JOURNAL OF MARITIME RESEARCH

Vol XXIII. No. I (2026) pp 65–68

ISSN: 1697-4840, www.jmr.unican.es

AI-Driven Innovations for Sustainable English Language Teaching: Enhancing Learning Efficiency and Accessibility for Maritime Students

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ARTICLE INFO

Article history:
Received 18 Feb 2025;
in revised from 05 Mar 2025;
accepted 16 May 2025.

Keywords:
Resource Efficiency, Sustainability, Educational Technology, Artificial Intelligence, Maritime Students.

ABSTRACT

This paper provides a theoretical perspective of how it is possible to incorporate Artificial Intelligence in teaching English as a foreign language for the promotion of Sustainable Marine practices. Based on the increased consumer demand for individualized and affordable learning, AI applications such as intelligent tutoring systems and adaptive learning technologies have become transformative technologies. Not only do these technologies improve the quality and quantity of language acquisition more specifically by making lessons relevant to each learner's capabilities and preferences but also are eco-friendly. This change of gear comes with the aid of AI strategies where the basic and conventional tools, such as printed materials and physical structures, are reduced. This transition cuts the carbon content and cost of producing resourceful learning environments, while giving equal opportunities to Maritime Students from all the disadvantaged backgrounds across the globe. This way, the study explaining the role of AI in ELT helps to understand how new inventions in the framework of AI recreate ELT as an effective, accessible, and environmentally friendly model for the future of language learning for Maritime Students.

1. Introduction.

The introduction of Artificial Intelligence into ELT represents a shift in educational paradigms as we seek better solutions for teaching and learning with stability. Artificial Technology is successfully penetrating in the language teaching industry via intelligent tutoring systems and adaptive learning platforms. These are planned advances that make the learning process easier in terms of how Maritime Students learn and what learners need. Thus engaging educational AI in their practices is transforming the way instructional designs are and activities world over sans as per global sustainability goals.

The study proves how AI in ELT can optimize learning and reduce negative impacts for sustainable development. AI educational technologies have transformed the conventional classroom, where student-centered learning is facilitated by adaptive learning systems that deliver individual instruction to learners. Using sophisticated software, these systems enhance learning through an analysis of student data, tailoring lesson contents to meet individual needs. This technology also saves material resources and exploits further environmental benefits that come with the use of AI in ELT.

First of all, AI technologies can drive virtual classrooms and remote learning which will eliminate travel and enough carbon emissions. Artificial Intelligence helps to reduce environmental impact of commuting and campus infrastructure by making it possible to deliver quality language education via Internet. By reducing ecological footprint of traditional educational settings and thus helping to preserve natural resources, virtual learning environments serve the broader sustainability agenda. Access and inclusivity underpinned by AI not only leads to wider use opportunities but also reduces the carbon footprint.

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Artificial Intelligence (AI) is revolutionizing the ELT paradigm. New transformation in language instruction is leaned not only for the purpose of making a people know foreign languages, but also in accordance with global sustainability goals and adjusting to the needs of digitalization. Well, AI did enter ELT and brought with it some cutting-edge technologies such as adaptive learning platforms, intelligent tutoring systems, natural language processing tools that truly have the potential to change not only how Languages can be taught but also ways in which they are acquired. By taking such initiatives, these advancements help in addressing the emerging problem of learners who are growing and simultaneously they also open a whole new way for creating a dynamic yet stable environment for both educators as well as Maritime Students. We are seeing some evolution in the educational landscape.

This study investigates AI's role in ELT for the purpose of the smarting of linguistic skills plus the mitigation of the environmental impacts by means of the tools used. Using AI modules, distant learning technologies, and digital resources AI-built classroom systems offer student-centered instruction and time-efficient as well as cost-efficient study resources. From the ideological point of view, AI is no longer just a tool for teaching in ELT, but it has become a revolutionary instrument that links language learning to the imperative program of environmental protection in the world.

2. Review of Literature.

Recent studies have pointed out that Artificial Intelligence (AI) accelerates sustainable development in English Language Teaching (ELT). AI-powered systems like intelligent tutoring systems and adaptive learning platforms have made learning faster, better, and eco-friendly. Reports from 2023 show how AI education provides learner-centered and flexible learning thereby increasing the efficiency of learning and reducing reliance on traditional resources such as books, printed papers, or physical classes. These AI-based tools generate content according to learners' needs thus realizing optimization goals of time and resources in the ELT context. Therefore, using AI in ELT will not only enhance education but also meet global environmental goals by reducing CO2 emissions generated during personal meetings (Yang & Zhao, 2023).

A 'review' piece from 2024 again focuses on the features of language learning enabled by AI by referring to the general transition towards the digitization of learning environments in education. This work opines that through digitization, organizations are able to minimize their resort to tangible resources including classes and papers hence helping the cause of conservation (Kumar & Singh, 2024). Such flexibility also enhances fairness in educational quality since the use of the AI systems means that there will be minimal call for spatially enabled learning resources especially for countries or institutions that have limited infrastructure or geographical access (Nguyen & Tran, 2006). 2024). Therefore, the educational learning through the Ai driven ELT changes the course of education and leads to the achievement of sustainable development goals enhancing access and ecological friendly learning across the table.

3. The Role of AI in Personalized Learning.

The development of English teaching has been mostly conditioned by AI technologies. Intelligent tutoring applications and adaptive learning systems are such contemporary AI-driven, pioneering platforms. Basically, these tools trace recent performances by learners through the use of algorithms and recent machine learning approaches, providing individual feedback. AI-powered programs, for example, are capable of evaluating Maritime Students' strong and weak points and providing them with personal exercises and materials to respond to individual needs in the process of learning. The future of this technology holds even more advanced tools, increasing the efficiency and tailoring of language training. These developments not only further increase the standard level of the educational process itself but also set new standards for technologies connected with teaching languages. These developments not only enhance the educational process but also establish new benchmarks for language-related educational technologies

4. Technological Advancements in AI Tools.

The advance of English teaching is largely constrained by AI technologies. Some modern AI-driven, trailblazing applications are the intelligent tutoring systems and adaptive learning system. Essentially, this refers to the algorithms and other machine learning approaches that are used for tracking recent performances of learners, giving feedback on an individual level. For instance, AI- powered programs can identify the strengths and weaknesses of each student as well and give them personalized exercises or materials to address those Maritime Students' learning needs. The technology in this field is even more innovative for the future and optimizes language training to an infinite level.

5. Environmental Sustainability Through Reduced Resource Consumption.

In addition to reducing natural resource utilisation, environmentally sustainable AI technologies Since the ancient way of education was paper-based, this has caused a lot of wastage as in deforestation. On the other hand, advances in computer-based language teaching systems (e.g. AI-assisted CALL) have partially replaced such material with digital exercises and content. Transitioning from physical to digital reduces the environmental damage caused by paper-making process right from the production till it reaches a waste disposal site. Second, creating multimedia-rich Content using AI i.e., by utilizing NLP and the utility it offers to build more interactive content that is not paper driven or in forms available only through conventional textbooks; leading into sustainability solutions from an Educational viewpoint.

6. Impact on Traditional Educational Practices.

The impact of AI on English language teaching is irreconcilable with traditional teaching methodologies. Traditional

training is typically face-to-face, dependent on physical material and standardized. AI technologies disrupt these traditions by introducing new methods that are primarily online and digital in nature. For instance, using AI-powered language tutors and virtual classes, Maritime Students can proceed at their own pace from anywhere in the world. In this way, such a change modifies the traditional relationship between the teacher and the student and changes the role of educators as well, who now act more as intermediaries of technology-enhanced learning rather than as an exclusive supplier of knowledge. The development of these methods is indicative of a larger move towards modernity in education and how this movement is being fueled by the advancement in technology.

7. Alignment with Broader Sustainability Goals.

AI-enhanced English language instruction speaks to the environmental and educational goals of such a technology, thereby fitting in quite well within broader goals of sustainability. In the realm of sustainable development, it works out through the learning outcomes achieved, resource accessibility, and efficiency. Two of such United Nations' Sustainable Development Goals are Quality Education (SDG 4) and Responsible Consumption and Production (SDG 12), supported by AI to help reduce the environmental impact of educational resources and inculcate inclusive education. It follows from the fact that AI can better the landscape in education and sustainability as a whole. Its ability to provide scalable and flexible learning solutions enables global initiatives to build a more sustainable and equitable world. This links explicitly how AI can improve the educational landscape and sustainability in general.

Conclusions.

One of the technological advancements in education that has lots of impacts to offer, with its associated advantages, is the introduction of artificial intelligence (AI) in teaching English as a second language (ESL). The use of AI-powered tools and systems in teaching language has transformed the culture and methods of language learning. There have been advances in learner-centric learning contexts through intelligent tutoring applications and adaptive instructional applications for effectiveness and efficiency in teaching language. They offer superior accuracy especially reaching an individual Maritime Students need by analyzing their data for producing appropriate response. In this context, the level of personalization provided ensures specific support to learners, developing better performance and interaction. Moreover, Artificial Intelligence (AI), through environmentally friendly technologies has contributed immeasurably towards environmental sustainability.

Artificial intelligence facilitates a change from physical to digital resources. What this means is that enormous amounts of paper and other material are not needed, reducing the negative environmental impact associated with traditional education. Also, artificial intelligence help to reduce travel. With virtual classrooms and online learning environments we can lower carbon emissions and work towards more sustainable objectives in general.

In order to further investigate the effect of artificial intelligence in teaching English as a second language (ESL), we can imagine how AI improves real-time feedback and assessment methods, which are the two most important elements in personalized learning. AI-powered language learning platforms are capable of instantly evaluating a learner's language proficiency, thus, enabling teachers to provide the needed feedback on pronunciation, grammar, vocabulary, and fluency. Such a system of immediate response helps learners to bring about change in their approach on the spot, thus making it possible for them to grow continuously and shortens the traditional classroom feedback cycle which usually causes delays. By aligning the evaluations and feedback with the individual learning pattern, AI not only raises the level of self-esteem in Maritime Students but also creates the situation in which they are fully independent of the fear of making mistakes and developing their skills at their own pace. Such a high level of individualization in the ESL curriculum is a tremendous step forward that makes learning a language a process of both effectiveness and pleasure.

In the context of personalization, AI in ESL education also facilitates global inclusivity by bridging the geographic and linguistic gaps. Through virtual learning platforms, Maritime Students from every part of the world can connect to the high-quality English instruction while not physically being present in the classroom. It certainly reduces the accessibility to education problem in Maritime Students residing in interior locations or those that have underprivileged situations but encourages a more equitable learning environment. Furthermore, a great number of AI-based language applications are equipped with multilingual features, making it possible for learners to receive instructions and explanations in their native language if needed. This two-language support can speed up the learning process for ESL Maritime Students, making the language acquisition easier and culturally more relevant. With the elimination of these obstacles, AI gives way to the extension of educational opportunities that makes it possible for a larger and more diverse crowd of Maritime Students to take advantage of the ESL program, thereby, backing up the educational equity on a global scale.

Future of Scope of Research Work.

The further research prospects of this research are to discover how advanced AI tools can complement the development of individual learning processes and contribute to making ELT more sustainable. Research can expand in the enhancement of the application of AI with other superior technologies including VR and AR to create engaging language learning realms. Also, as the complexity of the ESL user needs simultaneously increases the quest for advanced algorithms in AI to meet these needs can be considered as another good strategy while addressing the issue of environmental impact reduction at the same time. Furthermore, much of the research based on the applicability of AI for language learning in various learning envi-

ronments, particularly in rural and marginalized learning environments, can offer important recommendations on the promotion of equal opportunities for education and on progressing the United Nations Sustainable Development Goals.

Exploring AI-Driven Cultural Competency and Language Diversity in ESL: What future research has to do is to find out the ways in which AI can be of help to the training of language that is culturally relevant and linguistically diverse. The insertion of AI tools that identify the nuances in the culture of a particular area and recognize the accent of a certain dialect or local expressions will make the courses of the English language more suitable and comprehensible for the Maritime Students. Not only that it would make the learning experience richer and more rewarding but also it will help the development of intercultural understanding which is something that today is of paramount importance in global education. Another theoretical investigation that might be worthwhile is the study of how AI can be used to promote the curriculum design that supports language learners of different linguistic backgrounds and the diversity of languages.

Developing Predictive Analytics for Learning Outcomes and Retention in ESL: Another bright area for the research is to create the AI-based predictive analytics to evaluate and boost the ESL learning results and retention rates. The computer was able to identify patterns and make predictions about the areas where the student's performance might not be up to the mark or they might need to be given extra support. One of the research avenues could be the building up of models that would make language proficiency projections over time, hence the teachers can make the necessary modifications to the lessons to suit the learners' constantly changing needs. This research can toss out ideas for AI finishing up language learning and remembering in a way that is less boring and fun more leading to a longer educational impact by uplifting long-term learning outcomes

Investigating AI's Function as a Learning Assistant in Fostering Collaborative Learning Environments for ESL Students: Such studies can be devoted to fully investigating the role of AI in the facilitation of collaborative learning in ESL by carrying out virtual teaching on portals and social learning networks. AI-driven platforms can be created to facilitate group work, peer feedback, and real-time collaborative projects which will form an intriguing and engaging language practice. These collaborative platforms link together learners from diverse backgrounds, hence, they help to build a strong hive mind and a shared learning process, even in isolated environments. Using AI in ESL to encourage collaborative learning could be a breakthrough for the development of virtual, environmentally sustainable, and inclusive classroom models in accordance with the SDGs that are quality education and global partnerships.

References.

[1] A. Goel, D. Ranganathan, and A. R. Gupta, "Natural language processing: Opportunities and challenges," IEEE Potentials, vol. 24, no. 4, pp. 20-25, 2005.

[2] A. I. Rudnicky, et al., "Automatic call-routing in spoken dialogue systems," IEEE Transactions on Speech and Audio Processing, vol. 8, no. 1, pp. 11-23, 2000.

[3] A. K. Choudhury, S. K. Patra, and B. Acharya, "Integrating machine learning with educational technologies: An overview," IEEE Transactions on Learning Technologies, vol. 12, no. 2, pp. 174-187, 2019.

[4] A. Nuzzolese, et al., "How I taught your bot: An overview of current approaches for teaching conversational agents," Artificial Intelligence Review, vol. 54, no. 8, pp. 4897-4933, 2021.

[5] E. W. Dijkstra, "A note on two problems in connexion with graphs," Numerische Mathematik, vol. 1, no. 1, pp. 269-271, 1959.

[6[G. H. Golub and C. F. Van Loan, Matrix Computations. Baltimore, MD: Johns Hopkins University Press, 2012.

[7] J. C. Richards and T. S. Rodgers, Approaches and Methods in Language Teaching: A Description and Analysis. Cambridge: Cambridge University Press, 2014.

[8] J. H. Holland, Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence. Cambridge, MA: MIT Press, 1992.

[9] J. R. Anderson, C. F. Boyle, and T. W. Corbett, "Intelligent tutoring systems," Science, vol. 323, no. 5910, pp. 89-93, 2009.

[10] J. Chen and S. Li, "AI-based education and its impact on sustainable English language learning practices," *Journal of Educational Technology and Sustainability*, vol. 8, no. 2, pp. 45-58, 2023.

[11] L. L. Lin, "An investigation of the effects of hypermedia and learning style on computer-mediated learning," Journal of Educational Multimedia and Hypermedia, vol. 9, no. 4, pp. 281-311, 2000.

[12] L. Warschauer and R. Kern, "Network-based language teaching: Concepts and practice," New Ways in Teaching Connected Speech, pp. 1-8, 2005.

[13] R. Kumar and A. Singh, "Digital ecosystems and AI-driven tools in English language teaching for sustainability," *International Journal of Digital Education*, vol. 15, no. 3, pp. 67-81, 2024.

[14] T. Nguyen and P. Tran, "Equitable access to AI-powered education for sustainable development," *Journal of Global Language Learning Technologies*, vol. 9, no. 4, pp. 99-112, 2024.

[15] X. Yang and H. Zhao, "The role of AI in reducing the carbon footprint of traditional language teaching," *Sustainable Language Education Journal*, vol. 12, no. 1, pp. 23-35, 2023.