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Digital Formative Assessment for Maritime Vocabulary Learning: Evidence from Google Forms

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ABSTRACT

English proficiency, particularly mastery of specialized vocabulary, is essential for nautical students preparing for professional communication in the maritime industry. However, students often experience difficulties acquiring technical maritime terminology due to limited exposure, insufficient opportunities for repeated practice, and predominantly summative assessment practices. This study investigated changes in nautical students' maritime vocabulary mastery following the implementation of Google Forms-based formative assessment. A quantitative pre-experimental design with a one-group pretest–posttest approach was employed, involving 25 students enrolled in a Maritime English course. Maritime vocabulary tests were administered before and after the intervention, which incorporated repeated vocabulary practice and immediate feedback. The data were analyzed using descriptive statistics, gain-score analysis, and a paired-samples *t*-test. The results showed that the mean vocabulary score increased from 63.36 in the pre-test to 86.48 in the post-test, representing a mean gain of 23.12 points and a normalized gain of 0.63. The paired-samples *t*-test revealed a statistically significant difference between the two assessments, $t(24) = -27.45$, $p < .001$. These findings indicate substantial improvement in students' performance on maritime vocabulary following the intervention. The study extends digital formative assessment into the underexplored context of specialized Maritime English vocabulary instruction by positioning Google Forms beyond a testing platform as a medium for repeated practice, immediate feedback, and continuous vocabulary reinforcement. The findings provide context-specific evidence for integrating formative assessment into technology-enhanced Maritime English instruction.

Keywords: Maritime English; Vocabulary Learning; Formative Assessment; Google Forms; Maritime Education

INTRODUCTION

English plays a crucial role in the maritime industry, serving as the primary language for international communication at sea (Satler & Jurkovič, 2024; Simanjuntak et al., 2025). Officers and crew members from different countries rely on English to ensure effective communication in navigation, safety procedures, and

operational coordination. Therefore, maritime students, particularly those enrolled in nautical officer training programs, are required to master specialized maritime vocabulary to support their future professional responsibilities. The ability to understand and use maritime terminology accurately is essential not only for academic success but also for ensuring safety and efficiency in maritime operations. The International Maritime Organization established the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention, which places a strong emphasis on these competencies.

Maritime English differs from general English because it involves highly specialized terminology related to navigation, ship operations, meteorology, safety equipment, and communication procedures (Bocanegra-Valle, 2024). According to Maung (2025), international maritime standards require officers to demonstrate sufficient English proficiency to communicate effectively in both routine and emergency situations. This requirement is also emphasized in the STCW Convention, which highlights the importance of English competence for maritime professionals to maintain safety and coordination during maritime operations (Yi et al., 2025).

Despite its importance, many maritime students struggle to acquire maritime vocabulary. In the local context, maritime students in Sorong still experience difficulties in applying English in real workplace situations. For example, students often find it challenging to understand standard marine communication phrases, respond to safety instructions, or interpret technical terms used during ship operations and training simulations. Abimanto and Mahendro (2025) reported that students experience significant difficulties in mastering Maritime English terminology, particularly vocabulary and pronunciation, often influenced by first-language interference. Similarly, Rohmah et al. (2025) found that limited vocabulary knowledge negatively affects students' academic performance and readiness for professional communication. Nurdin et al. (2023) also identified insufficient vocabulary mastery as a major factor affecting maritime cadets' English communication ability. These challenges are often caused by the complexity of technical terminology, limited exposure to authentic maritime communication contexts, and the continued reliance on traditional teaching approaches. To ensure long-term memory, effective vocabulary learning necessitates frequent exposure, contextual practice, and ongoing feedback (Saputro et al., 2025). However, limited classroom time often restricts opportunities for regular practice and feedback.

It is widely acknowledged that formative assessment is an effective way to support language acquisition. Because it enables teachers to offer more frequent practice, quick feedback, and flexible access to learning activities outside of the classroom, including digital tools like Google Forms in formative assessment, is crucial in this situation. It enables instructors to monitor students' progress continuously and provide immediate feedback that helps learners identify their strengths and weaknesses (Anders et al., 2022; Pastore et al., 2025). Unlike summative assessment, which focuses on final evaluation, formative assessment emphasizes ongoing learning improvement through continuous monitoring and feedback that

promotes students' active engagement (Carless & Winstone, 2023). With the advancement of educational technology, digital tools have increasingly been integrated into language learning and assessment practices. One widely accessible tool is Google Forms, a web-based platform that allows teachers to design quizzes, surveys, and formative assessments efficiently (Mirzapour Kouhdasht, 2023; Singaram, 2022). Its features, such as automated scoring, instant feedback, and flexible question formats, enable instructors to evaluate students' vocabulary knowledge more frequently while providing learners with opportunities to review and improve their understanding (Singaram, 2022; Saputro et al., 2022).

Previous studies have highlighted the benefits of technology-based formative assessment for improving student engagement and learning outcomes (Saputro, 2025). Digital formative assessment can encourage active participation, facilitate immediate feedback, and enable teachers to collect learning data efficiently (Dewi et al., 2025; Saputro et al., 2026). In language-learning contexts, online assessment has also been associated with vocabulary development through repeated practice and immediate corrective feedback (Zou et al., 2021; Moorhouse & Kohnke, 2023). However, these studies have predominantly addressed general language-learning environments rather than the acquisition of specialized vocabulary required for safety-sensitive professional communication. In Maritime English education, digital formative assessment specifically designed to reinforce technical vocabulary remains underexplored, while assessment practices continue to rely substantially on summative evaluation (Shi & Fan, 2021). This gap is particularly relevant to the Sorong context, where nautical students must develop the technical vocabulary needed to understand operational instructions, safety procedures, and professional maritime communication. Consequently, there is a need to examine an assessment approach that not only measures vocabulary achievement but also continuously supports its development.

Addressing this gap, the present study investigates Google Forms-based formative assessment as a continuous learning mechanism for specialized Maritime English vocabulary rather than merely as a digital testing platform. Its distinctive contribution lies in connecting the technological affordances of Google Forms, particularly repeated practice, automated scoring, and immediate feedback, with the specific vocabulary demands of nautical education. This focus distinguishes the present study from previous technology-enhanced assessment research conducted predominantly in general English learning contexts and provides context-specific evidence from maritime education in Sorong. Accordingly, this study investigates whether Google Forms-based formative assessment significantly improves nautical students' mastery of maritime vocabulary. The study is guided by the following research question: Does Google Forms-based formative assessment significantly improve nautical students' mastery of maritime vocabulary?

LITERATURE REVIEW

Maritime English and Vocabulary in Nautical Education

English has become the dominant language for communication in the global maritime industry (Vidhiasi & Syihabuddin, 2022). Effective communication among multinational crews, port authorities, and maritime organizations is essential for navigational safety and operational efficiency (Nursyam, 2025). International maritime standards, including the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention, emphasize adequate English proficiency for professional communication in both routine and emergency situations (Moore & Nordquist, 2023). Within maritime education, therefore, English competence is closely connected to students' preparation for professional responsibilities rather than solely to general academic achievement.

Maritime English differs from general English because it incorporates specialized terminology associated with navigation, ship operations, meteorology, safety procedures, and maritime communication. Vidhiasi and Syihabuddin (2022) emphasize that Maritime English addresses specific professional communication needs and requires accurate use of technical vocabulary. Vocabulary mastery is consequently fundamental to nautical students' ability to understand operational instructions, interpret technical information, and communicate accurately in professional maritime settings.

More broadly, vocabulary knowledge supports the development of listening, speaking, reading, and writing abilities (Zheng, 2025; Zou et al., 2021) and is associated with comprehension and overall language proficiency (Brooks et al., 2023; Lavigne et al., 2022). However, specialized maritime vocabulary presents an additional learning challenge because technical terms must often be understood and retrieved accurately within specific operational contexts. This characteristic suggests that maritime vocabulary instruction requires more than one-time presentation or memorization. Students need repeated opportunities to encounter, retrieve, apply, and correct their understanding of technical terms. Thus, the pedagogical challenge is not simply how maritime vocabulary is introduced but how instructional and assessment practices can create sustained cycles of vocabulary practice and reinforcement.

Formative Assessment in Language Learning

Formative assessment is an assessment approach in which evidence of students' learning is continuously collected and used to inform subsequent learning and instruction. Unlike summative assessment, which primarily evaluates achievement after instruction, formative assessment provides opportunities to identify learning gaps while learning is still taking place. Wiliam (2021) emphasizes that evidence generated through formative assessment can support instructional adjustment and provide learners with information about their current progress.

The value of formative assessment for vocabulary learning can be understood through the interaction of practice, feedback, and subsequent improvement. When students respond to vocabulary tasks, the assessment process requires them to retrieve previously encountered lexical knowledge. Their responses then provide evidence of what has been understood and what remains problematic. Corrective feedback can direct attention to errors, while subsequent opportunities to encounter and answer similar items allow students to revise and reinforce their knowledge. Therefore, formative assessment creates a recurring learning cycle:

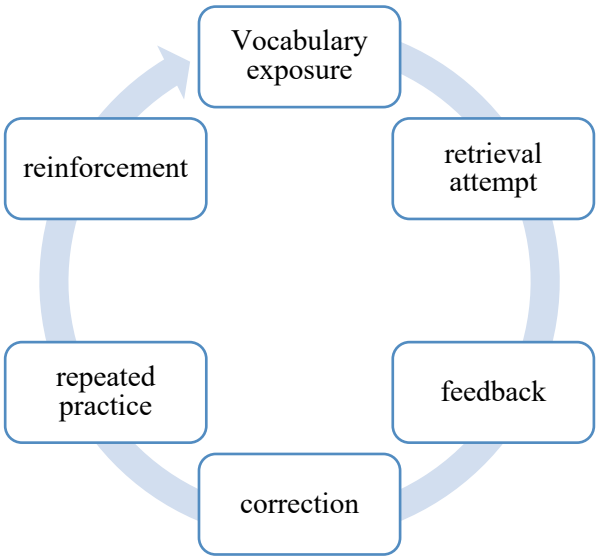


Figure 1. Learning Cycle

This process is particularly relevant to specialized vocabulary because technical terms require accurate recognition and retrieval. Studies have indicated that formative assessment can support vocabulary development by providing repeated exposure and opportunities for practice (Isnaini & Firdaus, 2025; Shobeiry & Namaziandost, 2026), while corrective feedback can strengthen students' understanding and retention of vocabulary items (Yan et al., 2021; Zhang & Huang, 2024). Accordingly, formative assessment may contribute to vocabulary learning not simply because students are tested frequently but because assessment activities generate repeated cycles of retrieval, feedback, and correction.

Formative assessment may also increase learners' awareness of their own learning progress. Through regular feedback, students can recognize which vocabulary items have been mastered and which require further attention. Elkington and Irons (2025) argue that formative assessment can promote student engagement by creating greater interaction between evidence of learning and subsequent learning actions. In Maritime English instruction, this function is particularly important because instructors need to identify difficulties with technical terminology before such gaps become barriers to more complex professional communication.

Digital Formative Assessment and the Use of Google Forms

Digital technology has expanded opportunities to implement formative assessment more frequently and efficiently (Bond et al., 2021). In language-learning contexts, digital platforms can provide flexible access to assessment activities and facilitate interaction beyond conventional classroom constraints (Hockly, 2024; Singaram, 2022). Among these platforms, Google Forms provides features such as automated scoring, immediate feedback, and multiple question formats that can be adapted for language assessment (Mirzapour, 2023; Singaram, 2022).

However, the educational value of Google Forms does not lie merely in digitizing conventional tests. Its relevance to formative vocabulary learning emerges when its technological features are deliberately connected to learning processes. Automated scoring enables learners to obtain information about their performance without substantial delay; immediate corrective feedback allows incorrect understanding to be identified and reviewed; repeated quiz opportunities increase encounters with target vocabulary; and flexible access extends vocabulary practice beyond limited classroom time. Together, these affordances can support a continuous cycle of retrieval, feedback, review, and reinforcement.

This connection is important because simply using a digital platform does not automatically make an assessment formative. Its formative value depends on whether the information generated by the assessment is used to support subsequent learning. When Google Forms is designed to provide immediate feedback and repeated opportunities to engage with target vocabulary, it can function as more than an efficient testing platform. Instead, it can become a learning environment in which assessment activities themselves contribute to vocabulary development. Previous research has demonstrated the potential of digital tools to facilitate feedback, learning-data collection, and student reflection (Bond et al., 2021; Moorhouse & Kohnke, 2023; Singaram, 2022). Nevertheless, these benefits have been examined more extensively in general educational and language-learning settings than in specialized Maritime English vocabulary instruction.

In maritime education, this distinction is particularly relevant because vocabulary knowledge is connected to professional and safety-sensitive communication. Existing research has recognized the potential contribution of digital tools to Maritime English learning (Masita & Fitri, 2020; Sofyan et al., 2025), yet limited evidence explains how digital formative assessment can systematically reinforce specialized maritime vocabulary through repeated retrieval and immediate feedback. The present study addresses this intersection by examining Google Forms not merely as a medium for administering vocabulary tests but as a formative mechanism that integrates continuous assessment, repeated vocabulary practice, and immediate corrective feedback within nautical education.

Based on the literature, this study's conceptual rationale proposes that Google Forms-based formative assessment may support maritime vocabulary development through an interconnected learning process. Regular digital formative quizzes

provide repeated opportunities for students to retrieve specialized maritime terminology. Automated scoring and immediate feedback subsequently make errors visible, while opportunities for review and repeated practice enable students to correct and reinforce their vocabulary knowledge. In this framework, Google Forms serves as the technological medium, formative assessment as the pedagogical process, and improved mastery of maritime vocabulary as the expected learning outcome. This theoretical integration provides the basis for examining whether systematic implementation of Google Forms-based formative assessment contributes to measurable improvement in nautical students' maritime vocabulary.

METHOD

Design and Sample

This study employed a quantitative pre-experimental, one-group pretest–posttest design to investigate changes in nautical students' mastery of maritime vocabulary following the implementation of Google Forms-based formative assessment. The design involved measuring the same participants before and after the intervention, allowing changes in vocabulary scores to be examined within a single group. The research design can be represented as follows:



Figure 2. Quantitative pre-experimental research design

Where O_1 represents the pre-test, X represents the implementation of Google Forms-based formative assessment, and O_2 represents the post-test. The pre-test was administered to establish students' initial mastery of the target maritime vocabulary. This was followed by a series of Google Forms-based formative assessment activities integrated into Maritime English instruction. After the intervention, the post-test was administered to determine changes in students' vocabulary achievement. Given the absence of a comparison group, the design was intended to provide preliminary evidence of vocabulary improvement associated with the intervention rather than establish definitive causal effects.

The participants were 25 students enrolled in the Nautical Study Program in Sorong during the 2025/2026 year. The participants were undertaking a Maritime English course as part of their professional preparation to become maritime officers. Purposive sampling was employed because the study required participants who were actively receiving Maritime English instruction and learning specialized vocabulary directly related to their professional field. The participants were therefore selected based on three inclusion criteria: (1) enrollment in the Nautical Study Program, (2) active participation in the Maritime English course during the period of data collection, and (3) exposure to the target maritime vocabulary

covered by the intervention. The sampling strategy was considered appropriate because the study focused on the effectiveness of a specific instructional intervention within an intact group of nautical students rather than attempting to represent the broader university student population. The relatively small sample size reflected the number of students in the intact class who participated in the intervention. Consequently, the findings are interpreted within this specific educational context, and generalization to broader populations should be approached cautiously.

Instruments and Procedure

The primary research instrument was a maritime vocabulary achievement test designed to measure students' knowledge of specialized terminology relevant to nautical education. The target vocabulary covered four major domains: navigation, ship parts and operations, safety procedures, and maritime communication. The test consisted of 40 items, including 10 multiple-choice items, ten fill-in-the-blank items, ten matching items, and ten re-arrange into the right letter items. The same target vocabulary domains and comparable assessment specifications were used for the pre-test and post-test to ensure that both assessments measured the same construct. The pre-test assessed students' vocabulary knowledge before the intervention, whereas the post-test measured their vocabulary achievement after completing the Google Forms-based formative assessment activities. To establish content validity, the vocabulary test was reviewed by two experts with expertise in Maritime English and English language assessment. The reviewers evaluated the relevance of the items to the target vocabulary domains, clarity of instructions, linguistic appropriateness, and alignment between the test content and the learning objectives. Revisions were made based on their recommendations before the instrument was administered.

The intervention consisted of Google Forms-based formative assessments integrated into Maritime English instruction over eight sessions. Each quiz focused on specialized vocabulary related to navigation, ship operations, safety procedures, and maritime communication. Google Forms provided automatic scoring and immediate feedback, allowing students to identify errors and review their understanding. The intervention followed a formative learning cycle of vocabulary instruction, digital assessment, immediate feedback, and vocabulary review, providing repeated opportunities to reinforce students' maritime vocabulary mastery. Data collection was conducted sequentially in three major phases. First, participants completed the pre-test to establish their initial level of mastery of maritime vocabulary. The test was administered under the same instructional conditions for all participants. Second, students participated in an 8-session Google Forms-based formative assessment intervention. Following the introduction and practice of each vocabulary topic, students completed a formative quiz through Google Forms. Immediate feedback was provided after submission, enabling students to identify errors and review the relevant vocabulary. Third, after all formative assessment sessions had been completed, students undertook the post-test. The resulting pre-test and post-test scores were subsequently compiled and

analyzed to determine the magnitude and statistical significance of changes in students' maritime vocabulary achievement.

Data Analysis

The data were analyzed using descriptive statistics, the Shapiro–Wilk normality test, and a paired-samples *t*-test at a significance level of .05. Gain scores were calculated to measure students' improvement, while Cohen's *d* was used to determine the effect size and practical significance of the intervention.

RESULT AND DISCUSSION

The results of this study were obtained from the analysis of students' pre-test and post-test scores after the implementation of Google Form-based formative assessment in Maritime English learning. The results indicate that students improved their mastery of maritime vocabulary after participating in the formative assessment activities.

Descriptive Statistics

Table 1 presents the descriptive statistics for students' maritime vocabulary scores before and after the implementation of Google Forms-based formative assessment. The mean score increased from 63.36 (*SD* = 8.74) in the pre-test to 86.48 (*SD* = 9.16) in the post-test, representing a mean improvement of 23.12 points.

Table 1. Mean Scores

Test	N	Mean	Standard Deviation
Pre-test	25	63.36	8.74
Post-test	25	86.48	9.16

The increase in the mean score indicates a marked improvement in students' maritime vocabulary performance following the intervention. However, inferential analysis was conducted to determine whether this observed difference was statistically significant.

Normality Test

The normality of the score distributions was examined using the Shapiro–Wilk test. As presented in Table 2, the significance values for both the pre-test and post-test were greater than .05.

Table 2. Normality Test

Variable	Statistic	Sig.
Pre-test	0.964	0.534
Post-test	0.952	0.287

The results indicated no statistically significant departure from normality for either the pre-test (p = .534) or post-test (p = .287). Therefore, the data were considered appropriate for parametric analysis using a paired-samples *t*-test.

Paired-Samples t-Test Analysis

A paired-samples *t*-test was conducted to examine whether students' maritime vocabulary scores differed significantly before and after the intervention. The results are presented in Table 3.

Table 3. Paired Sample t-test

Variable	Mean Difference	*t*	*df*	Sig. (2-tailed)
Pre-test – Post-test	−23.12	−27.45	24	< .001

The paired-samples *t*-test showed a statistically significant difference between the pre-test and post-test scores, $t(24) = -27.45$, $p < .001$. The negative mean difference, obtained by subtracting the post-test score from the pre-test score, indicates that students achieved higher scores after the intervention.

Gain Score and Effect Size

To complement the significance test, the magnitude of students' improvement should be examined through gain-score and effect-size analyses. The results are presented in Table 4.

Table 4. Gain Score and Effect Size of Students' Vocabulary Performance

Variable	Pre-test Mean	Post-test Mean	Mean Gain	Normalized Gain (*g*)	Interpretation
Maritime Vocabulary	63.36	86.48	23.12	0.63	Moderate

The mean score increased from 63.36 in the pre-test to 86.48 in the post-test, resulting in a raw mean gain of 23.12 points. The normalized gain (g = 0.63) indicates a moderate improvement in students' maritime vocabulary performance following the implementation of Google Forms-based formative assessment.

The findings indicate a marked improvement in students' performance on maritime vocabulary following the implementation of Google Forms-based formative assessment. The mean score increased from 63.36 (SD = 8.74) in the pre-test to 86.48 (SD = 9.16) in the post-test, representing a mean gain of 23.12 points. The paired-samples *t*-test confirmed that this difference was statistically significant, $t(24) = -27.45$, $p < .001$. These findings provide evidence that students achieved substantially higher vocabulary scores after participating in the intervention. However, given the one-group pre-experimental design, the improvement should

be interpreted as being associated with the implementation of Google Forms-based formative assessment rather than as definitive evidence of causality. Nevertheless, the observed pattern supports the view of Irons and Elkington (2021) that formative assessment can serve beyond achievement measurement by generating learning opportunities through continuous practice, monitoring, and feedback.

The observed improvement may be explained by the learning processes embedded in the formative assessment cycle. Unlike conventional assessments conducted primarily at the end of instruction, the Google Forms-based activities provided students with recurring opportunities to review previously introduced maritime vocabulary and receive immediate feedback on their responses. Immediate feedback may have helped students recognize incorrect understanding while the target vocabulary was still being learned, thereby creating opportunities for subsequent correction and reinforcement. This interpretation is consistent with previous studies that highlight the role of feedback in vocabulary learning and language development (Hossain et al., 2024; Zalisman, 2023). In addition, repeated encounters with maritime terminology through formative quizzes may have strengthened students' familiarity with and retrieval of the target vocabulary. Zou et al. (2021) similarly emphasized the importance of repeated engagement with lexical items for vocabulary development. The findings, therefore, suggest that the value of Google Forms may lie not simply in digitizing vocabulary tests but in facilitating a recurring sequence of retrieval, immediate feedback, review, and reinforcement.

This interpretation extends previous research on digital formative assessment in an important way. Earlier studies have largely demonstrated the benefits of digital assessment technologies in general educational or English language-learning environments (Bond et al., 2021; Hockly, 2024; Moorhouse & Kohnke, 2023). Similarly, studies examining Google Forms have primarily emphasized its accessibility, assessment efficiency, and automated feedback capabilities (Singaram, 2022). The present findings differ in their disciplinary focus by showing how these formative affordances can be applied to the acquisition of specialized maritime terminology. This distinction is significant because maritime vocabulary is not simply a subset of general English vocabulary; it is closely connected to professional functions involving navigation, ship operations, safety procedures, and emergency communication (Bocanegra-Valle, 2024). Thus, the present study extends existing evidence on digital formative assessment from general language learning to a specialized English-for-Specific-Purposes context in which accurate lexical knowledge has direct professional relevance.

The findings are also relevant to the relationship between Maritime English education and professional preparedness. Inadequate understanding of specialized terminology may make it difficult to interpret operational instructions and participate effectively in professional communication. The substantial improvement observed after the intervention, therefore, suggests the pedagogical potential of integrating vocabulary practice more systematically into assessment activities. Nevertheless, improved vocabulary test performance should not be

interpreted as direct evidence of improved workplace communication or maritime safety because these outcomes were not measured in the present study. Rather, vocabulary mastery represents a foundational competence that may support the development of broader professional communication abilities. This distinction is particularly important in the context of nautical education, where future research should examine whether vocabulary gains obtained through digital formative assessment can be transferred to authentic tasks such as responding to safety instructions, interpreting operational messages, and using Standard Marine Communication Phrases.

The novelty of the present study lies in the intersection of digital formative assessment, specialized maritime vocabulary, and nautical education, particularly within the underrepresented context of Sorong. While previous studies have examined digital assessment in general English learning and others have investigated the language difficulties experienced by maritime students, limited research has empirically linked the formative affordances of Google Forms with the systematic reinforcement of specialized maritime vocabulary. More specifically, this study conceptualizes Google Forms not merely as a platform for administering tests but as a technological medium for implementing a continuous formative cycle involving repeated vocabulary retrieval, automated scoring, immediate feedback, and subsequent reinforcement. In this respect, the study extends formative assessment into a specialized professional language-learning domain and provides context-specific evidence from maritime education in Eastern Indonesia. The contribution is therefore not the use of Google Forms itself, but its pedagogically structured application to an underexplored area of technical vocabulary development.

From a pedagogical perspective, these findings suggest that maritime instructors may incorporate short and regular digital formative assessments into vocabulary instruction rather than relying predominantly on end-of-course or summative testing. Such an approach can create additional opportunities for students to practice technical terminology and receive timely information about their performance without requiring assessment to be separated from the learning process. Compared with previous applications of Google Forms that have largely focused on general language learning or assessment efficiency (Singaram, 2022; Moorhouse & Kohnke, 2023), the present study highlights its potential for supporting vocabulary with specific operational and professional relevance. Maritime institutions may therefore consider digital formative assessment as a complementary instructional strategy for strengthening technical vocabulary development. However, its effectiveness is likely to depend not simply on the technology employed but on how assessment tasks, feedback, and opportunities for subsequent practice are pedagogically designed and integrated into Maritime English instruction.

The findings also establish several directions for further investigation. Because the present study employed a one-group pretest–posttest design with a relatively small sample from a single educational context, future research should use quasi-experimental or randomized designs with comparison groups and larger multi-

institutional samples to provide stronger evidence regarding the effects and generalizability of digital formative assessment. Longitudinal research is also needed to determine whether the observed vocabulary gains are retained over time and, more importantly, whether they transfer from vocabulary-test performance to authentic maritime communication. Future studies could therefore incorporate performance-based outcomes involving listening to operational instructions, using maritime terminology in simulated communication, and responding to routine and emergency scenarios. Further investigation of artificial intelligence-supported feedback, mobile learning, learning management systems, and gamified formative assessment may also clarify whether different technological affordances can strengthen the formative cycle identified in this study. Such research would move the field beyond examining whether digital assessment improves scores toward understanding how, under what conditions, and to what extent technology-supported formative assessment contributes to sustainable Maritime English competence and professional readiness.

CONCLUSION

This study extends formative assessment into the specialized context of Maritime English vocabulary instruction, an area that remains underexplored in technology-enhanced language-learning research. Its primary contribution lies in connecting specialized vocabulary acquisition, digital formative assessment, and maritime education. The findings indicate that students achieved substantially higher scores on maritime vocabulary following the implementation of Google Forms-based formative assessment. This suggests that digital assessment can support vocabulary learning when structured around repeated practice, immediate feedback, review, and reinforcement. Rather than positioning Google Forms merely as a testing platform, this study highlights its potential as a medium for implementing a continuous formative learning cycle. The evidence from maritime education in Sorong also provides a locally grounded contribution to the broader literature on technology-enhanced learning in specialized and professionally oriented English education.

The study further highlights the potential value of shifting from assessment practices focused primarily on measuring learning outcomes to approaches that actively support the learning process. Nevertheless, improved vocabulary performance should not be interpreted as direct evidence of enhanced workplace communication or maritime safety, as these outcomes were not measured. Future research should examine whether vocabulary gains are retained over time and transferred to authentic maritime communication tasks, including operational instructions, safety communication, and routine and emergency interactions. Studies involving control groups, larger multi-institutional samples, and performance-based measures are also needed to provide stronger causal and generalizable evidence. Further integration with artificial intelligence-supported feedback, mobile learning, and authentic maritime simulations may contribute to a more comprehensive approach to technology-enhanced Maritime English education.

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