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**AI-BASED ADAPTIVE INSTRUCTIONAL SYSTEMS
FOR MARITIME ENGLISH**

**АДАПТИВНІ НАВЧАЛЬНІ СИСТЕМИ НА ОСНОВІ ШТУЧНОГО
ІНТЕЛЕКТУ ДЛЯ МОРСЬКОЇ АНГЛІЙСЬКОЇ МОВИ**

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English is the official language of international maritime communication in accordance with the standards developed by the International Maritime Organization. The requirements of the STCW Convention emphasize the necessity of effective communication skills for officers and crew members to ensure navigational safety and operational coordination. Training of future seafarers for outcome-based professional communication on board a ship is a mandatory condition for their successful career at sea. Misunderstandings during communication, especially in multinational crews, may lead to critical maritime incidents. Consequently, the development of high-level professional communicative competence in Maritime English remains a priority in maritime education.

Maritime English is a branch of English for Specific Purposes characterized by standardized phraseology, technical terminology, and operational communication patterns, including the Standard Marine Communication Phrases (SMCP). Traditional teaching methods rely on textbooks, simulation exercises, role-playing tasks, and audio materials. These approaches sometimes lack personalization, continuous feedback mechanisms, and scalable opportunities for extended communicative practice [7].

The rapid advancement of artificial intelligence has significantly influenced global educational practices. According to the report presented by British Council (2024), 76% of English language teachers report already using AI-powered tools for various tasks. The most frequently used tools include language learning apps, AI for language generation, and chatbots. Research in Artificial Intelligence in Education (AIED) demonstrates that AI-driven tools enhance personalization, automate assessment, and improve learner engagement [c. 250, 1]. AI-powered chatbots and generative models have shown positive effects on communicative competence, learner autonomy, and interaction strategies in studying [2, p. 16].

Adaptive Learning Systems are smart digital platforms that adjust lessons based on how each student learns. They use technology, mainly AI and data to track student progress and adapt lessons in real time. These systems respond to individual learner's needs, create a flexible and personalized lessons; adjust instructional content to meet individual needs. Adaptive learning systems represent one of the most promising applications of AI in Maritime English instruction. Adaptive technologies in higher education improve knowledge retention and learning efficiency by tailoring educational pathways [3, p. 50].

In maritime contexts, adaptive platforms can provide customized exercises on navigational terminology, as well as terminology for marine engineers, grammar patterns typical of technical instructions, and safety-related vocabulary. Such personalization ensures that cadets with varying levels of English proficiency receive appropriate academic challenges. This contributes to the systematic formation of professional language competence aligned with maritime operational requirements.

Generative language models based on transformer architecture have transformed natural language processing and educational applications [4, p. 5998]. These models can generate realistic dialogues, simulate emergency scenarios, and produce context-specific communication tasks. In Maritime English courses, AI-generated simulations may replicate communication with Vessel Traffic Services (VTS), distress calls, collision warnings, or onboard safety briefings.

Recent empirical research indicates that AI-assisted conversational tools improve students' communication strategies and increase confidence in speaking tasks within ESP environments [5, p.215]. By interacting with AI systems, learners gain opportunities for repetitive, scenario-based practice beyond classroom limitations. However, instructors must verify AI-generated content to ensure terminological accuracy and compliance with maritime safety standards.

Pronunciation accuracy and speech intelligibility are critical elements of maritime communication. Automatic Speech Recognition (ASR)

technologies provide immediate feedback on pronunciation, stress, rhythm, and clarity. ASR-based instruction significantly enhances phonetic competence in second-language learners [6, p. 210].

In Maritime English training, ASR tools simulate realistic radio communication and evaluate clarity under conditions resembling authentic maritime exchanges. Continuous corrective feedback supports the development of standardized pronunciation patterns required for safe and efficient ship-to-ship and ship-to-shore communication.

The integration of AI facilitates the implementation of blended learning models in maritime academies. Students combine face-to-face instruction with AI-assisted online practice, enabling continuous language development. Blended approaches allow educators to monitor student progress through data analytics, identify learning gaps, and adapt instructional strategies accordingly. In institutions with limited access to advanced simulators, AI-powered platforms provide alternative means for practicing professional communication scenarios.

Despite its pedagogical potential, AI implementation in Maritime English education presents several challenges. First, generative systems may occasionally produce inaccurate or outdated maritime terminology. Second, concerns regarding data privacy and academic integrity require institutional regulation. Moreover successful integration depends on teachers' digital competence and readiness to adopt innovative methodologies.

Artificial intelligence should be viewed not as a replacement for educators but as a complementary tool that enhances instructional effectiveness. Teachers remain responsible for methodological supervision, ensuring that AI-generated materials correspond to international maritime standards and pedagogical objectives.

The integration of artificial intelligence into Maritime English instruction represents a strategic direction for modernizing maritime education. Adaptive learning systems, generative language models, and automatic speech recognition technologies significantly contribute to personalized learning, communicative competence development, and professional readiness of future seafarers. When aligned with international maritime regulations and implemented under pedagogical guidance, AI technologies can strengthen both the quality and efficiency of maritime language training.

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