AI Adoption in Maritime English through the Technology Acceptance Model: Evidence from Indonesia

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Abstract. The increasing role of artificial intelligence (AI) in language learning presents new opportunities and challenges for maritime professionals, particularly for the maritime navigational officers. Proficiency in Maritime English is emphasized for safe and effective operations, yet many trainees and students face difficulties in acquiring and using the language in professional contexts. This study investigates their perceptions, current use, and potential adoption of AI tools in learning English. Through a structured survey, data is collected on their familiarity with AI-assisted learning, preferred AI features, and perceived benefits and challenges. The findings provide insights into how AI can be effectively integrated into Maritime English classroom to enhance pronunciation, vocabulary acquisition, and real-time communication skills. Additionally, the study identifies barriers to AI adoption and proposes strategies for optimizing its implementation in maritime education. By understanding the perspectives of the trainees and maritime academy students, this research aims to contribute to the development of more effective, technology-driven language training solutions for future maritime professionals.

Keywords: Artificial Intelligence, Educational Technology, Indonesia, Maritime English, Student Perceptions, Teacher Perspectives, Technology Acceptance Model

1 Introduction

In the rapidly evolving digital era, the maritime industry faces increasing pressure to enhance seafarers' English communication skills, an essential competency that directly influences safety, operational efficiency, and international collaboration. As the maritime sector continues to operate within a globalized framework, Maritime English serves as the lingua franca, bridging communication gaps among multinational crews and stakeholders. However, traditional methods of language instruction often fall short in addressing the dynamic and practical needs of maritime communication. This creates a growing demand for more adaptive, contextual, and technology-enhanced approaches to language learning.

The integration of Artificial Intelligence (AI) into Maritime English education presents a promising solution. With technologies such as Large Language Models (LLMs), speech recognition, and adaptive learning systems, AI offers transformative

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tools to improve how seafarers acquire and apply language skills. These technologies can simulate realistic dialogue environments, reinforce vocabulary usage, enhance speaking and writing proficiency, and foster better listening and comprehension abilities, thereby making learning more engaging, personalized, and relevant to real-world maritime scenarios.

Despite the potential of AI-driven solutions, there remains a limited understanding of how maritime students perceive, utilize, and are prepared to adopt such technologies. While global trends indicate increasing interest in AI for language education, the specific context of Maritime English, particularly within Indonesian maritime institutions, has not been sufficiently explored. It is essential to assess students' readiness and attitudes toward AI adoption in order to develop effective, inclusive, and future-oriented educational strategies.

To better understand the adoption of AI in educational settings, the Technology Acceptance Model (TAM), proposed by [4]), provides a valuable theoretical lens. TAM posits that users' behavioural intentions to adopt a technology are shaped primarily by two factors: perceived usefulness (PU) and perceived ease of use (PEoU). These are further influenced by external variables such as user experience, infrastructure, training, and institutional support.

Recent studies support the growing relevance of AI in maritime language instruction. For instance, [7] found that students' positive perceptions of technology were closely linked to increased levels of engagement and adoption, while [6] emphasized how interactive AI tools could enhance communication competencies in specialized contexts like the maritime sector. [1] highlighted the pedagogical value of AI-driven approaches, noting how digital tools, including chatbots, virtual tutors, and simulation-based platforms, could cater to diverse learning needs, improve learner participation, and support better linguistic outcomes through methodologies like Integrated Learning Methodology (ILM).

In addition, [10] reported that 76% of English language educators had already adopted AI-powered tools such as virtual assistants and dialogue simulations to support language instruction. Complementary to this, [9] demonstrated how AI-enabled chatbots could make learning more accessible, targeted, and effective, particularly for learners needing practical Maritime English skills. These findings collectively affirm that AI holds significant potential not only to improve the quality of Maritime English education, but also to reduce the workload of instructors and streamline language assessment processes.

[2] further emphasized that perceived knowledge, motivation, and engagement significantly influence learners' attitudes toward AI. His study found that these factors explain a considerable portion of the variance in students' intention to adopt AI tools for language learning, offering valuable insight into the conditions needed to foster acceptance. Nevertheless, despite these promising developments, barriers to widespread AI adoption still exist. Challenges such as limited digital infrastructure, lack of user trust, and insufficient training continue to hinder effective implementation [3].

This study, therefore, examines how students engage with AI-based learning tools and seeks to provide valuable insights into their attitudes, current practices, and the underlying factors that influence the adoption of AI in Maritime English education. It

explores not only the promise AI holds in enhancing language learning, but also the nuanced challenges it presents.

2 Method

This study adopts a qualitative approach to explore how Artificial Intelligence (AI) is being adopted in Maritime English learning, using the Technology Acceptance Model (TAM) as a conceptual framework. The approach centred on the lived experiences of maritime students and instructors in engaging with AI-based tools in Maritime English learning. It aims to capture their insights into the perceived usefulness, ease of use, and challenges surrounding AI adoption.

2.1 Participants

This study engaged a diverse group of participants from multiple maritime institutions. A total of 268 respondents, representing different academic levels and backgrounds, completed a structured questionnaire aimed at exploring their perceptions and experiences with AI in Maritime English learning. To gain deeper insights, ten students were purposively selected for follow-up interviews. Complementing the student perspective, three experienced Maritime English lecturers from three different institutions were also interviewed to provide instructional viewpoints and discuss pedagogical and institutional challenges related to AI integration.

2.2 Data Collection Procedure

The process was conducted in two main stages: an online questionnaire and semi-structured interviews. Both instruments were developed based on the Technology Acceptance Model (TAM) framework, which comprises five core constructs: Perceived Usefulness, Perceived Ease of Use, Attitude Toward Use, Behavioural Intention to Use, and Actual System Use. This framework served as the conceptual basis for exploring the participants' acceptance, perceptions, and behavioural intentions regarding the use of AI tools in Maritime English learning.

The first stage involved a structured questionnaire that was distributed online via Google Form to students and lecturers within the maritime education institutions. Participants were given a one-month period to complete the survey, resulting in 268 valid responses. The questionnaire consisted of two parts. The first part included a series of statements aligned with TAM dimensions, assessed using a Likert-type scale ranging from "Strongly Agree" to "Strongly Disagree." Example items included: I am familiar with AI-based tools for language learning; AI can effectively support English learning for professionals in the maritime industry; and AI can help improve communication skills relevant to maritime occupations. The second part of the questionnaire consisted of open-ended questions designed to gather qualitative input. Participants were invited to freely express their personal experiences, expectations, and concerns regarding AI in English language learning. Sample questions included: How do you use AI tools in

your English language learning? and What concerns do you have about using AI in English language learning?

The second stage of data collection involved semi-structured interviews conducted online via Zoom video conferencing with 13 participants (10 students and 3 lecturers) who had previously completed the questionnaire. The interview guide was also structured according to the TAM framework, ensuring consistency with the questionnaire. The conversations explored several key areas, including: (i) students' and lecturers' perceptions of AI in language learning; (ii) the benefits they experienced when using AI tools; (iii) the challenges or barriers they encountered in adopting such technologies; and (iv) their recommendations for improving AI acceptance and effectiveness in maritime language education.

2.3 Data Analysis

All data collected from the questionnaires and interviews were analysed using descriptive statistics and thematic analysis. The quantitative data from the questionnaire responses were first tabulated and analysed using descriptive statistical methods to summarize trends, frequencies, and distribution patterns across the five TAM-based dimensions: Perceived Usefulness, Perceived Ease of Use, Attitude Toward Use, Behavioural Intention to Use, and Actual System Use. This provided a general overview of participants' perceptions and acceptance levels regarding AI in Maritime English learning.

In parallel, the qualitative data from the semi-structured interviews were analysed using thematic analysis. The process began with data classification based on predetermined themes derived from the Technology Acceptance Model (TAM) framework. Responses that did not align with any of the five core constructs were excluded through a data reduction process. Relevant responses were then organized and tabulated to assist in identifying meaningful patterns. Following this, the data were coded to highlight significant units of meaning, which were subsequently grouped into broader categories. These categories were examined to extract overarching themes that could address the research questions and provide a deeper understanding of how students and lecturers engage with AI tools in their language learning practices.

To ensure the credibility of the findings, triangulation was employed by cross-verifying insights from both the questionnaire and interview data. Additionally, member checking was conducted by inviting selected participants to review the interpretation of their responses, ensuring the accuracy of the thematic findings.

3 Results

In today's evolving maritime education landscape, Artificial Intelligence (AI) is increasingly recognized as a valuable tool in supporting English language acquisition, particularly among professionals operating in international environments. To understand how AI is shaping learning in this field, a survey involving 268 maritime students and professionals was conducted, exploring their perceptions of AI, patterns of use, and the overall impact on their language development. The findings not only reveal positive attitudes but also point to concrete patterns of integration in daily learning routines.

Among the tools used, Google Translate emerged as the most frequently adopted, selected by 74.25% of respondents. ChatGPT followed closely with a usage rate of 64.93%, reflecting the growing appeal of generative AI for language interaction and feedback. Other tools such as Duolingo (35.45%), Grammarly (26.87%), Meta AI (24.63%), and speech-to-text applications (14.55%) also appeared in significant numbers, indicating a broad range of AI adoption depending on the learners' needs, ranging from instant translation and grammar support to structured practice and accessibility features.

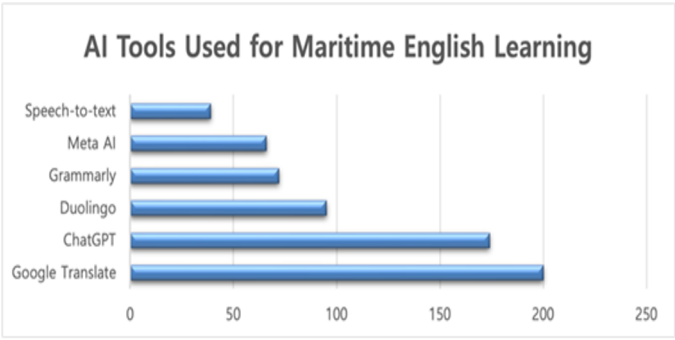

Fig. 1. AI Tools Used for Maritime English Learning

Figure 1 reflects the diverse ways in which learners approach English acquisition. Google Translate and ChatGPT serve different yet complementary roles: while the former assists in immediate translation, the latter provides deeper, interactive language support such as conversation practice, grammar feedback, or explanation of context. Duolingo appeals to learners who enjoy structured lessons and gamified learning, while Grammarly helps polish formal writing. Meta AI and speech-to-text tools also contribute, especially for listening, pronunciation, and accessibility.

The depth of AI integration becomes even clearer when we look at how learners apply these tools. A thematic analysis of respondents' open-ended answers revealed five dominant patterns. The most common use of AI among maritime learners is translation. Many respondents rely on tools like Google Translate to quickly understand unfamiliar words or sentences, particularly during reading or study. The second key pattern is grammar correction, with learners using platforms such as Grammarly or ChatGPT to polish their writing, an essential skill for maritime professionals who must communicate clearly. Third, AI supports vocabulary development by helping learners find synonyms, understand word usage, and retain new terms, moving them closer to fluency. Fourth, tools that offer pronunciation feedback or conversational simulations are used for speaking and listening practice, preparing learners for real-life communication at sea. Lastly, AI is seen as a valuable resource for interactive learning and test prep, with apps like Duolingo and ChatGPT simulating TOEFL or IELTS questions and providing custom quizzes to boost academic performance.

To further assess AI's contribution, learners were asked which language skills had improved the most due to AI assistance. Vocabulary topped the list, with 59.3% of respondents selecting it as the most noticeably enhanced area. This was followed by speaking (57.5%) and pronunciation (56.3%)—two skill sets crucial for verbal clarity in multinational crews. Grammar correction came next at 54.9%, followed by listening comprehension (49.3%), reading (46.6%), and writing (39.2%).

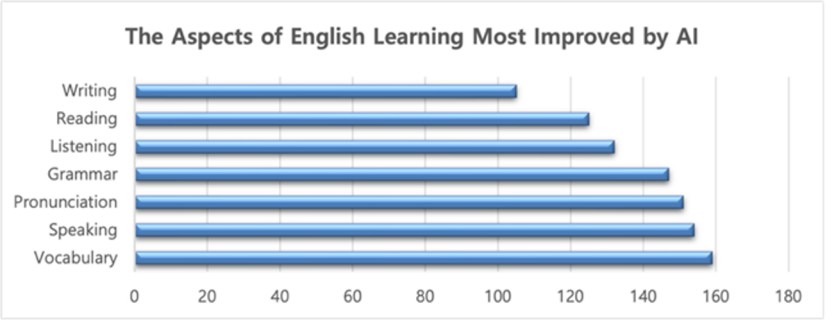

Fig. 2. The Aspect of English Learning Most Improved by AI

Figure 2 indicates that AI tools are particularly effective in strengthening productive skills, especially speaking and vocabulary, which are often the most challenging for second-language learners. These are the areas where learners typically lack confidence, and where AI offers immediate support without judgment. It also shows that even receptive skills like listening and reading benefit from AI features such as voice playback, podcasts, and real-time question generation. From these responses, it becomes clear that AI's impact on learning is not limited to technical or isolated functions. It enhances the learner's broader communicative ability, helping them feel more equipped to understand, speak, and write in English, particularly in high-responsibility maritime contexts.

3.1 Perceived Ease of Use

Perceived Ease of Use refers to the extent to which users believe that engaging with a system requires minimal effort. In this study, both students and instructors overwhelmingly perceived AI tools, particularly ChatGPT and Google Translate, as intuitive, efficient, and accessible. Many described their interactions with these tools as straightforward, fast, and user-friendly, even without prior specialized training. These perceptions are further supported by usage frequency data, which show that 26% of respondents use AI tools daily and 23% use them weekly. Such consistent usage patterns indicate that learners face few technological barriers, confirming that ease of use plays a crucial role in promoting continued adoption of AI in Maritime English learning, especially when digital platforms provide seamless and immediate support.

Excerpt 1: *"Lebih mudah dan lebih cepat."*

(Translation: "It's easier and faster.")

Excerpt 1 encapsulates the general sentiment of many respondents, who emphasized that AI platforms, particularly ChatGPT and Google Translate, offered a streamlined learning experience. The interface design, prompt responsiveness, and simplified interaction process were often cited as elements that contributed to the effortless nature of these tools. This ease of use plays a vital role in encouraging students to integrate AI into their daily study routines without requiring external assistance or formal training.

Excerpt 2: *"Dia bisa memberikan informasi secara instan dan secara ringkas."*
(Translation: "It can provide information instantly and concisely.")

Excerpt 2 reflects learners' appreciation for the immediacy and clarity offered by AI applications. In educational settings where time constraints and cognitive load are high, such efficiency is crucial. The ability to obtain quick, clear responses supports real-time learning, particularly when tackling complex language structures or maritime-specific terminology. This immediacy not only reduces frustration but also enhances user satisfaction, further reinforcing the platform's perceived simplicity.

Excerpt 3: *"Saya gunakan Blackbox AI untuk meng-upload gambar yang ingin diketahui."*
(Translation: "I used Blackbox AI to upload an image I wanted to understand.")

The mention of multimodal interaction such as visual content uploads demonstrates how learners benefit from diverse entry points into the learning process. The AI's ability to process both text and image-based queries reduces the friction often experienced in traditional methods, particularly for visual learners or for understanding technical schematics. By catering to different learning preferences, these tools become more approachable and inclusive.

3.2 Perceived Usefulness

Perceived Usefulness is the extent to which an individual believes that using a specific system enhances their academic or professional performance. In the context of this research, AI's perceived utility was remarkably high among respondents. Participants articulated how AI directly supported key areas of English language acquisition: vocabulary development, grammar correction, reading comprehension, writing enhancement, and pronunciation practice. Quantitative data revealed that participants primarily used AI for vocabulary acquisition (59.3%), grammar correction (54.9%), speaking practice (57.5%), and pronunciation training (56.3%). The high frequency of these activities underscores AI's utility in supporting both foundational and applied language skills. Students noted that these tools not only clarified unfamiliar words but also helped them structure sentences more accurately and gain confidence in oral communication.

> **Excerpt 4:** *"Saya biasanya pakai AI buat ngecek grammar dan struktur kalimat, apalagi kalau lagi nulis tugas dalam Bahasa Inggris."*
> (Translation: "I usually utilize AI to check grammar and sentence structure, especially when writing English assignments.")

Excerpt 4 underlines how AI tools function as language editors and writing assistants. For students working on formal maritime documents or academic papers, AI fills a critical gap by providing grammar checks, sentence restructuring, and stylistic improvements. This assistance ensures that learners are not only producing correct language but are also engaging with academic conventions. Moreover, by learning from AI-generated corrections, students can gradually internalize these rules, improving their independent writing skills over time.

> **Excerpt 5:** *"Kalau ada kosa kata baru, saya langsung cari di AI buat tahu artinya dan gimana penggunaannya."*
> (Translation: "If I find new vocabulary, I immediately look it up in AI to know the meaning and its usage in making sentences.")

Here, AI is utilized as a personalized vocabulary trainer. Rather than passively memorizing word lists, learners engage in contextual understanding, which deepens their retention and application of new vocabulary. In a field like Maritime English, where precision is essential, this kind of active vocabulary building is invaluable. The quick turnaround from encountering an unfamiliar term to understanding and applying it enriches the learning experience significantly.

> **Excerpt 6:** *"AI itu bantu banget, kadang saya minta dia jelasin arti paragraf atau bantu nyusun kalimat biar lebih jelas."*
> (Translation: "AI really helps; sometimes I ask it to explain a paragraph or help rephrase a sentence.")

This excerpt demonstrates how AI serves as a cognitive partner. Rather than offering mere answers, AI engages users in a form of guided discovery, supporting processes such as paraphrasing and comprehension. Students move beyond surface learning and begin to manipulate language in meaningful ways, building autonomy in academic communication.

3.3 Attitude Toward Use

Attitude Toward Use refers to users' overall affective evaluation of a technology, whether they perceive it positively or negatively. In this study, the general sentiment among participants towards AI tools was largely favourable. Survey results showed that 72% of respondents agreed that AI enhanced their communication skills in Maritime English. Moreover, 79% expressed interest in deeper integration of AI technologies

into their learning experience. These high percentages reveal a strong baseline of enthusiasm and openness to innovation. However, qualitative responses present a more nuanced picture, revealing both appreciation and apprehension.

> **Excerpt 7:** *"Bagi saya, kekurangan AI dalam membantu saya dalam tugas sehari-hari itu adalah satu: membuat saya malas."*
> (Translation: "For me, the downside of AI is that it makes me lazy.")

Excerpt 7 underscores a recurring theme: the risk of overdependence on AI. While AI is perceived as helpful, some learners worry that its convenience could weaken their initiative and critical thinking. This ambivalence reflects a deeper cognitive tension between the desire for efficiency and the fear of skill atrophy. The statement suggests that while learners recognize AI's potential, they also call for moderation and self-discipline in its use.

> **Excerpt 8:** *"Jadi lebih ketergantungan gitu ya sama alat AI."*
> (Translation: "It makes me overly dependent on AI.")

Echoing the previous concern, Excerpt 8 reinforces the perception that AI, while supportive, might disrupt learners' intrinsic motivation. Students who rely excessively on AI for translation, structure, and vocabulary risk becoming passive consumers of language rather than active constructors of knowledge. This perception reveals that attitude toward use is influenced not just by satisfaction but also by ethical and pedagogical concerns.

> **Excerpt 9:** *"Iya, karena kan kita jadi apa-apa instan, terus nggak ada interaksi sama orang."*
> (Translation: "Yes, because everything becomes instant, and there's no interaction with others.")

Excerpt 9 adds a social dimension to the critique. Language is inherently interactive, and this participant's response indicates that the use of AI could reduce human communication, especially with peers or instructors. The fear of isolation reflects a broader anxiety about digital learning replacing interpersonal experiences. Such concerns are particularly relevant in the maritime sector, where teamwork and communication are critical.

In sum, the overall attitude toward AI use among learners is positive but critically reflective. Students appreciate the benefits of speed, accessibility, and productivity but are also mindful of the potential downsides. This duality indicates a mature user base that is not blindly adopting technology but is considering its pedagogical implications. Therefore, attitude toward use is shaped not only by functionality but also by a desire for balance between technology and traditional interaction.

3.4 Behavioural Intention to Use

Behavioural Intention to Use reflects an individual's readiness to continue using a particular technology. In this study, intention to use AI tools in Maritime English learning was strongly evident, supported by both quantitative data and qualitative insights. As mentioned earlier, 79% of survey respondents indicated a willingness to explore further AI integration in their academic routines. This intention is not merely theoretical, but it is grounded in consistent usage patterns and supported by emotional investment in the learning process.

> **Excerpt 10:** *"Saya akan tetap menggunakan ChatGPT, terutama untuk menulis dan mengecek kosa kata."*
> (Translation: "I will continue using ChatGPT, especially for writing and checking vocabulary.")

Excerpt 10 reflects the participant's satisfaction with current outcomes and trust in AI tools to deliver consistent results. It also signals the integration of AI into daily habits and academic workflow, suggesting that behavioral intention is supported by both routine and perceived benefit. This habitual use becomes self-reinforcing, increasing user reliance and satisfaction over time. However, sustained usage is not without challenges. Many users voiced concerns about accessibility.

> **Excerpt 11:** *"Fitur terbaik dari platform ini hanya tersedia di versi pro… sayang sekali."*
> (Translation: "The best features of this platform are only available in the pro version… that's unfortunate.")

Excerpt 11 illustrates that while the desire to use AI is high, access to full functionality is limited by financial constraints. Students may begin with enthusiasm but encounter barriers that inhibit long-term engagement. The comment also reveals a gap between potential and practical utility, one that institutions must address through policy support and equitable access. Instructors also emphasized the importance of proper training.

> **Excerpt 12:** *"Dosennya dilatih dulu… nanti bisa ditularkan ke mahasiswa-mahasiswanya."*
> (Translation: "Lecturers should be trained first, then pass it on to the students.")

Excerpt 12 underscores that behavioural intention is not solely an individual decision; it is also shaped by institutional support and educator readiness. Without structured guidance and modelling, students may misuse or underutilize AI tools. Therefore, behavioural intention can be sustained only when users are supported by a holistic ecosystem involving policy, infrastructure, and training.

In conclusion, the high behavioural intention to use AI among maritime learners is promising but contingent. While the willingness is present, its realization depends on

addressing financial, institutional, and pedagogical barriers. Ensuring equitable access, promoting ethical use, and integrating AI training into curricula are essential steps to convert this intention into consistent, meaningful practice.

4 Discussion and Conclusion

Several prominent themes emerged from participants' feedback, highlighting key areas for improving the design and implementation of AI tools in Maritime English learning. These insights point to a shared need for more contextual, equitable, and ethically grounded AI applications that align with learners' educational realities.

One of the most significant insights from this study is the perceived lack of maritime-specific terminology within current AI platforms. Many participants expressed that general-purpose AI tools often fail to recognize or correctly interpret technical terms used in maritime communication, such as those found in radio operations, navigational instructions, and shipboard procedures. This limitation frequently results in inaccurate outputs, which can hinder learning and reduce the tools' practical relevance in a maritime context. The suggestion to integrate maritime domain-specific vocabulary into AI systems points to a need for more context-aware tools that mirror the learners' real-world environment. This finding aligns with [9], who highlighted the importance of domain-adapted AI chatbots in improving the accuracy and usability of language tools for professional purposes. Similarly, [1] emphasized the pedagogical value of simulation-based and content-specific AI applications for increasing learner engagement and contextual understanding in vocational education.

Participants also recommended the inclusion of interactive speaking and listening features, such as voice-based simulations and AI-driven virtual assistants that can respond in real time. These tools were seen as essential for fostering productive skills, especially in situations that require task-based, functional communication—like emergency drills or ship-to-shore exchanges. This echoes the findings of [6] of whom argued that interactivity plays a critical role in enhancing communication skills in ESP (English for Specific Purposes) environments. Moreover, [10] highlighted that a growing number of educators are adopting AI-powered dialogue simulations, reinforcing the idea that maritime learners could benefit from similarly immersive and responsive tools.

Another important theme that emerged was accessibility. Many participants noted that the most useful features of AI platforms, such as personalized feedback, advanced writing support, and adaptive learning systems, are often hidden behind paywalls. This creates disparities, as not all students can afford premium subscriptions. Respondents called for institutional efforts to provide subsidized or open-access tools to ensure all learners benefit equally from technological advancements. These concerns mirror global trends highlighted in the works of [3], who discussed how unequal digital access and infrastructure limitations can impede the equitable adoption of AI in education, especially in under-resourced or developing regions. While the current study focused on a maritime institution, the accessibility gap it reveals has wider implications for inclusive digital education.

Beyond technical and accessibility concerns, the study also uncovered ethical considerations raised by both students and lecturers. Participants shared worries about overreliance on AI, particularly the risk of using it to bypass independent effort or critical thinking. There were also concerns regarding plagiarism, data privacy, and the possible erosion of academic integrity. Many suggested that institutions should proactively offer guidance on how to use AI responsibly—teaching students not only how to operate the tools but also how to critically assess and ethically apply them. This echoes [2], who found that learners' intention to adopt AI is shaped not only by motivation and perceived usefulness but also by the presence of institutional support and ethical awareness. His study underlined the importance of teaching responsible digital literacy, especially when AI becomes an integral part of the academic environment.

Equally important, the study captured a generally positive attitude toward AI, provided it is relevant, accessible, and well-integrated into the learning experience. Many participants viewed AI as a powerful supplement to traditional learning methods, especially when used to improve efficiency and engagement. This perspective aligns with [7], who reported that students with favourable perceptions of technology were more likely to engage actively and benefit from AI-enhanced learning environments. The enthusiasm shown by maritime learners in this study suggests that, despite current limitations, there is strong potential for well-designed AI tools to improve English language outcomes when grounded in real-world needs.

This study highlights that Artificial Intelligence (AI) plays a transformative role in Maritime English learning by enhancing vocabulary acquisition, speaking, pronunciation, and grammar accuracy. Grounded in the Technology Acceptance Model, the findings demonstrate that maritime students and instructors in Indonesia perceive AI tools, such as ChatGPT, Google Translate, and Duolingo, as both easy to use and highly useful for practical language tasks. Thematic analysis reveals consistent usage patterns driven by translation needs, grammar correction, and speaking practice. While learners show strong behavioural intentions to adopt AI, the study also uncovers critical concerns such as overdependence, limited access to premium features, and a lack of maritime-specific terminology. Addressing these challenges through equitable access, contextual integration, and ethical AI training is essential to ensure meaningful, long-term adoption. Institutions and educators must work collaboratively to create AI-enhanced learning settings that are accessible, relevant, and future-ready.

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