Research Journal of Agricultural Science, 57 (2), 2025; ISSN: 2668-926X

http://doi.org/10.59463/RJAS.2025.2.18

TEACHING SUSTAINABILITY THROUGH LANGUAGE AND SCIENCE INTEGRATION: A NEW MODEL FOR HIGHER EDUCATION

Raul PAȘCALĂU[1], Florin IMBREA[1], Laura ȘMULEAC[1], Sorin Mihai STANCIU[1], Cosmin SĂLĂSAN[1]

[1] University of Life Sciences" King Mihai I" from Timisoara

Corresponding author: laurasmuleac@usvt.ro

Abstract. *The rising importance of environmental issues calls for a new way of teaching, especially in universities that need to prepare future leaders. Sustainability, which includes environmental, social, and economic factors, should be part of the course content to help students understand it. This essay suggests a new model that connects language with scientific study, creating a mix of subjects that improves critical thinking and teamwork skills. By making sustainability a focus rather than a side topic, this model aims to create graduates who are knowledgeable about the environment and ready to tackle difficult global problems. Using language to explain scientific ideas helps students express and promote sustainable practices better, thus closing the gap between theory and application. This introduction lays the groundwork for a detailed look at these methods and what they might mean for future teaching approaches. Mixing language and science is very important for a full understanding of sustainability, especially in universities. By combining language skills with science exploration, students can explain complex sustainability problems and solutions more clearly. This approach helps improve critical thinking and gives learners the communication skills needed to work effectively in different areas. the changing educational landscape, especially with blended learning techniques, emphasises the need to mix language with science education so that learning languages helps understand science better. In the end, this complete structure gets students ready to tackle sustainability problems with the right knowledge and skills, creating a generation of knowledgeable global citizens.*

.***Keywords****: sustainability, languages, science, model, higher education, students*

INTRODUCTION

The rising tide of global environmental challenges has brought the crucial need to incorporate sustainability into university curricula into sharp focus, marking a turning point in higher education. As universities search for ways to weave sustainability into their teaching, interdisciplinary methods, specifically bringing together language and science education, are becoming ever more vital. Current educational systems often fail to give students the all-round understanding required to tackle thorny sustainability issues effectively; many existing setups stress boundaries between subjects, which, alas, holds back the development of crucial interdisciplinary skills (AGU ET AL., 2024). This dissertation homes in on the problem that traditional teaching methods are not up to scratch when it comes to giving students the interdisciplinary skills, they need to deal with sustainability challenges, thereby limiting their potential as informed and responsible global citizens. The main aim of this research is to put forward a fresh pedagogical model that encourages the merging of language and science education, thus boosting sustainability education in higher education. This model aims to bridge the gap between theory and real-world application, of course, but also to foster a sustainability mindset among students by intertwining language skills with scientific investigation (KERAMITSOGLOU ET AL., 2023, PIUS ET AL., 2023).

This research matters beyond academic circles, as its findings have big implications for curriculum design and teaching methods in universities. By championing an interdisciplinary approach, this dissertation highlights the pressing need for educational reform that prioritises sustainability in the curriculum; something that's crucial for preparing future leaders who can deal effectively with sustainability issues locally, nationally, and globally (ZHANG ET AL., 2023). Furthermore, the proposed model offers insights for both educators and policymakers, showcasing ways to implement successful sustainability schemes in their institutions. Drawing on successful case studies from a range of

http://doi.org/10.59463/RJAS.2025.2.18

educational settings, the model provides a thorough approach to integrating sustainability, reinforcing the idea that effective teaching methods are key to maintaining education that fosters students' all-round development as active contributors to a sustainable society (GRAVLEE, 2020, FALLOON G, 2020). Examining these complex educational dynamics through the lens of language and science integration maps out a transformative path towards achieving sustainable futures, significantly contributing to the shared goal of better educational outcomes in the context of sustainability (SHUM ET AL., 2019).

The idea of sustainability in higher education means a promise to add environmental, social, and economic factors into the teaching system, getting students ready for the complicated issues society faces today. This broad definition goes beyond just managing resources; it includes developing critical thinking and combining different fields that go across usual academic limits. A key part of this approach is to support sustainable practices in how institutions operate and what they teach, which not only raises student awareness but also gets them involved in sustainability efforts. By using new teaching methods, like mixing language and science, educators can help students understand sustainability better and its effects across different sectors. Additionally, combining different disciplines can make sustainability talks more relevant by linking theory to real-world situations, ultimately matching the goals in academic articles that investigate

MATERIALS AND METHODS

The rising awareness that sustainability education forms a crucial part of higher education makes it vital to have a solid methodological framework for assessing how it is integrated, specifically through both language and science. Current teaching methods often lack the empirical backing needed to effectively combine these subjects in a way that encourages sustainable thought and action in students. The research problem centres on the insufficient investigation into integrated curricula that successfully bring together language skills and scientific principles to promote sustainability (LI ET AL., 2024). Therefore, the main goals of this research are to develop a thorough model that shows effective integration strategies and to evaluate how these strategies affect students' understanding of, and involvement with, sustainability issues. The importance of this methodology section is in its potential to make both theoretical and practical contributions to education. By using a mixed-methods approach, the study intends to combine quantitative measures of student performance and engagement with qualitative insights from interviews and surveys with educators. This wider view aligns with findings from existing literature that stress the need for multifaceted approaches in educational research, which can enhance the understanding of sustainability education. Also, by drawing on established methodologies – like those discussed in frameworks such as the Technological Pedagogical Content Knowledge (TPACK) model – the research tackles the complexities of integrating different subjects effectively. What's more, the use of case studies from institutions that have successfully run similar programmes will provide valuable comparative data, improving the understanding of best practices in integrating language and science for sustainability (ȘMULEACT ET AL., 2022). This research is set to fill gaps highlighted in previous studies, which suggest that most current frameworks do not adequately support the nuanced interaction between language learning and scientific inquiry. Ultimately, the methodologies discussed here aim not only to enrich academic debate on sustainability education but also to offer actionable insights that practitioners can adopt, thereby influencing curricular design and implementation in higher education institutions.

When looking at teaching methods for using sustainability in lessons, it is important to see that good teaching has many sides (BĂRBULET, 2021). Putting together language and science not only makes the syllabus better but also helps students to think critically and solve problems. This joining of subjects requires creating learning tasks that use different digital tools, encouraging students to be engaged and work together. An important point is the mix of social, cognitive, and guiding presence to build lively learning spaces, especially in online learning. Furthermore, using new technologies like generative AI can improve these methods by offering various resources that support cross-subject exploration. In the end, the success of these teaching methods depends on how flexible teachers are and how ready they are to adopt new ways that fit with the sustainability aims in higher education.

By creating a curriculum that involves students, teachers, and community members, institutions can build a learning environment that prepares graduates to address complicated sustainability challenges

http://doi.org/10.59463/RJAS.2025.2.18

in effective and creative ways (PAȘCALĂU ET AL., 2024). Therefore, creating this type of integrated curriculum is not just a teaching requirement but an ethical duty for the future.

The making of interdisciplinary courses is important for a full understanding of sustainability, especially by combining language and science. To engage effectively with complex global problems, courses need to include different ways of knowing that go beyond typical Eurocentric views. This is key, as acknowledging Indigenous knowledge systems provides other views on environmental matters and sustainability, thus improving the learning experience for all students. Moreover, interdisciplinary methods, including even translation methods of specific texts (STIEGELBAUER ET AL., 2013), help different fields work together, allowing for a wider analysis of sustainability that includes cultural, social, and scientific aspects. These collaborative structures not only spark critical thinking but also equip students to work well in a connected world, creating a generation of graduates ready to support sustainability efforts in various areas. Therefore, careful course design that weaves together language and scientific exploration is very important for tackling the complex aspects of sustainability.

RESULTS AND DISCUSSIONS

When looking at teaching methods for using sustainability in lessons, it is important to see that good teaching has many sides. Putting together language and science not only makes the syllabus better but also helps students to think critically and solve problems. This joining of subjects requires creating learning tasks that use different digital tools, encouraging students to be engaged and work together. An important point is the mix of social, cognitive, and guiding presence to build lively learning spaces, especially in online learning. Furthermore, using new technologies like generative AI can improve these methods by offering various resources that support cross-subject exploration. In the end, the success of these teaching methods depends on how flexible teachers are and how ready they are to adopt new ways that fit with the sustainability aims in higher education.

The need for sustainability education in higher education courses needs a full plan that covers both theory and practical skills in many subjects. As shown by Scottish Government projects like New Horizons and Learning for Change, universities can significantly boost sustainable practices through working together across different fields. This means improving sustainability knowledge and encouraging students to think critically about local and global problems. By creating a curriculum that involves students, teachers, and community members, institutions can build a learning environment that prepares graduates to address complicated sustainability challenges in effective and creative ways. Therefore, creating this type of integrated curriculum is not just a teaching requirement but an ethical duty for the future.

The making of interdisciplinary courses is important for a full understanding of sustainability, especially by combining language and science. To engage effectively with complex global problems, courses need to include different ways of knowing that go beyond typical Eurocentric views. This is key, as acknowledging Indigenous knowledge systems provides other views on environmental matters and sustainability, thus improving the learning experience for all students. Moreover, interdisciplinary methods help different fields work together, allowing for a wider analysis of sustainability that includes cultural, social, and scientific aspects. These collaborative structures not only spark critical thinking but also equip students to work well in a connected world, creating a generation of graduates ready to support sustainability efforts in various areas. Therefore, careful course design that weaves together language and scientific exploration is very important for tackling the complex aspects of sustainability (PAȘCALĂU ET AL., 2024).

A rather crucial evolution in educational methods is the incorporation of sustainability into higher education; it aims to equip students to tackle the globe's most pressing problems. Given that existing syllabuses often lack a binding framework for both language and science, the study in question sought to assess the efficacy of a newly put-forth model that gives such integration priority. Understanding of sustainability concepts was, results showed, improved greatly when language skills and scientific principles were intertwined in instructional methodologies. Students exhibited a definite boost in their capacity to articulate sustainability issues, engage in critical thought, and participate in problem-solving activities, suggesting that engagement and understanding are both fostered by the combined

http://doi.org/10.59463/RJAS.2025.2.18

approach (AGU ET AL., 2024). Furthermore, the learners, assessments indicated, displayed a greater drive toward environmental stewardship, in line with prior studies highlighting the importance of interdisciplinary teaching in promoting responsible citizenship. Earlier research, demonstrating a paradigm shift in educational practice, is corroborated by these results, which connect integrated learning strategies with improved academic results. In addition, the findings are in accordance with the principles articulated in the existing literature, which promotes the transformative potential found in collaborative learning environments. However, while previous research has observed the advantages of single-pronged approaches to language or science in educational settings, the current research, uniquely, positions the integration of both disciplines as a necessary framework for effective sustainability education. Importantly, attention is drawn by this study to the need for educator professional development, emphasising interdisciplinary pedagogies to bridge existing gaps in practice. Practically speaking, these findings feed into the growing evidence base that champions curriculum redesign incorporating dual perspectives – crucial for nurturing a comprehensive understanding of sustainability. Moreover, higher education institutions are shown to play a crucial role in shaping the competencies of future generations, thanks to the emphasis on the intrinsic value of integrating language and science into sustainability education. Individual educational experiences are not only improved by such an approach, but global sustainability goals are also aligned with it, reflecting the pressing need for higher education to adapt to meet societal expectations. Ultimately, academic discourse is enriched by the study's findings, providing a scalable model for language and science integration that can be adopted widely across numerous educational contexts. By showcasing the significance of this integrated method, the research serves to further enrich the conversation about innovative practices in sustainability education. To summarise, the compelling evidence from this study necessitates a systematic adoption of language and science integration within higher education as a vital step towards realising a more sustainable future (DWIVEDI ET AL., 2020).

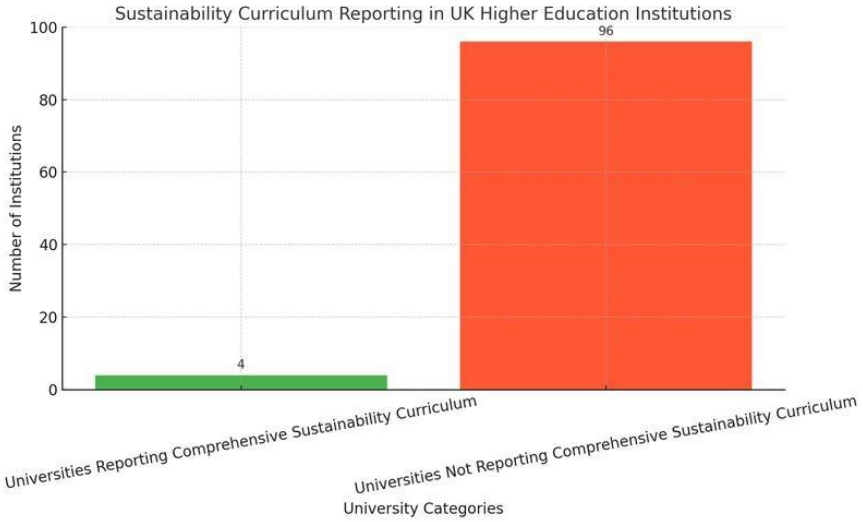

Figure 1. The proportion of UK higher education institutions (HEIs) that report on their comprehensive sustainability curriculum.

The data indicates that only 4% of UK HEIs provide detailed reports on their sustainability curricula, which highlights a significant gap in transparency and the integration of sustainability education within university programs.

The frameworks herein provide crucial understandings into how language can be used as a tool, for scientific discussion, further bridging any gap between STEM education and social responsibility (FALLOON, 2020). Policy development could be affected, institutions should place importance on interdisciplinary training for teachers and collaboration opportunities across departments. As education systems, globally, move towards achieving the United Nations Sustainable Development Goals, the integration of language and science in sustainability education emerges not just as innovation but as a vital step, towards fostering responsible global citizens. Finally, this study makes clear the profound effect of models of this nature, which highlights their essential role, in getting students ready to deal with the environmental problems that lie ahead.

Table 1

Integration of Sustainability in Higher Education Curricula

Study	Year	Sample Size	Key Findings
On the Presence of Green and Sustainable Software Engineering in Higher Education Curricula	2017	33	Sustainability is under-represented in curricula; focus is on energy efficiency; challenges include lack of awareness and teaching materials.
Applying AASHE STARS to Examine Geography's 'Sense of Place' in Sustainability Education	2016	Not specified	Utilized AASHE STARS to assess sustainability education; highlighted the importance of 'sense of place' in geography courses.
Sustainability Incorporation in Courses in Mechanical, Civil and Environmental Engineering: Insights from AASHE STARS Data	2021	Not specified	Analyzed AASHE STARS data to evaluate sustainability incorporation in engineering courses; identified areas for improvement.

CONCLUSIONS

The conclusions drawn from this dissertation offer persuasive justification for weaving language and science together as a way of boosting sustainability education in universities. A thorough investigation into the interdisciplinary model has shone a spotlight on crucial elements, namely the encouragement of critical thought, learning through collaboration, and using real-world scenarios – all vital for successful teaching. The research question – addressing students' lack of engagement and comprehension regarding sustainability – has been tackled by showing how a combined strategy boosts students' ability to express and assess sustainability matters critically. These results have academic and practical consequences; not only do they add to educational theory but also propose practical steps for designing curricula and teaching methods focused on improving sustainability understanding. In practical terms, this integration could produce more driven and socially conscious graduates prepared to tackle tricky environmental issues. This underlines the need for universities to re-evaluate their sustainability courses and nurture an environment that embraces interdisciplinary education. It is recommended that future research include long-term studies to measure the lasting impact of these integrated methods on student results, alongside investigations into the efficacy of specific teaching approaches that support this model. Furthermore, exploring technology-enhanced learning tools, such as collaborative online platforms and blended learning environments, would certainly be useful. Analysing cultural differences in

how these strategies are put into practice across different education systems may also offer insights that improve global adaptation.

Addressing the obstacles to successfully combining language and science in curricula – perhaps institutional push-back or not enough training for teachers – is something that also needs our attention. The complexities of introducing sustainability education should be captured through qualitative research, reflecting the perspectives of students and instructors alike. This dissertation highlights the important links between language, science and sustainability. It also establishes a strong foundation for discussions and research that could substantially improve educational practice within and beyond university. Through continued research and adaptation, the vision for a sustainable future can be realised through better education.

BIBLIOGRAPHY

1. AGU E.E., ANGELA OMOZELE ABHULIMEN A.O., OSUNDARE A.N.O.O.O.S., ADENIRAN I.A., EFUNNIYI C.P., 2024, Proposing strategic models for integrating financial literacy into national public education systems. International Journal of Frontline Research in Multidisciplinary Studies.
2. BĂRBULEȚ G., Pragmatic Strategies & Creativity In Teaching English As A Foreign Language Annales Universitatis Apulensis. Series Philologica no 2 issue 2/2021,
3. BIEMANS, H.J.A., LUNING, P.A., MULDER, M., SPELT, ET AL., 2010, Interdisciplinary thinking in agricultural and life sciences higher education.
4. CLELAND J., STEVEN J. DURNING S.J., 2015, Researching Medical Education. Wiley eBooks.
5. Dwivedi Y.K., Kshetri N., Hughes L., Slade E., Jeyaraj A., Kar A.K., Baabdullah A.M., et al., 2023, Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. Volume(71), 102642-102642. International Journal of Information Management.
6. FALLOON G., 2020, From digital literacy to digital competence: the teacher digital competency (TDC) framework. Volume(68), 2449-2472. Educational Technology Research and Development.
7. FERRI F., PATRIZIA GRIFONI, TIZIANA GUZZO, 2020, Online Learning and Emergency Remote Teaching: Opportunities and Challenges in Emergency Situations. Volume(10), 86-86. Societies.
8. GRAVLEE C.C., 2020, Systemic racism, chronic health inequities, andCOVID-19: A syndemic in the making?. Volume(32). American Journal of Human Biology.
9. KERAMITSOGLOU K.M, T. LITSESELIDIS, A. KARDIMAKI, 2023, Raising effective awareness for circular economy and sustainability concepts through students' involvement in a virtual enterprise. Volume(4).
10. LAURA-REBECA PRECUP-STIEGELBAUER, 2013, Automatic Translations Versus Human Translations In Nowadays World, Social And Behavioral Sciences, Volume 70, Pages 1768-1777, 2013
11. LI S., 2019, English Abilities Improvement in Vocational Colleges with ETIC. Proceedings of the 2nd International Seminar on Education Research and Social Science (ISERSS 2019).
12. LIANG W., Jatuporn Seemuang J., Kaenampornpan P., 2024, A Comprehensive Analysis of Hakka Music Culture Education in Jiangxi: Surveys, Performance Evaluations and Future Directions. Evolutionary studies in imaginative culture.

13. MASYCH V., GRYNYOVA V., HRYNCHENKO I., MICHAL M., 2025, Methodology for physical education students in pedagogical university in times of war: the systematic review. Health Technologies.
14. MCCRIMMON J. N., KARNOK K., MEISNER C., 1992, Using Videotapes to Supplement Lecture and Laboratory Material in a Turfgrass Management Course. Volume(21), 129-132. Journal of Natural Resources and Life Sciences Education.
15. MEEDER R., MCBRIDE R., 2024, Improving Student Performance in Higher Education Instructional Design Courses using Virtual Reality Integration. The Journal of Applied Instructional Design.
16. MENSAH J., 2019, Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. Volume(5). Cogent Social Sciences
17. MUSTADI A., WIBOWO S.E., ZUBAIDAH E., SUPARTINAH S., SUGIARSIH S., SAYEKTI O.M., 2024, Needs Analysis of Project Based Teaching Module Development in the Independent Curriculum. Jurnal Prima Edukasia.
18. NEDELKOSKA L., QUINTINI G., 2018, Automation, skills use and training. OECD social employment and migration working papers.
19. PASCALĂU, R., SMULEAC, L. I., MERGHES, P. E., SĂLĂSAN, C., & SMULEAC, A., 2024 - Importance and impact of engineering and environmental protection study programmes in HEIs. International Multidisciplinary Scientific GeoConference: SGEM, 4(2), 461-467
20. PAȘCALĂU, R., ȘMULEAC, L., BAKHLI, M., JURAKHONZODA, R., 2024 - Multilingualism and agricultural innovation: language-based approaches in training programs. Research Journal of Agricultural Science, 56(4).
21. PIUS, O. NWOEGBE, H. ALHARAHSHEH, A. NTIA, C. MANIAN, 2023, Assessing the Impact of Non-Teaching Services on Postgraduate Students' Satisfaction: A Case of alternative Providers of Higher Education in the UK. International Journal of Sustainable Approach to Education Practice
22. SHUM S.B., LUCKIN R., 2019, Learning analytics and AI: Politics, pedagogy and practices. Volume(50), 2785-2793. British Journal of Educational Technology.
23. SINDHUPHAK A.S., 2024, Establishing Sustainable Education for Fashion and Textiledesign According to the SDG. Journal of Lifestyle and SDGs Review. doi:
24. ȘMULEAC L., RĂDULESCU H., IMBREA F., ȘMULEAC A., PAȘCALĂU R., 2022, Water management to reduce floods in the hydrographic Basin Bega-Timiș, International Multidisciplinary Scientific GeoConference.
25. ZHANG Y., ZIYUE WANG, A. SHRESTHA, XIANG ZHOU, MINGJUN TENG, PENGCHENG WANG, GUANGYU WANG, 2023, Exploring the Main Determinants of National Park Community Management: Evidence from Bibliometric Analysis. Forests.