



# Maritime English Instruction for Future Ship Engineers: A Pedagogical Study Using ChatGPT and Digital Learning Platforms

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## To cite this paper:

Diahyleva, O., Kononova, O. & Yurzhenko, A. (2025). Maritime English Instruction for Future Ship Engineers: A Pedagogical Study Using ChatGPT and Digital Learning Platforms. *International Journal of Multilingualism and Languages for Specific Purposes*, 7 (02), 20-32.

**Received:** 12/05/2025; **Accepted:** 11/11/2025, **Published:** 31/12/2025

**Abstract:** *The paper is devoted to the use of Artificial Intelligence while teaching Maritime English to future ship engineers. The analysis of scientific literature was done in the article. The research shows a limited number of works devoted to the use of Artificial Intelligence in maritime education and training. The experimental study was conducted at the Ukrainian Maritime Academy and college. Diagnostic testing, questionnaires, various interactive teaching methods, professionally oriented tasks, digital tools, and instruments were used during the experiment. Moreover, the pedagogical experiment was conducted to test the effectiveness of motivational assessments, interactive and professionally oriented methods of teaching Maritime English in the training of future ship engineers. The sample consisted of 153 cadets from the Marine Engineering Faculty. They were divided into experimental and control groups. Questionnaires identified the dynamics of cadets' motivation in the AI use while e-learning. The DataIsland platform with integrated ChatGPT*

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was chosen as the main Artificial Intelligence tool. LMS Moodle was used as the main platform to contain interactive tasks, quizzes, etc. Systematic processing and analysis were carried out to verify the validity of the results. Quantitative and qualitative approaches were combined to ensure objectivity of the experiment. Statistical analysis was used to process the data. Cadets studied the following topics in Maritime English: engine room equipment, its maintenance, instructions on emergencies, watchkeeping procedure, etc. The integration of artificial intelligence into the learning process allowed the use of ChatGPT to simulate dialogues in professional scenarios. ChatGPT was also effective in creating case scenarios. Another advantage of ChatGPT is its effectiveness in creating glossaries and creating interactive exercises. According to the results, the experimental group achieved greater progress in learning Maritime English, which is very important for ship engineers. The results also prove that AI in Maritime English e-learning should be used as a supportive and motivational tool. This research has important practical implications for teachers (e.g., design of professionally oriented tasks, teachers' digital competence development).

**Keywords:** *Digital Learning Platforms; Digitalization; E-Learning; Maritime Education and Training; Maritime Professionals.*

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## 1. Introduction

Artificial intelligence (AI) is rapidly transforming the educational space, and the training of future maritime specialists is no exception. Modern AI technologies allow not only to optimise the learning process, but also to create conditions for a personalised approach to each student. Thanks to the ability to analyse large amounts of data in real time, AI provides teachers with information about the involvement of cadets, the dynamics of their academic achievements, and possible difficulties in mastering the material. This is especially important in the study of Maritime English, where the effectiveness of communication is directly related to future professional activities.

The sharp increase in the number of educational applications with AI elements indicates the relevance of integrating such tools into the maritime education system. They provide access to adaptive digital platforms that take into account individual learning styles, the pace of knowledge acquisition, and the level of readiness for more complex tasks. Personalised learning is becoming a key approach, as it allows cadets to practice precisely those skills that are critical for their future profession: understanding technical documentation, negotiating, and following emergency instructions in English. Thus, the use of AI-based tools in teaching Maritime English creates new opportunities for increasing motivation, developing responsibility, and achieving a high level of professional competence.

The objective of the article is to show the potential of AI technologies in personalised Maritime English learning, to identify effective tools and methods for their implementation in the training of future ship engineers.



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## 2. Literature Review

Augmented reality technologies, integrated with the capabilities of AI, open up new perspectives in the field of education, providing students with a more immersive and interactive learning experience. Thanks to these technologies, it has become possible to process virtual objects and situations in a way that was previously unattainable. Although AI systems are a relatively new tools in pedagogical practice, in recent years, a significant amount of research has appeared on their implementation in the educational process. Such researchers include Postma, A. Nanne, M. Anteunis, C. G. Van Der Lee, E. O. Postma, S. Wubben, G. Van Noort (2020), G. Al. Murshidi, G. Shulgina, A. Kapuza, J. Costley (2024), T. Hagedorff (2020), T. Adiguzel, H. Kaya, F. Cansu (2023), and others.

The results of their work confirm the high potential of AI in education, while emphasising the need for further research and consideration of challenges and risks. In particular, the report of the Executive Agency for European Education and Culture (European Commission, 2023) emphasises that for the responsible use of AI in educational institutions, it is important to find a balance between obtaining the benefits of new technologies and minimising potential threats, in particular, preserving human control and ethical values (Artificial Intelligence Act, 2024). This demonstrates the sustained interest of the scientific community in the issue and highlights the need for deeper analysis.

Many scientific investigations focus on studying the potential of AI in personalising learning. For example, in the studies of Holmes, Bialik, and Fadel (Stanford University) and Mitrović (MIT Media Lab), the emphasis is on the effectiveness of algorithms for adapting educational content to the individual needs and cognitive styles of students. Empirical results show that personalised platforms driven by artificial intelligence can significantly increase motivation, the level of student engagement, and optimise learning outcomes.

These findings are consistent with the theoretical positions presented by Lozova and Trotsko (2002), who emphasise the role of cognitive activity in the formation of sustainable learning motivation. Personalisation implemented through AI creates conditions for deeper immersion in the learning material, the development of individual strategies, and the formation of the ability to self-study. At the same time, it is worth noting that in the field of maritime education, in particular in the teaching of maritime English, research on the integration of AI is currently insufficient. This opens up prospects for further scientific research and the introduction of innovations in the professional training of future maritime specialists.



### **3. Methodology**

The experimental study was conducted at the Kherson State Maritime Academy (KSMA, Ukraine) and the Maritime Applied College of KSMA (MAC KSMA, Ukraine) at the Marine Engineering Faculty during one semester. The participants were cadets of the ship engineering department of MAC KSMA.

Participants of the study. The sample included male cadets aged 17 to 19 years, who, after completing high school, had a basic level of English (mostly at level A2 according to CEFR, with partial proficiency in B1). Their training was limited to a school foreign language course, without significant experience in using professionally oriented English.

The following methods were used during the experiment:

- Diagnostic testing to determine the initial level of lexical and grammatical skills and the ability to work with professional texts and audio materials. The tests were teacher-designed.
- A Questionnaire to determine the level of external and internal motivation to learn English. The questionnaire was also teacher-designed.
- The formative stage, during which interactive teaching methods, professionally oriented tasks, the use of digital tools, and elements of motivational assessment were introduced.
- Intermediate and final teacher-designed testing to record the dynamics of changes in educational achievements and the level of involvement of cadets.
- Methods of self-assessment and mutual assessment, which allow for assessing the degree of development of reflection and responsibility for the results of one's own educational activities.

The purpose of the experiment was to test the effectiveness of using motivational assessment, interactive, and professionally oriented methods of teaching English in the training of future ship engineers.

#### **3.1 Research Design**

The experimental study was designed to test the hypothesis that the speaking skills in Maritime English of future marine engineers would significantly improve under the condition of integrating artificial intelligence (AI) into the learning process, which is currently conducted entirely online. The core assumption was that AI-powered tools, when applied in personalised and professionally oriented tasks, would increase learners' motivation, engagement, and communicative competence compared to traditional instruction methods.



The participants of the study were cadets of the Faculty of Marine Engineering at Kherson State Maritime Academy (KSMA, Ukraine) and its Maritime Professional College. In total, 153 cadets took part in the research. They were divided into two groups based on the principle of maintaining similar initial levels of English proficiency (assessed by pre-test results) and ensuring balance in age and study background. The experimental group consisted of 76 cadets, while the control group included 77 cadets. Such a distribution enabled a reliable comparison between groups exposed to AI-powered tools and those taught using conventional methods.

Alongside the cadets, four English language instructors participated in the study. Two of them worked with the experimental group, applying AI-driven applications (chatbots, adaptive testing, and virtual simulations), while the other two continued teaching the control group using standard approaches without AI support.

Before the start of the experiment, informed consent to participate was obtained from all cadets as well as from the instructors involved. Participants were assured of the voluntary nature of their involvement, confidentiality of the results, and the possibility to withdraw from the study at any stage without negative consequences. This ensured compliance with ethical standards of pedagogical research and created a safe environment for testing innovative teaching methods.

### **3.2 Research Instruments**

At the initial and final stages of the experiment, questionnaires were conducted to identify the dynamics of cadets' motivation and their attitude toward learning Maritime English with AI integration. The surveys were administered through the Moodle platform, which enabled not only convenient access for participants but also automatic data analysis. The system generated graphical visualisations of the results, which facilitated a clear comparison of pre- and post-experimental indicators (Singh et al., 2025).

In addition to the questionnaires, small interviews were carried out. At the beginning of each lesson, cadets were asked brief questions to determine their expectations, and at the end of the session, they shared reflections regarding the use of AI in the learning process. This approach provided valuable qualitative data on learners' perceptions, engagement, and challenges, complementing the quantitative results of the surveys.

As part of the experiment, the platform <https://academy.dataisland.com.ua/chat> was chosen as an external resource that supports ChatGPT-based interaction. This tool provided cadets with opportunities



for authentic language practice, interactive dialogues, and personalised feedback outside the classroom environment (Zhao, 2025).

Apart from these instruments, several supporting tools were employed to ensure the effectiveness of the experiment:

- Learning Management System (LMS Moodle) – used to host tasks, quizzes, and track student performance.
- Automated testing modules – applied for formative assessment and immediate feedback.
- Collaborative tools (e.g., Google Docs/Forms) – for peer-review activities and group projects (Qin & Zhang, 2025).
- Digital portfolios – to accumulate evidence of learning progress and achievements over the course of the experiment.

### ***3.3 Data Collection and Analysis***

After the collection of empirical data during the experimental study, systematic processing and analysis were carried out to verify the validity of the results and to identify the dynamics of change between the experimental and control groups. The main purpose of this stage was to ensure the objectivity of interpretation, as well as to combine quantitative and qualitative approaches to obtain a complete picture of the effectiveness of the applied teaching methods.

The primary tool of data processing was statistical analysis. Quantitative indicators from pre-tests and post-tests, as well as from questionnaires, were calculated and compared (Cukurova, 2025). Average scores, percentage changes, and growth rates of each competence component were determined. This allowed the identification of significant improvements in the experimental group compared to the control group.

Results were compared between groups (E and C) and within the same group at different stages (before and after the experiment). This method made it possible to assess the relative progress and to verify the influence of AI-powered tools on Maritime English learning outcomes (Tlili et al., 2025).

The pre-test and post-test results were analysed in dynamics. The emphasis was placed on changes in cognitive, operational, reflective, and communicative components, which made it possible to evaluate the developmental trajectory of students' competencies. The Moodle platform automatically processed questionnaire data and generated graphical visualisations. Diagrams and charts were used to present the results clearly, which facilitated their interpretation and highlighted key tendencies.



Qualitative analysis of open-ended questionnaire responses and interviews was performed. This method helped to capture cadets' attitudes towards AI integration, their reflections, and perceived challenges (Bearman et al., 2022). In cases where it was necessary, correlation analysis was used to establish relationships between motivation levels and test results, which demonstrated whether higher motivation directly influenced better learning performance.

#### **4. Results and Discussion**

During the semester, cadets in the Marine Engineering speciality mastered a number of modules in Maritime English, which were aimed at developing both professional terminology and practical communication skills. Key topics include studying engine room equipment and its maintenance, familiarising themselves with instructions on emergency and rescue procedures in accordance with the requirements of SOLAS, MARPOL, and STCW, developing communication strategies during watchkeeping, as well as working with technical documentation and drafting reports in English (Yurzhenko et al., 2024).

The integration of artificial intelligence into the learning process allowed the use of ChatGPT to simulate dialogues in professional scenarios. For example, a cadet could practice communicating with the chief engineer in the event of a fuel pump malfunction or simulate a dialogue during an emergency in the engine room. Such practice provided the opportunity to practice realistic communication situations online, in a safe learning environment (Diahyleva et al., 2025).

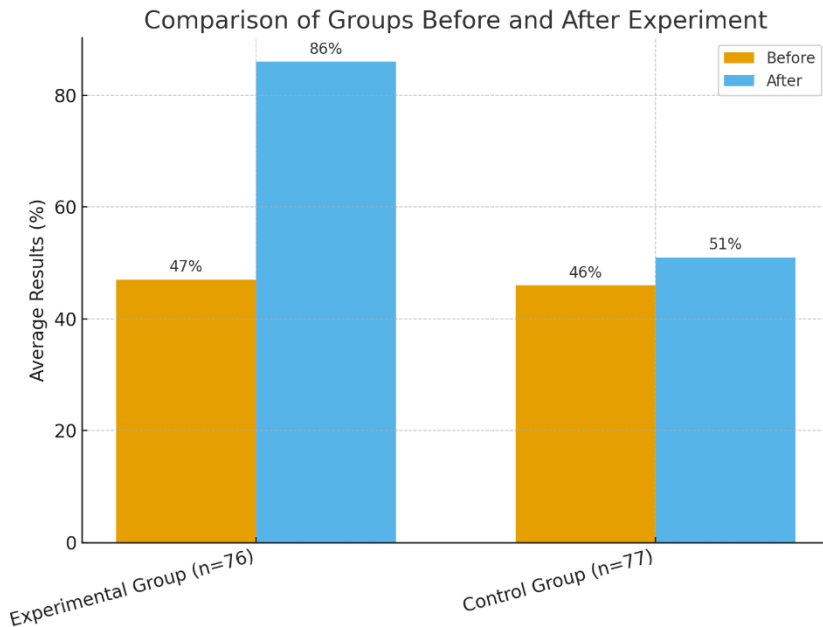
In addition to dialogues, ChatGPT was effective in creating case scenarios. Typical examples include cases of oil spill response (SOPEP), auxiliary generator failure, or ballast system failure. The chat offered several options for solving the problem, but its answers were not always completely correct. That is why an important part of the teacher's work was to analyse the AI's answers, make comments, and make corrections. This approach not only contributed to the development of critical thinking in cadets but also formed the ability to check the reliability of the information received.

An additional advantage of using ChatGPT was the formation of dictionaries of technical terms, which, after processing, could be transferred to the glossary in the Moodle system. In addition to translation and definitions, the chat provided examples of the use of terms in a professional context, which made their assimilation more practical. The voice mode function allowed the cadets to practice both speaking and listening, creating conditions for a more natural assimilation of language structures (Samala et al., 2025).



The chat's potential for creating game exercises is also important. It generated quizzes on maritime terminology, role-playing scenarios, and mini-tests on reaction speed, which significantly enlivened the learning process and made it more motivating. Teachers were able to adapt these exercises to specific learning goals, using them in classes as a gamification tool.

The results of the experiment showed (Fig.1) that it was the experimental group, where artificial intelligence tools were actively used, that achieved significantly greater progress. If the average level of preparation before the start of the study was 48% in the experimental group and 47% in the control group, then after the end of the experiment, the indicators increased to 88% and 50%, respectively. This confirmed that the use of ChatGPT and other AI applications in learning Maritime English significantly increases both the professional communicative competence and motivation of future marine engineers to study.



**Figure 1.** The results of the experiment

Source: MAC KSMA, Ukraine



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This graph clearly demonstrates the significant difference between the groups and confirms the effectiveness of using AI tools for teaching Maritime English.

## **5. Conclusion and Recommendations**

The conducted experimental study confirmed the significant potential of artificial intelligence tools in the teaching of Maritime English to future marine engineers. The integration of AI-powered applications into the learning process increased student motivation, facilitated more effective development of speaking skills, and improved the ability to apply professional terminology in authentic contexts. The experimental group showed much higher progress compared to the control group, both in terms of language proficiency and soft skills development, which demonstrates the effectiveness of AI-supported personalised learning.

At the same time, the research also revealed certain limitations. AI systems do not always provide fully accurate or contextually appropriate answers, especially when it comes to highly specific technical content. This makes the teacher's role in verifying, correcting, and commenting on AI-generated responses indispensable. Another drawback is the risk of overreliance on automated tools, which may reduce critical thinking if students accept AI answers without analysis. Furthermore, the integration of AI technologies requires sufficient digital literacy from both students and instructors, as well as a stable technical infrastructure.

Thus, artificial intelligence in Maritime English learning should be viewed as a supportive and motivational tool rather than a complete substitute for traditional pedagogy. It enriches the educational process with interactivity, personalisation, and authentic professional scenarios, but its effective use is possible only when combined with teacher guidance, reflective analysis, and careful adaptation to the specific needs of maritime education.

Future research should be directed at studying the long-term effects of AI integration into professional language training, the development of reliable AI-assisted assessment methods, and the creation of specialised applications adapted to the unique requirements of Maritime English.



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## Acknowledgements

This research did not receive any specific funding from public, commercial, or not-for-profit funding agencies.

## Authors' Biodata

Olena Diahyleva is the First Vice-Rector of Kherson State Maritime Academy (Ukraine), PhD in Pedagogy, and Associate Professor. She graduated from Kherson State Pedagogical University in 2002 with a Specialist's degree in Primary Education, English Language, and Literature. In 2013, she obtained a Bachelor's degree in Navigation from Kherson State Maritime Academy. From 2018 to 2025, she served as Vice-Rector for Educational and Methodological Work and as an Associate Professor in the English Language Department for Maritime Officers. Since 2025, she has held the position of First Vice-Rector of Kherson State Maritime Academy and Associate Professor in the English Language Department



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### **Author's Contributions**

*Olena Diahyleva* contributed to the conceptualization of the study and conducted the data analysis. *Olena Kononova* designed the experiment, developed the theoretical framework, and oversaw the research process. *Alona Yurzhenko* provided the necessary resources and contributed to editing the manuscript.

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### **Declaration of conflicting interests**

The authors declared no conflicts of interest with respect to the research, authorship, and/or publication of the article.



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### **Ethical approval**

This research did not require any ethical approval.

### **Informed consent**

This article does not contain any studies with human participants performed by any of the authors.

