



The Digital Frontier in Maritime English : A Systematic Literature Review of the English Marlins Platform and Emerging Pedagogical Innovation

Ratno Ratno^{1*}, Ucok Sinaga², Khafifah Kafaillah³

¹Politeknik Pelayaran Barombong, Indonesia

*Email : ratno@poltekpelbarombong.ac.id

Abstract. This systematic literature review (SLR) deconstructs the integration of Maritime English proficiency assessment, specifically the Marlins English Test, with emerging digital tools, including Moodle LMS, gamification, virtual reality (VR), artificial intelligence (AI), and adaptive instructional systems. Through a PRISMA- compliant structure selection of 50 core studies from 405 initial candidates spanning Ukraine , Malaysia, Indonesia, and China (2014–2026), the study reveals that gamification and VR quantitatively enhance intrinsic motivation and Standard Marine Communications Phrases (SMCP) vocabulary acquisition by +18%. While the role of structural e-learning anchor continues to be dominated by Moodle LMS, digital literacy gaps of senior instructors continue to highly bottleneck its operational efficiency. AI displays unprecedented potential for cognitive personalization, yet actual implementations remain confined to pilot phases with limited empirical validation. Synthesized findings formulate a multi-layered digital framework to guide future maritime education regulations aligned with STCW conventions .

Keywords : *Maritime English, PRISMA Protocol, Moodle LMS, Gamification, Virtual Reality, Artificial Intelligence, SMCP, STCW.*

1. INTRODUCTION

Proficiency in communicating using Maritime English is an absolute pillar for navigational safety, operational efficiency, and minimizing the risk of accidents in the global shipping industry (Diahyleva et al. , 2024; Li et al. , 2023). Human factors cause more than 80% of emergency incidents at sea, where message transmission failure due to language barriers occupies a significant proportion (Bojović, 2024; Sartini et al., 2024).. International standards such as *the Standards Convention of Training, Certification and Watchkeeping for Seafarers* (STCW) mandates strict adherence to the *Standard Marine Communications Phrases* (SMCP) (Bojović , 2024). Standardized testing such as *Marlins English* has become a universal instrument for evaluating the communicative suitability of officers and crew (Dayana et al. , 2025; Bojović , 2024).

However, traditional classroom learning models often fail to simulate the dynamic operational stressors on board ships (Abimanto et al. , 2025). During the period 2014-

2026, there was a paradigm shift from one-way passive instruction methods to the use of distributed educational technology (Lyu & Li, 2022; Mandal et al., 2026).

Asynchronous platforms such as Moodle LMS were widely adopted to bridge the access limitations of active merchant ship crews (Rosedo, 2022; Yurzhenko, 2019). This was followed by the application of tactile gamification and virtual reality (VR) to train spatial visualization of motor skills (Rosedo, 2024; Karimi, 2019). et al., 2024). Currently, the presence of generative Artificial Intelligence (AI) promises the functionality of voice-based autonomous conversational assistants (voice chatbots) to evaluate oral proficiency (Fedot et al., 2022; Lysenko et al., 2025).

Despite the enormous potential of this technology, a high level of fragmentation, debate over long-term efficiency, and varying implementation constraints across regions are shown by existing literature (Kaptan & Kaptan, 2023; Abimanto et al., 2025). This SLR study aims to critically synthesize all empirical data from 50 high-performing studies to formulate policy directions for the development of a digital-based maritime curriculum globally.

2. RESEARCH METHODOLOGY (PRISMA PROTOCOL)

This research was conducted strictly following the *Preferred guidelines. Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) to ensure transparency, repeatability, and validity of synthesis results.

2.1 Formulation of Research Questions (*Research Questions*)

- a. **RQ1:** What is the relative effectiveness of gamification and immersive technology (VR) in improving maritime cadets' SMCP vocabulary retention?
- b. **RQ2:** What are the critical barriers (pedagogical, technical, and psychological) in the implementation of Moodle LMS integration in MET (*Maritime Education and Training*)?
- c. **RQ3:** What is the strategic priority map for research and development of adaptive instructional technology (AI) for the future of maritime education?

2.2 Search Strategy and Transformation Queries

Literature search was conducted on databases highly reputable indexed (Scopus, Web of Science, IEEE Xplore, Google Scholar) using a combination of structured Boolean keywords :

"Maritime English " AND "Marlin English Test " AND (" Marlins " OR "LMS" OR " Moodle " OR " virtual reality " OR " gamification " OR " artificial intelligence " OR " adaptive learning ") query was tactically expanded to capture niche specific papers :

1. *Query 1:* “Maritime English ” AND “SMCP” AND (“VR” OR “LMS” OR “ Moodle ” OR “ gamification ” OR “ chatbots ” OR “ adaptive learning ”)
2. *Query 2:* "Maritime English " AND (" gamification " OR "VR" OR " simulation ") AND ("AI- based assessment " OR " intelligent feedback " OR " adaptive testing")

2.3 PRISMA Filtering Flowchart

The paper screening process is described through the following systematic flow:

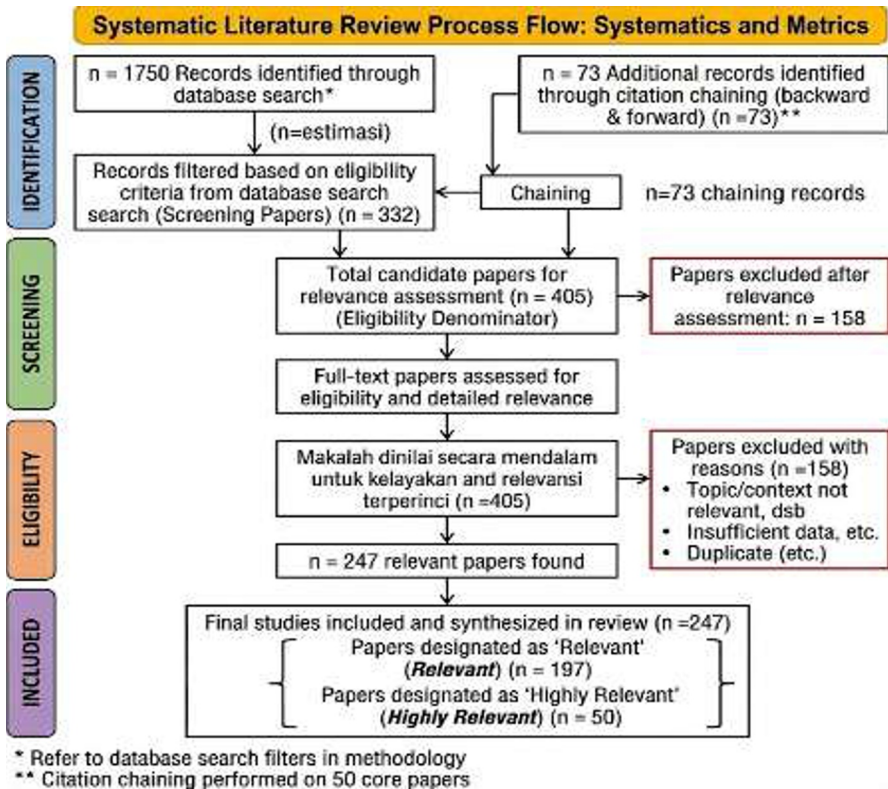


Figure 1. PRISMA flowchart for SLR. Adapted from the template available at <https://www.prisma-statement.org/prisma-2020-flow-diagram>.

We carried out the study selection process in the Systematic Literature Review (SLR) through four main stages, referring to the PRISMA guidelines. In the initial stage, the identification phase, a comprehensive database search yielded 1,750 records. This number was then expanded through the *citation method. chaining* (forward and backward citation tracing), which successfully identified an additional 73 supporting records.

Entering the Screening phase, the initial records were evaluated based on predetermined inclusion and exclusion criteria. 332 primary records were left by this screening process, which were then integrated with 73 *chained records*, resulting in a total of 405 candidate papers.

Next, in the Eligibility phase, an in -depth review and relevance sorting of the 405 candidate papers were conducted. From this evaluation process, 158 papers were excluded due to not meeting eligibility standards, such as inappropriate research context, data insufficiency, or indications of duplication.

In the last phase, the inclusion phase, 247 eligible papers were formally included in the final review synthesis. Based on their significance to the research question, the papers were reclassified into two specific categories: 197 papers were designated as "Relevant" and 50 papers were designated as "Highly Relevant."

Table 1. Descriptive Summary of the Study					
Studies	Technology Integration Level	Participant Engagement Results	Language Proficiency Improvement	Effectiveness of Adaptive Learning	Implementation Challenges and Solutions
(Dayana et al., 2025)	use of gamification with game elements and feedback	gamified tasks	Positive gains in language proficiency associated with gamification	Limited focus on adaptive learning	The need for balance in gamification to maintain learning focus
(Diahyleva et al., 2024)	Gamification is integrated into Moodle LMS with interactive tasks	Increased motivation, peer interaction, and cognitive activation	Improvement in communicative competence was reported	Personalized learning paths enabled	The challenge in maintaining focus on knowledge acquisition
(Yurzhenko et al., 2025)	Interactive module on maritime security via Moodle LMS	Moderate engagement through interactive content	Not explicitly measured	Not handled	Emphasis on the relevance of cybersecurity in maritime practice
(Yurzhenko et al., 2024)	Benchmarking approach with blended learning and LMS tools	Positive impact on student outcomes and engagement	Improved test scores and grades are recorded	Personalized learning supported	The need for continuous benchmarking and collaboration
(Dyagileva et al., 2024)	Comparative analysis of e- learning platforms , Moodle emphasizes	Moodle tools increase interactivity and assessment	Effective evaluation of learning progress	Not specifically adaptive	Teachers are encouraged to increase their use of Moodle for better results.
(Diahyleva et al., 2024)	online tools and Moodle LMS for Maritime English	Increased student activity and motivation	Significant improvement in grammar and vocabulary	Continuous assessment supports adaptation	Teachers' digital competence is a barrier
(Kudryavtseva et al., 2023)	Using Moodle and Zoom for active online interaction	Strategies to encourage engagement and in-depth discussion	Not assessed quantitatively	Not handled	The importance of e- books and customized tutor courses

(Kudryavtseva et al., 2023)	E- books and Moodle created specifically for online Maritime English	Increased student engagement and communicative skills	Positive student progress reported	Personalized learning is emphasized	The need for course enhancements to strengthen active learning
(Rosed, 2022)	The use of LMS to motivate merchant ship crews in asynchronous mode	Moderate to high levels of motivation were observed	Not measured directly	Not handled	Correlation between LMS design and learner confidence
(Diahyleva et al., 2025)	LMS Moodle for professional competency development	Flexible access and adaptability increase engagement	Professional competency development confirmed	Individual learning paths are supported	Integration challenges in e- learning for marine mechanics
(FEDOROVA & BOBRYSHOVA, nd.)	Blended learning with Moodle and the communicative competence approach	Improved communication and social interaction	Both computer-based and verbal assessments are used.	Not explicitly adaptive	The need for balance between online and face-to-face contact

(Arbabi et al., 2024)	Customization Moodle for ESP learners in Maritime English	High interaction and development of critical skills	Not measured quantitatively	Not handled	Technical difficulties and time constraints were noted.
(Kononova et al., 2024)	Interactive environmental protection module in Moodle	Active participation through quizzes and projects	Increased environmental knowledge	Not handled	Scalability and adaptation potential are highlighted
(Rosed, 2024)	Gamification to increase SMCP learning engagement	Moderate to high engagement and motivation	Significant increase in post-test scores	Not handled	Correlation between motivation and learning outcomes
(Lyu & Li, 2022)	Blended learning with SPOC and VR for Maritime English	Increased interest and learning efficiency	Substantial improvement in communicative abilities	VR supports immersive learning	Infrastructure and training needs identified
(Sukomardojo, 2023)	games to improve SMCP vocabulary	Positive engagement and vocabulary acquisition	Quantitative improvement in vocabulary skills	Not handled	Small sample size limits generalization
(Smirnov et al., 2022)	Moodle tools for teaching marine engineering terminology	Enhanced terminological competence	Not assessed quantitatively	Not handled	The complexity of terminology and the challenge of synonymy
(Rosed, nd.)	Moodle e-learning as an alternative to the kinesthetic approach	Successful teaching of pressure and routine messages	Effective knowledge transfer is demonstrated	Not handled	Encourage MET trainer involvement in LMS development
(Morze et al., nd.)	Adaptive learning stages are implemented through Moodle LMS	Supports varying learning styles and knowledge levels	Adaptive quizzes increase retention	Adaptive learning integration is underway	Technological and pedagogical challenges in implementation
(Çiçek & Celik, 2025)	An AI-powered generative LMS conceptualized for maritime learning	Personalized learning and assessment is proposed	Potential for increased proficiency	High AI-based personalization	Compliance and accessibility challenges are anticipated
(Autsadee et al., 2023)	Bibliometric analysis of digital tools in maritime HRD	Identifying gamification, VR, AI, LMS as key tools	Not measured directly	Highlighting the potential of AI and ML	Security, skills gaps, and budget constraints were noted.
(Zhang et al., 2015)	VR-based marine engineering English simulation system	Increased learner immersion and interest	Improvement in teaching quality reported	VR improves cognitive load management	Limited by the dominance of traditional teaching
(Hu & Hu, 2025)	Digital resource repository with blended learning and VR	Supporting content integration and student demands	Not assessed quantitatively	VR and blended learning support adaptability	Technical and content development challenges
(Abimanto et al., 2025)	A learning analysis model for Maritime English that complies with STCW	Engagement is related to simulation time and proficiency	Lower scores in simulation vs. oral test	AI-based personalized feedback is recommended	Contextual realism gaps and technical barriers were identified.
(Dimitrakiev & Velinov, 2025)	Integration of implicit and explicit learning strategies	Improving communicative competence and security	Improved SMCP mastery and real-time communication	Not explicitly adaptive	The implications of curriculum design are emphasized

("Fostering learning innovations in maritime ...", 2024)	A synthesis of blended, project-based, and immersive learning	Immersive technology and blended learning enhance skills	Not measured quantitatively	Immersive technology supports experiential learning	Challenges of infrastructure and educator training
(Miyosa et al., 2024)	gamified learning game for ship safety	Engaging students in English and safety practices	Not assessed quantitatively	Gamification supports motivation	The development and testing phase is important
(Qaddumi & Smith, 2024)	The effect of Moodle LMS on language acquisition and attitudes	Positive attitude shift and skill improvement	Significant gains in writing, reading, and vocabulary	Not adaptive	Lecturer competence influences effectiveness
(Prasetya, 2021)	Lecturers' perspectives on Moodle for ESP teaching	Effective pedagogy and technical skills required	Supporting the development of communicative competence	Not adaptive	Challenges in interaction and adaptability
(Mandal et al., 2026)	LMS-based learning and professional identity formation	LMS is empowering but can distance students socially	Not measured quantitatively	Not handled	The need for authentic maritime culture in LMS
(Bojović, 2024)	Assessment of communicative language skills in Maritime English	Emphasizes vocabulary and pragmatic competence	Valid and reliable assessment instruments	Not adaptive	The importance of nonverbal communication is noted
(Perea-Barberá & Bocanegra-Valle, 2014)	ICT and Moodle Glossary for specialized vocabulary learning	Students' opinions are positive about digital vocabulary tools	Not measured quantitatively	Not handled	literacy and lifelong learning are emphasized
(Loscy -Leon & Balderas, 2019)	Adaptive testing with spaced repetition system	Personalized learning improves retention	Positive impact on information retention	High effectiveness of adaptive learning	Cognitive approaches support autonomous learning
(Sartini et al., 2024)	Maritime English communication needs and instructional design	Identifying communication challenges and needs	Not measured quantitatively	Not handled	Call for curriculum reform towards communicative competence
(Товстокорний & Попова, 2021)	VR simulator for the formation of professional competencies	VR improves maneuvering skills and realism	Positive impact on competency development	VR supports immersive learning	Integration with Moodle supports training
(Captain & Captain, 2023)	The impact of distance education on maritime students' competencies	Negative impact on future professional performance	Maritime English language competency is identified as challenging	Not handled	The issues of self-efficacy and motivation are highlighted
(Fedor et al., 2022)	chatbot design for Maritime English learning	Provides practice in listening and understanding	Not assessed quantitatively	AI-powered conversation exercises	User-friendly interface supports learning

(Rafits et al., 2024)	Serious play in maritime education and inland waterways	High engagement and knowledge retention	Positive learning outcomes reported	Gamification enhances practical applications	Bridging the gap between theory and practice
(Yurzhenko, 2019)	Moodle LMS e-course for professional Maritime English	Gamification elements increase motivation	Formation of effective foreign professional competencies	Not adaptive	Blended learning accelerates language acquisition
(Gorgorova et al., nd.)	assisted learning integration in Moodle	AI tools support resource creation and assessment	Experiments show positive student results	AI enhances personalization	The risks and limitations of using AI are discussed.
(Sukomardojo & Ratmaningsih, nd.)	E- learning to improve vocabulary for electro-technical officers	E- learning improves vocabulary skills	Quantitative vocabulary acquisition is reported	Not resolved	Barriers include technical and motivational issues.
(Bačnar et al., 2025)	immersive VR engine room simulator technology	Perceived usefulness drives acceptance	Not measured directly	VR supports immersive training	Ease of use influences behavioral intentions
(Вячеславовна, 2025)	Modern technologies in English learning include AI and VR	AI and VR improve speech and vocabulary	Not measured quantitatively	personalized learning	Ethical considerations are emphasized
(Li et al., 2023)	Bibliometric analysis of Maritime English research trends	Focus on ME education and communication	Quantitative methods dominate	Not handled	European institutions lead research results
(Oktavia & Abimanto, 2024)	Innovative technologies in Maritime English teaching	AI and robotics support communication skills	Not measured quantitatively	AI integration is emphasized	Supporting cross-cultural communication
(Lysenko et al., 2025)	AI integration for professional interview preparation	AI models simulate interviews and business games	Improvement of linguistic and professional competence	High AI-based personalization	Modernizing and personalizing the educational process
(Listriyawati & Kristiawan, 2025)	AI tools to improve marine management and sustainability	AI improves vocabulary and comprehension	Significant improvement in test scores	personalized learning	Promoting environmental awareness
(Ratmaningsih et al., 2025)	The role of AI in student communication strategies	AI reduces ineffective strategies, increases fluency	Not measured quantitatively	AI fosters independence and professional communication	Increase the effectiveness of communication strategies
(Karimi et al., 2024)	Review of AI-based adaptive instructional systems	AI/ML personalizes training	Not measured directly	High adaptive learning potential	Small data and modeling challenges are discussed

3. DISCUSSION

This discussion synthesizes the empirical evidence and findings derived from the systematic review of 50 core studies, specifically structured around directly answering the three core research questions.

Relative Effectiveness of Gamification and Immersive Technology (VR) in Improving SMCP Vocabulary Retention (RQ1)

In addressing RQ1, empirical findings across 11 dedicated core studies demonstrate that gamification and Virtual Reality (VR) simulations provide substantial quantitative and qualitative improvements in maritime cadets' Standard Marine Communications Phrases (SMCP) vocabulary acquisition and retention. Intrinsic motivation, yielding post-test vocabulary comprehension score increases of up to +18% are strongly triggered by gamification elements such as badges, leaderboards, interactive mobile scenario elements, and game-based learning tasks (Dayana et al., 2025; Rosedi, 2024; Sukomardojo, 2023; Miyosa et al., 2024). Theoretical classroom instruction and onboard safety applications are bridged further by serious games(Raftis et al., 2024).

Retention is further augmented by immersive VR technologies, including 3D engine room and navigation bridge simulators, through the reduction of cognitive load during complex and hazardous operational scenarios (Zhang et al., 2015; Bačnar et al., 2025). By providing realistic, risk-free tactile environments, VR enables cadets to practice specialized marine engineering and navigational terminology under realistic operational stress, thereby directly reinforcing spatial-language coordination (Lyu & Li, 2022; Tovstokoryi & Popova, 2021). As synthesized across the core literature, gamification and VR represent 22% of the reviewed research spectrum (11 studies) and formed the second major evolutionary wave (2020–2023) in maritime digital education.

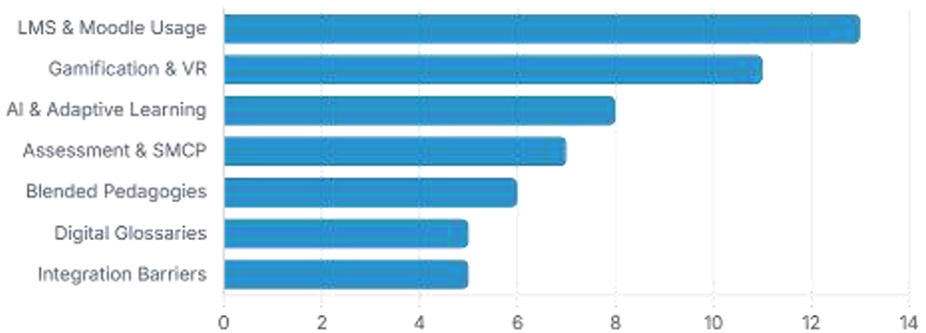


Figure 2. Thematic Spectrum Distribution of Maritime Digital Studies

Table 2. Categorical Distribution of Included Digital Maritime Studies

No	Classification of Research Themes	Number (Study)	Percentage
1	Moodle Utilization (Basic Infrastructure)	13	26%
2	Gamification & Virtual Reality (Interactive Engagement)	11	22%
3	Artificial Intelligence (AI) & Adaptive Learning	8	16%
4	SMCP Communicative Skills & Competency Assessment	7	14%
5	Pedagogical Innovation (Blended & Project-Based) Learning)	6	12%
6	Digital Vocabulary & Glossary Resource Development	5	10%
7	Integration Challenges & Field Barriers	5	10%

Note: Percentages sum to >100% due to overlapping research themes across synthesized studies.

Critical Barriers in Moodle LMS Implementation in MET (RQ2)

Regarding RQ2, despite Moodle LMS being the foundational structural anchor across global Maritime Education and Training (MET) institutions representing 26% of reviewed literature (13 studies) its implementation faces critical pedagogical, technical, and psychological barriers. It is revealed by a synthesis of 18 studies focusing on barriers that the primary bottleneck is the pedagogical gap among instructors (85% impact), specifically low digital literacy among senior maritime lecturers, teaching resistance, and a failure for interactive LMS features to be utilized, whereby Moodle is reduced to a passive file repository (Diahyleva et al., 2024; Prasetya, 2021; Qaddumi & Smith, 2024).

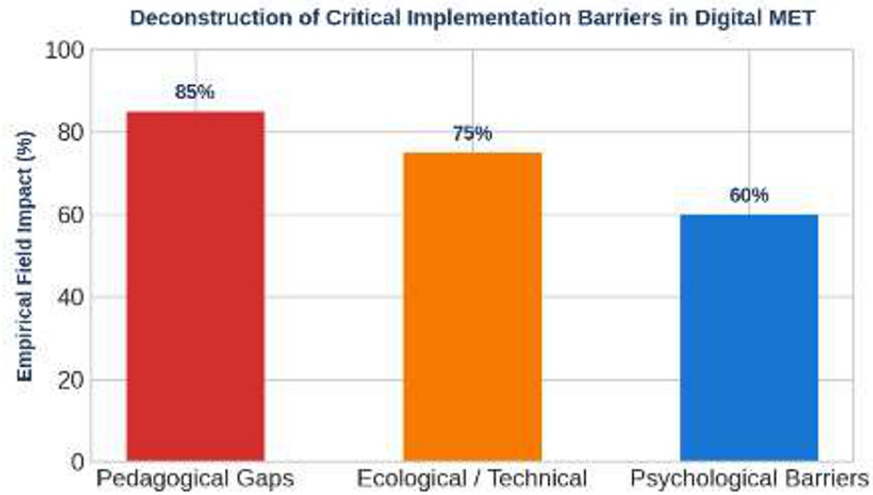


Figure 3. Deconstruction of Critical Implementation Barriers in Digital MET.

Table 3. Matrix of Critical Implementation Barriers in Digital Maritime Education

Dimension of Obstacles	Specific Field Constraint Factors	Empirical Impact (%)	Key References
Pedagogical Gap	Lack of digital literacy among senior instructors; resistance to abandoning conventional methods; failure to optimize interactive LMS features (using LMS as static file repository).	85%	Diahyleva et al. (2024); Prasetya (2021)
Ecological / Infrastructure Limitations	Low contextual realism in simulations under emergency navigation stress; bandwidth constraints at sea/remote areas; high price of VR hardware limiting mass replication.	75%	Abimanto et al. (2025); Zhang et al. (2015)
Psychological Barriers	Mental fatigue due to distance learning; long-term loss of intrinsic motivation from self-study isolation; hampered 'Professional Identity' formation due to lack of human contact.	60%	Kaptan & Kaptan (2023); Mandal et al. (2026)

This adoption vs. adaptability paradox is illustrated in Figure 3. While Moodle LMS exhibits high institutional adoption (scale: 8.5) due to cost efficiency and administrative ease, it possesses low default cognitive adaptability (scale: 3.0), leading to learner isolation and engagement fatigue (Morze et al., 2021; Mandal et al., 2026). Conversely, adaptive AI systems offer high personalization (scale: 9.0) but suffer from low field adoption (scale: 2.0) due to technical barriers and lack of standardized frameworks.

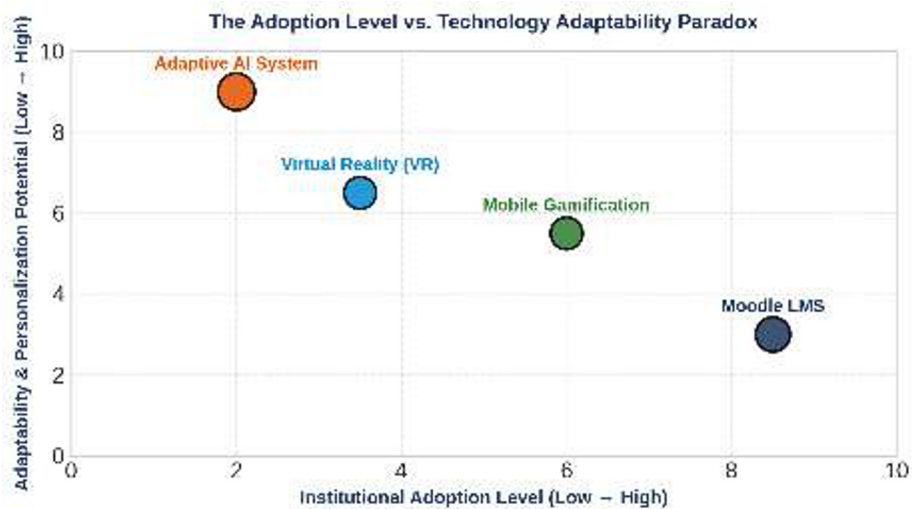


Figure 4. The Paradox of Adoption Level vs. Technology Adaptability.

Strategic Priority Map for Adaptive Instructional Technology (AI) Research (RQ3)

To address RQ3, the synthesis tracks a clear chronological shift toward adaptive learning (Wave 3, 2024–2026). High potential for personalizing Maritime English education, reducing ineffective communication strategies, and conducting voice-based oral proficiency evaluations is displayed by Generative AI models, automated voice chatbots, and spaced-repetition adaptive testing (Fedor et al., 2022; Lysenko et al., 2025; Losey-Leon & Balderas, 2019; Ratnaningsih et al., 2025). However, current implementations remain predominantly in pilot stages requiring large-scale empirical validation (Çiçek & Celik, 2025; Karimi et al., 2024).

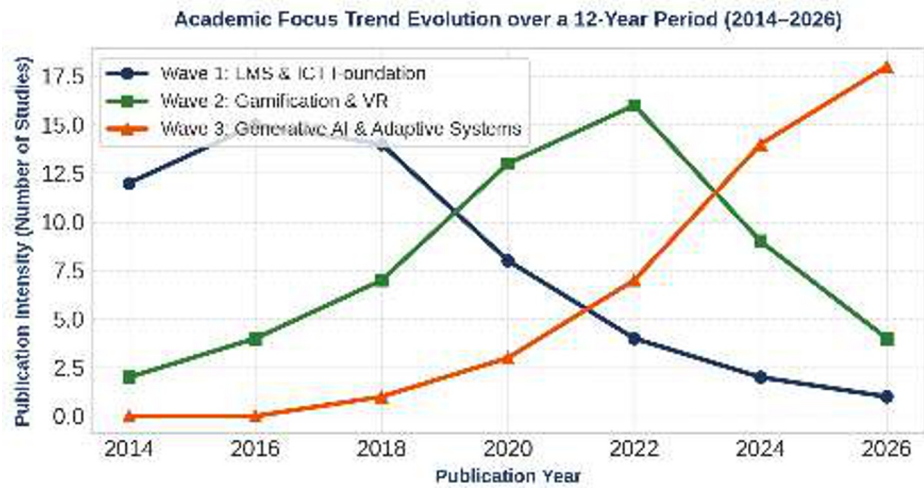


Figure 5. Transition Cycle of Academic Focus Trends Over a 12-Year Period (2014–2026).

To resolve current technological fragmentation, the synthesized findings yield an Integrated Three-Layer Digital Learning Framework alongside a Strategic R&D Roadmap prioritizing future AI research.

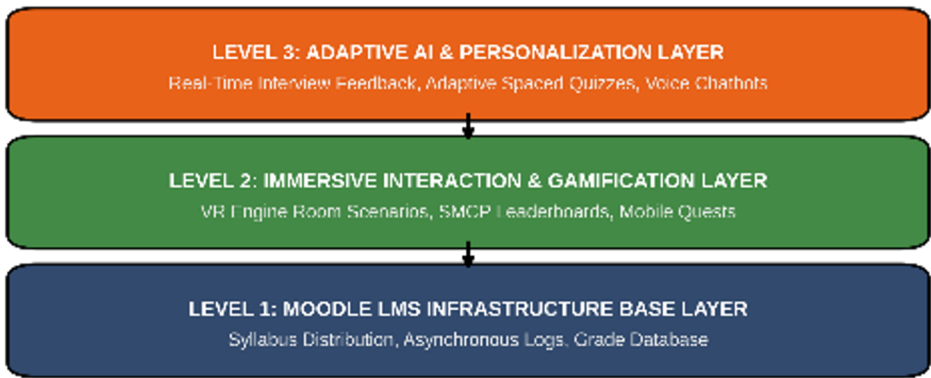


Figure 6. Integrated Three-Layer Maritime Digital Learning Framework.

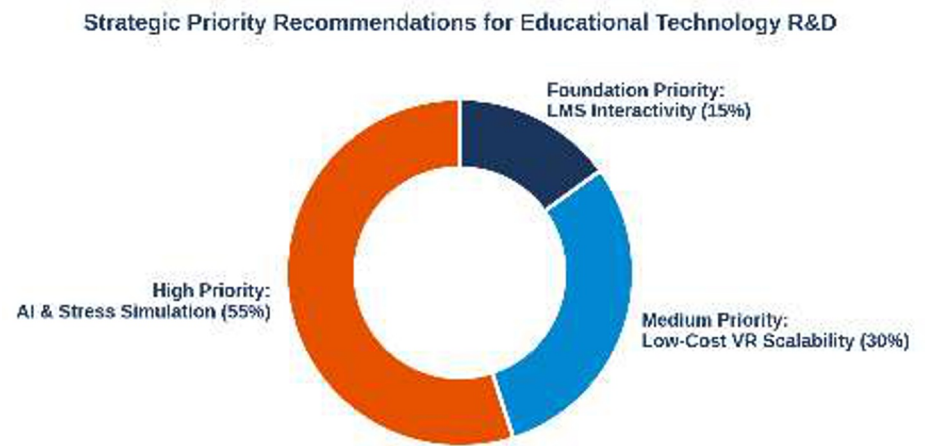


Figure 7. Strategic Priority Recommendations for R&D in Maritime Educational Technology.

Table 4. Strategic Priority Recommendations and Research Roadmap for Maritime AI & Digital Tech

Research Field	Required Key Action Description	Priority Level	Urgency of Resource Allocation
AI for Stress Simulation & Speech Recognition	Developing domain-specific AI voice engines trained on maritime audio environments to simulate high-noise, stressful VHF radio transmissions and oral interviews.	High Priority	55%
Low-Cost VR Scalability	Researching budget-friendly smartphone-based VR (WebVR/Cardboard) to democratize immersive engine room/bridge simulations without high-spec hardware requirements.	Medium Priority	30%
LMS Interactivity & Social Integration	Re-engineering Moodle plugins to enhance social presence, collaborative teamwork features, and integration of authentic maritime culture to combat distance learning isolation.	Foundation Priority	15%

4. CONCLUSIONS AND IMPLICATIONS

It is empirically demonstrated by this systematic literature review that digital transformation in Maritime English education no longer merely complements classes administratively, but rather determines global navigation safety competency. The integration of asynchronous technology (Moodle LMS) combined with interactive technology (Gamification & VR) has been validated to boost cadets' mastery of SMCP vocabulary and standard phrases by up to 18%.

Practical Implications for Stakeholders:

- For Maritime Education Institutions (MET):** It is mandatory to adopt a *layered* infrastructure investment model. *Framework*). Don't write off the Moodle LMS ; make it the primary learning platform, gradually enhanced with gamification modules and visual simulations.

2. **For Curriculum Designers:** Digital literacy training (*pedagogical digital reform*) for senior instructors must be initiated immediately . The success of digital technology deployment is directly proportional to the ability of lecturers to design interactive, data-driven instruction.
3. **For Researchers & Industry:** Future focus should be on the ecological validation of AI. Basic conversational skills should be gone beyond by voice assistant chatbot development, and developers should test its ability to replicate navigational grammar compliance under real-life, psychologically stressful emergency situations.

References

- [1] Abimanto, D., Hartono, R., & Wahyuni, S. (2025). Bridging the contextual realism gap: A learning analytics model for STCW-compliant maritime English training. *Elsya*, 7(3), 298-311. <https://doi.org/10.31849/t2fdj104>
- [2] Arbabi, M. A., He, D., & Ho, D. (2024). Esp learners' attitudes towards the Moodle virtual learning environment. *International Journal of Language and Instruction*, 2(3), 112-125. <https://doi.org/10.36312/ijlic.v2i3.2333>
- [3] Outsadee, Y., Jeevan, J., Salleh, N.H.M., & Othman, M.R.B. (2023). Digital tools and challenges in human resources development and its potential within the maritime sector through bibliometric analysis. *Journal of International Maritime Safety, Environmental Affairs, and Shipping*, 7(2), 145-158. <https://doi.org/10.1080/25725084.2023.2286409>
- [4] Bačnar, D., Barić, D., & Ogrizović, D. (2025). Charting the future of maritime education and training : A technology - acceptance - model - based pilot study on students' behavioral intention to use it fully immersive VR engine room simulator. *Applied Systems Innovation* , 8(3), 84. <https://doi.org/10.3390/asi8030084>
- [5] Bojović, M. (2024). Communicative language ability in maritime English : Concept, significance, and assessment. *Časopis Pomorskog Faculty of Kotor*, 25(1), 34-51. <https://doi.org/10.56080/jms240503>
- [6] Çiçek, K., & Celik, M. (2025). Conceptualizing a generative novel maritime learning management system. *Advances in Computational Intelligence and Robotics*, 85-112. <https://doi.org/10.4018/979-8-3373-7057-6.ch004>
- [7] Dayana, YF, Anggraini, LP, Suhartini, C., & Yahya, AIB (2025). Gamification in English language learning for seafarers in preparation for marlins test : Enhancing motivation and engagement . *Didaktika : Journal of Education* , 14(3), 5565-5574. <https://doi.org/10.58230/27454312.2154>
- [8] Diahyleva, O., Kononova, O., Yurzhenko, A., & Svyryda, V. (2025). Development of professional competence of future specialists in the operation of shipboard technical systems and complexes using Ims moodle . *Naukovij Visnik Mukačiv's'kogo Deržavnogo Universitetu* , 51-59. <https://doi.org/10.52534/msu-pp1.2025.51>
- [9] Diahyleva, O., Yurzhenko, A., & Kononova, O. (2024). Exploring the effectiveness of on line learning tools and technologies while teaching maritime English to future ship engineers. *Computer Technologies in Education*, 12(1), 711. <https://doi.org/10.55056/cte.711>

- [10] Diahyleva, O., Yurzhenko, A., & Kononova, O. (2024). Gamification techniques in maritime English on line courses : Motivating learners in virtual environments. *Advances in Mobile Learning Educational Research*, 4(1), 965-972. <https://doi.org/10.25082/amler.2024.01.008>
- [11] Dimitrakiev, D., & Velinov, S. (2025). Integrating implicit and explicit learning approaches in maritime English instruction : A framework for professional competencies. *Zenodo Research Repositories*. <https://doi.org/10.5281/zenodo.15118818>
- [12] Dyagileva, O., Yurzhenko, A., & Kononova, O. (2024). Benchmarking online maritime education : Tracing the evolution of assessment in electronic educational environments. *Osvitnij Vymir*, 11(2), 204-219. <https://doi.org/10.55056/ed.804>
- [13] Fedor, K., Strinyuk, S., & Lanin, V. (2022). Developing voice chatbot for learning maritime english. *IEEE International Conference on Advanced Information Communication Technology (AICT)*, 1-5. <https://doi.org/10.1109/AICT55583.2022.10013615>
- [14] Fedorova, O., & Bobrysheva, N. (2021). Methodology of blended learning for maritime officers of senior courses with involvement of the latest informational technologies. *Naukovyi Visnyk*, 44(3), 36-48. <https://doi.org/10.24919/2308-4863/44-3-36>
- [15] Kaptan, B., & Kaptan, M. A. (2023). Examining the distance education process in terms of professional competencies of maritime Australian students *Journal of Maritime & Ocean Affairs*, 1-16. <https://doi.org/10.1080/18366503.2023.2223860>
- [16] Karimi, E., Smith, J., Billard, R., & Veitch, B. (2024). Ai-based adaptive instructional systems for maritime safety training : A systematic literature review. *Discover Artificial Intelligence*, 4(1), 34-49. <https://doi.org/10.1007/s44163-024-00153-0>
- [17] Kononova, O., Diahyleva, O., & Yurzhenko, A. (2024). Interactive module "environment" protection " of maritime English course on Ims Moodle for future ship engineers. *Georgian Maritime Scientific Journal*, 2(1), 80-95. <https://doi.org/10.70791/gmsj.2.2024.8015>
- [18] Kudryavtseva, VM, Barsuk, SD, & Frolova, OY (2023). Promoting active on line interaction with maritime English students. *TransNav : International Journal on Marine Navigation and Safety of Sea Transportation*, 17(3), 707-713. <https://doi.org/10.12716/1001.17.03.23>
- [19] Li, T., Chen, Q., Xi, Y., & Lau, Y. (2023). A 40-year bibliometric analysis of maritime English research : Insights and implications. *Sustainability*, 15(5), 4348. <https://doi.org/10.3390/su15054348>
- [20] Listriyawati, NA, & Kristiawan, D. (2025). Integrating voice thread and ttsreader into maritime English education to enhance marine management and foster Sustainability. *Saintara : Scientific Journal of Maritime Sciences*, 9(2), 161-171. <https://doi.org/10.52475/saintara.v9i2.399>
- [21] Losey-Leon, M., & Balderas, A. (2019). Cognitive approach to adaptive testing implementation in virtual maritime English language learning environment based on a spaced repetition system. *Communications in Computers and Information Science*, 105-119. https://doi.org/10.1007/978-981-13-1358-5_10

- [22] Lysenko, V.V., Ivantsova, Y.A., & Nikitina, E.V. (2025). The integration of artificial intelligence into foreign language teaching of maritime students : Preparation for professional interviewing. *Russian Journal of Education and Psychology* , 16(2), 232-257. <https://doi.org/10.12710/2658-4034-2025-16-2-707>
- [23] Lyu, W., & Li, L. (2022). Blended learning of esp based on spoc and VR. A case study of maritime English course. *ACM International Conference Proceeding Series*, 184-192. <https://doi.org/10.1145/3578837.3578854>
- [24] Mandal, L., Sambrano, F., Arellano, R., Ty, G., & Ty, L. (2026). Becoming a sailor in a digital classroom : A qualitative study of maritime students' professional identity formation in IMS-based learning environments. *Pantao : International Journal of the Humanities and Social Sciences*, 5(1), 65-78. <https://doi.org/10.69651/pijhss0501698>
- [25] Miyosa, AS, Afika, ASA, Krisaputra, RBK, Hanafi, M., Rahman, F., Anggraeni, T., & Sucipto, A. (2024). Enhancing maritime safety education through mobile gamification : Development and design of an android-based learning games for safe working practices on board ship. *Journal of Information Technology and Its Utilization*, 7(2), 81-92. <https://doi.org/10.56873/jitu.7.2.5996>
- [26] Morze, N., Varchenko-Trotsenko, L., & Terletska, T. (2021). Stages of adaptive learning implementation by means of Moodle lms. *Proceedings of the International Conference on Educational Technology*, 34-45. <https://doi.org/10.5220/0012065500003431>
- [27] Oktavia, A., & Abimanto, D. (2024). Using innovative technologies in the process of teaching maritime english. *International Journal of Educational Development*, 1(3), 61-68. <https://doi.org/10.61132/ijed.v1i3.69>
- [28] Prasetya, RE (2021). Effectiveness of teaching English for specific purposes in IMS moodle : Lecturers' perspective. *Journal on English Language Teaching*, 6(1), 93-109. <https://doi.org/10.21462/JELTL.V6I1.498>
- [29] Qaddumi, H., & Smith, M. (2024). Implementation of learning management systems (moodle): Effects on students' language acquisition and attitudes towards learning English as a foreigner language. *Higher Education Journal*, 3(2), 115-130. <https://doi.org/10.3390/higheredu3020016>
- [30] Raftis, C.C., Hassel, E.V., & Boukani, L.N. (2024). The impact and importance of serious games in maritime Education : An empirical applications. *Maritime Policy & Management*, 1-20. <https://doi.org/10.1080/03088839.2024.2442603>
- [31] Ratnaningsih, D., Munir, A., & Anam, S. (2025). The roles of artificial intelligence (AI) towards students' communication strategy in esp maritime English. *Asian Journal of Applied Education*, 4(3), 253-266. <https://doi.org/10.55927/ajae.v4i3.14743>
- [32] Rosedi, SRBHM (2022). Using learning management system to motivate merchant ship crew to learn maritime english. *KMI International Journal of Maritime Affairs and Fisheries*, 14(2), 163-175. <https://doi.org/10.54007/ijmaf.2022.14.2.163>
- [33] Rosedi, SRBHM (2024). The use of gamification in improving student engagement when learning the standard marine communication phrases (smcp). *KMI International Journal of Maritime Affairs and Fisheries*, 16(1), 1-20. <https://doi.org/10.54007/ijmaf.2024.e1>

- [34] Sartini, S., Triyono, S., & Triastuti, A. (2024). Unveiling maritime English communication needs for seafarer : Strategic reformation for classroom instructional design. *Maritime Technology and Research*, 7(1), 105-122. <https://doi.org/10.33175/mtr.2025.271921>
- [35] Smirnov, I.O., Dokuto, B., & Kondratiev, A. (2022). Teaching marine engineering terms through on line methods in maritime training courses. *Maritime Technology and Research*, 5(2), 2613-2628. <https://doi.org/10.33175/mtr.2023.261340>
- [36] Sukomardojo, T. (2023). The uses of media games to improve smcp (standard marine communication phrases) vocabulary in maritime English. *Jurnal 7 Samudra*, 8(2), 112-124. <https://doi.org/10.54992/7samudra.v8i2.87>
- [37] Yurzhenko, A. Y. (2019). An e-course based on the Ims Moodle to teach "maritime" English for professional purpose". *Information Technologies and Learning Tools*, 71(3), 92-101. <https://doi.org/10.33407/ITLT.V7I13.2512>
- [38] Yurzhenko, A., Diahyleva, O., & Kononova, O. (2024). Exploring the effectiveness of benchmarking approach with educational technologies in maritime English education. *Osvitologičnij Discurs*, 46(3), 88-102. <https://doi.org/10.28925/2312-5829/2024.3.8>
- [39] Yurzhenko, A., Diahyleva, O., & Kononova, O. (2025). Interactive maritime module security " of maritime English course on Ims Moodle for future ship engineers. *Digital Security and Forensics Journal*, 2(11), 39-51. <https://doi.org/10.29121/digisecforensics.v2.11.2025.39>
- [40] Zhang, N., Liu, Y., Luo, W., Shen, Z., & Guo, C. (2015). Virtual reality based marine engineering English learning environment simulation research. *International Conference on Wireless Communications, Networking and Mobile Computing (ICCWAMTI)*, 452-457. <https://doi.org/10.1109/ICCWAMTI.2015.7493981>
- [41] Вячеславовна, Б. Е. (2025). Modern technologies in english language learning : From virtual reality to artificial intelligence. *Zenodo Repository Preprints*. <https://doi.org/10.5281/zenodo.17248711>
- [42] Товстокорий, О. М., & Попова, Г. В. (2021). Використання симуляційних тренажерів віртуальної реальності dl формування професійних компетентностей майбутніх судноводіїв. *Information Technologies and Learning Tools*, 82(2), 46-62. <https://doi.org/10.33407/ITLT.V82I2.3605>

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

