national development. [89] Drawing from the ESD framework, curricula should be designed to foster systems thinking, enabling students to understand the inter-connectedness of socio-economic and environmental systems. [90]

The limited research capacity of Sierra Leone's HEIs also hampers progress toward the SDGs. Research is a crucial element of sustainable development, providing the insights and innovations needed to address environmental and social challenges. However, without adequate funding and resources, universities struggle to build the research infrastructure necessary for this work [91]. As demonstrated in the Maribor case, interdisciplinary research can drive regional development when properly supported by institutions and external stakeholders. Therefore, expanding research capacity through increased funding and international collaboration is vital to achieving Sierra Leone's sustainability goals.

Finally, the lack of strong industry partnerships remains a significant barrier. Industry collaboration is essential for aligning academic programs with the needs of the job market and for fostering innovation through applied research. [92] Sierra Leone's HEIs currently operate in isolation from local industries, which limits the practical application of academic knowledge and reduces the impact that graduates can have on the workforce. Collaborative learning and research partnerships, such as those established in the Podravje region with the University of Maribor, can offer a model for Sierra Leone to strengthen ties between academia, industry, and government.

6.3. Fostering Interdisciplinary Research and Industry Partnerships for Innovation (RQ3)

Interdisciplinary research and industry partnerships are crucial for fostering innovation and driving national socio-economic development. Kioupi & Voulvoulis (2019)

highlights the importance of interdisciplinary collaboration and stakeholder participation in achieving sustainability outcomes. [93] Systems thinking, a core tenet of ESD, encourages collaboration across different disciplines to address complex, interconnected challenges such as climate change, food security, and energy access. Additionally, industry partnerships can play a critical role in bridging the gap between academia and the job market. By collaborating with industries such as renewable energy, agribusiness, and waste management, universities can align their research with the needs of the local economy, fostering innovation and supporting national development goals.

As demonstrated in other contexts, such as the collaborative sustainability initiatives in the University of Maribor. [94], interdisciplinary approaches allow universities to address complex sustainability challenges by combining expertise from various academic fields. Furthermore, by breaking down academic silos, interdisciplinary research encourages comprehensive approaches to sustainability challenges, such as water resource management, agricultural productivity, or public health. [95]. For instance, a research project aimed at improving sustainable agriculture in Sierra Leone would benefit from the expertise of both agronomists and economists to develop farming methods that are not only environmentally sustainable but also economically viable for smallholder farmers. Such collaborative efforts can foster innovation and create solutions tailored to Sierra Leone's unique development context.

Additionally, industry partnerships provide critical opportunities for applied research and innovation. These partnerships allow universities to develop projects that have practical, real-world applications, such as designing renewable energy systems or developing waste management solutions. For example, Sierra Leone universities could partner with energy companies to explore solar power or hydroelectric energy solutions, addressing both environmental and economic challenges. In return, industries benefit from access to cutting-edge research that can improve their operations and competitiveness.

The successful partnership between universities and industries in Japan's Regional Centers of Expertise (RCEs) offers a model for Sierra Leone. In these RCEs, universities collaborate with local governments and industries to promote sustainable development projects that address local and regional challenges. Sierra Leone could adopt a similar model, focusing on partnerships that promote sustainable urban development, clean energy, and environmental conservation.

The success of such interdisciplinary research and industry partnerships depends on the establishment of strategic frameworks that promote collaboration between universities, industries, and government agencies. As demonstrated, the SDGs provide a common vision for sustainability that can guide these collaborations, ensuring that research and educational initiatives are aligned with both local and global sustainability goals.

7. Conclusion

Transforming Sierra Leone's higher education system is imperative for advancing sustainable development. This study has illustrated that the integration of *Transformative Learning Theory (TLT)* and *Education for Sustainable Development (ESD)*, coupled with pedagogical innovations such as *Problem-Based Learning (PBL)* and *experiential education*, can cultivate the critical thinking, problem-solving, and leadership capabilities necessary to address the nation's multifaceted socio-economic and environmental challenges. However, several entrenched obstacles, including insufficient funding, outdated curricula, and limited research infrastructure, continue to hinder this progress.

Addressing these systemic barriers requires a comprehensive overhaul of higher education institutions (HEIs) in Sierra Leone. Priority should be given to the modernization of curricula to ensure they reflect the contemporary realities of sustainability. Expanding interdisciplinary research initiatives and fostering robust partnerships with industries are pivotal strategies for aligning academic outputs with the demands of the local economy. Interdisciplinary research and industry collaboration are critical for developing innovative solutions to real-world challenges, as demonstrated by successful models and initiatives at institutions such as Aalborg University, the University of Malaya, the University of Cape Town, and the University of Maribor. These partnerships facilitate a deeper connection between academic inquiry and national development imperatives.

HEIs in Sierra Leone hold a unique potential to be catalysts for sustainable development, contributing significantly to economic growth, social progress, and environmental stewardship. The framework proposed, which emphasizes interdisciplinary learning, applied research, and community engagement, charts a viable course for transforming universities into engines of national development. However, realizing these potential demands coordinated action among all stakeholders, including academia, industry, government, and international development partners. Aligning policy objectives with institutional practice is critical to overcoming existing challenges and unlocking the transformative potential of the higher education sector.

By addressing structural deficiencies—particularly those related to underfunding, pedagogical rigidity, and insufficient industry collaboration—Sierra Leone's HEIs can reposition themselves as drivers of innovation aligned with the *Sustainable Development Goals (SDGs)*. Through the adoption of innovative educational practices, bolstered research capacity, and sustained industry partnerships, universities can produce graduates capable of navigating and addressing the nation's most urgent challenges. In this way, higher education can serve as a cornerstone in Sierra Leone's pathway toward a more resilient, equitable, and sustainable future.

Finally, it can be asserted: "To transform education, Si-

erra Leoneans must first embody the change they seek. Teaching and learning should be carried out with an unwavering commitment to the well-being of students and society. Educators must strive, through their methods, curricula, and outcomes, to inspire growth and uplift the community. True educational progress lies in recognizing the interconnectedness of all, making each accountable not only for collective development but also for the empowerment of future generations.”

7.1. Encouragement for Future Research

The findings of this study underscore the potential for transformative change within Sierra Leone's higher education system, but further research is crucial to evaluate the effectiveness of the proposed interventions over time. Future research could focus on longitudinal studies that examine the long-term impacts of integrating Transformative Learning Theory and Education for Sustainable Development principles. Such research would track how graduates of reformed educational programs contribute to national socio-economic progress, community resilience, and environmental stewardship. Additionally, comparative studies that evaluate the outcomes of different pedagogical approaches, such as Problem-Based Learning and experiential education, across diverse cultural contexts could further refine strategies for aligning education with sustainable development.

Another promising area of research would be an analysis of the synergies between academia, industry, and government. This could include case studies that investigate successful partnerships in fostering innovation and driving sustainable development goals, particularly in regions with limited resources. Exploratory research on how digital technologies can be utilized to expand access to higher education and support interdisciplinary research, especially in rural areas, would also be beneficial [96]. These efforts could inform policymakers and educators about the feasibility and scalability of these innovative practices.

7.2. Broadened Discussion

Higher education plays a pivotal role in the achievement of global sustainability initiatives, extending beyond local or national development. It serves as a critical driver for addressing some of the most pressing challenges of our time, including climate change, poverty, and social inequality [97]. By embedding sustainability principles into higher education curricula, institutions can cultivate a generation of leaders who are equipped with the critical thinking skills, innovative mindsets, and ethical consciousness necessary for transformative change.

The integration of sustainable development principles into educational systems not only supports local progress but also strengthens the capacity of countries to contribute to global

sustainability efforts, such as the UN Sustainable Development Goals (SDGs) [98]. Higher education institutions should leverage their role as centers of knowledge to foster cross-border collaborations, enhance knowledge exchange, and engage in global dialogues on sustainable practices¹. By doing so, they can align their objectives with the broader agenda of creating a more resilient, equitable, and sustainable world.

A collective approach, rooted in multidisciplinary research, community engagement, and innovative teaching methodologies, can redefine higher education as a cornerstone for global sustainability, capable of adapting to an evolving landscape and meeting the needs of future generations [99].

Abbreviations

HEIs	Higher Education Institutions
SDGs	Sustainable Development Goals
TLT	Transformative Learning Theory
SDT	Sustainable Development Theory
PBL	Problem-Based Learning
USL	University of Sierra Leone
UNESCO	United Nations Educational, Scientific and Cultural Organization
ESD	Education for Sustainable Development
HE	Higher Education
UCT	University of Cape Town
RCE	Regional Centers of Expertise
SD	Sustainable Development
GDP	Gross Domestic Product
JSS	Junior Secondary School
MDGs	Millennium Development Goals
COVID-19	Coronavirus Disease 2019
ICT	Information and Communication Technology
OECD	Organisation for Economic Co-operation and Development
CSR	Corporate Social Responsibility
STEM	Science, Technology, Engineering, and Mathematics
ILO	International Labour Organization
JICA	Japan International Cooperation Agency
ECSR	Expanded Corporate Social Responsibility

Author Contributions

Chernor Mohamadu Jalloh is the sole author. The author read and approved the final manuscript.

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Conflicts of Interest

The author declares no conflicts of interest.

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