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ADVANCED DIGITAL STRATEGIES FOR ENHANCING MARITIME LANGUAGE EDUCATION

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The modern maritime industry is experiencing an intensive phase of digital transformation, which is changing the nature of the professional activities of ship specialists and putting forward new requirements for their language training. E-Navigation technologies, the concept of smart ships and the development of remote operations are forming a new type of operational environment in which the interaction of the seafarer with digital systems is dominant. This requires updating the content of English-language professional training and adapting it to the conditions of the digital maritime infrastructure.

An important component of digitalisation is the transition to electronic documentation, which involves the use of electronic logbooks, digital checklists, electronic reporting forms and technical journals. Working with such documents requires future ship engineers not only a high level of English proficiency, but also the ability to operate with terminology related to digital platforms, interfaces and automated ship machinery control systems (Xiao, 2022).

Modern formats of professional communication in the maritime industry are changing under the influence of the active use of video conferencing platforms, automated information systems and digital simulators. These technologies are transforming the way professionals interact, introducing new channels and means of information transmission.

The use of complex high-level realistic training systems, engine room simulators and VR/AR technologies is forming a different type of language activity, in which the accuracy of technical formulation, the ability to correctly interpret digital commands and understand messages from automated systems are key (Aurelia, 2024). Such conditions put forward increased requirements for the level of proficiency in Maritime English, adapted to the digital environment of ship equipment operation.

In this context, Maritime English must be adapted to digital interfaces, including alarm messages, electronic charts, automated notifications, electronic protocols and navigation systems with English functionality. Such adaptation allows bringing the educational process closer to the real conditions of work on a modern ship and to ensure the readiness of education seekers for effective communication in a technologically advanced multilingual environment.

One of the key areas of digital innovation in maritime language education is the use of modern technologies to ensure the authenticity of professional speech and enhance cadets'

practical training. In this context, advanced digital strategies that include simulation, artificial intelligence, gamification, collaborative and LMS-oriented approaches to learning maritime English are of particular importance.

The first of these strategies is Simulation-Based Learning, which includes VR, AR solutions and specialised simulators, in particular the Engine Room Simulator (ERS) and Bridge Simulator. The use of VR scenarios for accidents, procedures, and technical tasks creates realistic conditions for professional communication, and AR settings with prompts support understanding of technical vocabulary and procedural commands (Garg, 2022). The main advantage of simulation learning arises in the modelling of authentic interaction situations on board the ship.

An important place is occupied by the AI-powered Learning strategy, which includes the use of ChatGPT, voice bots and adaptive platforms. Artificial intelligence makes it possible to model dialogues and professional programs in the engine department, automatically recognise speech, correct pronunciation and generate correctly according to the individual needs and level of training of the applicant (Garg,
2022). The advantage of the approach is the individualisation of Maritime English learning.

Gamified Digital Learning also has significant potential, which is implemented through the Kahoot, Quizizz platforms, Duolingo-style modules and digital emergency scenario simulators. Gamified tasks increase motivation, ensure dynamic learning of maritime terminology and contribute to training in radio exchange and technical communication in an interesting format.

In the modern digital environment, Virtual Collaboration Platforms are especially valuable, including Microsoft Teams, Zoom, Google Meet and other means of online interaction. By creating international training groups and conducting joint projects – digital journals, safety reports, video exercises – such platforms contribute to the formation of real team communication and the development of intercultural competence.

A significant component of modern digital strategies is the use of Learning Management Systems (LMS), which organize and facilitate the entire educational process. Platforms such as Moodle, with their interactive modules, online case studies like “Engine Room Incidents,” and SCORM-based units on maritime terminology, provide learners with convenient access to materials, promote autonomous study, and ensure a well-structured, streamlined learning workflow within the digital environment.

Also, Maritime podcasts, training videos and reports on dangerous incidents also play an important role. They recreate the real situation on board a ship and demonstrate the specifics of communication in multinational crews. Watching videos and listening to podcasts activate listening, expand vocabulary and contribute to a better understanding of professional dialogues and procedures.

An effective tool for mastering terminology is interactive cards and mobile applications with maritime vocabulary. They should organise training in a microdosing format (microlearning), which is especially important for complex technical terms and abbreviations. Regular work with such resources ensures gradual AND steady expansion of vocabulary.

Working with digital standards (electronic standards of IMO, MARPOL, STCW and SOLAS) allows cadets to master professional language in the context of real safety

requirements and operate a vessel, developing the ability to interpret official messages and instructions correctly.

A significant limitation is the financial costs associated with the acquisition and maintenance of simulators, VR equipment and licensed software products. There is also the problem of standardisation of digital content, since not all materials require IMO requirements or the specifics of work on board a modern ship. This requires the creation of high-quality, unified and pedagogically sound digital educational content (Gao, 2023).

Modern artificial intelligence tools opened new opportunities for organising training in Maritime English and provide a more economical, personalised and practice-oriented approach to training. AI services such as ChatGPT, voicebots, dialogue script generators, automatic speech recognition platforms and adaptive simulators can simulate authentic professional situations, create realistic dialogues between crew members, reproduce radio exchanges, emergency scenarios or technical instructions (Diahyleva et al.,2025). The teacher can use AI to develop training materials, create “Emergency on board” cases, generate terminological activities, form dictionaries and virtual digital simulators for practising special maritime vocabulary. AI also supports an individual learning trajectory by offering levelled tasks, analysing errors and offering adapted content according to the student's needs (Perminova et al., 2025).

Despite the significant potential of digital strategies, their implementation leads to many challenges. First, there is a need to develop the digital literacy of teachers and cadets, since the effective use of simulators, adaptive platforms, VR/AR technologies and artificial intelligence tools requires appropriate technical skills. An important condition is also the availability of a stable and powerful Internet connection, since most digital services operate online. An additional limitation is the financial costs of purchasing and maintaining simulation equipment, VR devices and licensed software (Aurelia, 2024). The problem of standardisation of digital content remains relevant, since not all available materials meet IMO requirements and the specifics of modern ship operations, which necessitate the creation of unified, pedagogically sound resources.

At the same time, the use of artificial intelligence opens wide opportunities for improving the teaching of Maritime English. Generative models allow you to simulate professional situations on the bridge and in the engine room, practice radio phraseology, enrich technical vocabulary and train dialogic speech. Adaptive platforms and chatbots provide personalised learning, offering tasks according to the cadet's level of training, and help the teacher quickly create accident scenarios, training situations or terminology materials. At the same time, AI also has certain risks: automatically generated texts may contain inaccuracies in specialised maritime terminology, which requires careful verification, and excessive use of AI can reduce student independence. Additional challenges are associated with confidentiality restrictions and the inability to apply AI to materials that have limited access or relate to real ship operations (Yurzhenko et al., 2025).

Therefore, the use of digital strategies and artificial intelligence tools opens up new opportunities for modernising the English language training of future ship mechanics. The combination of simulation learning, adaptive platforms, interactive LMS solutions and generative models provides a more realistic, technologically close to the conditions of a modern ship, mastering professional vocabulary and communicative scenarios. These approaches

enhance the individualisation of learning, contribute to the formation of technical and linguistic competence, increase motivation and allow the reproduction of complex production situations without risk for cadets.

At the same time, the effective integration of digital technologies requires the development of digital literacy of participants in the educational process, ensuring a reliable Internet infrastructure, as well as thorough verification and standardisation of the created content. The use of AI requires pedagogical control and a critical approach, because automatically generated materials may contain inaccuracies, and excessive dependence on technology may reduce the level of student independence.

In general, advanced digital strategies have significant potential to enhance the quality of language training for future maritime professionals, ensuring its compliance with the requirements of modern shipping, international standards and real conditions of professional activity. Their conscious and methodically justified application will contribute to the formation of a new generation of highly professional, competitive and technically competent seafarers.

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