Innovation in Maritime Environmental Education: Integration into English Curriculum in Vocational Maritime Institutes in Indonesia

Winarno
Research and Community Science Departement
Maritime Institute of Jakarta, Sekolah Tinggi Ilmu Pelayaran Jakarta
North Jakarta, Indonesia
andreziam21@gmail.com

Larsen Barasa
Research and Community Science Departement
Maritime Institute of Jakarta, Sekolah Tinggi Ilmu Pelayaran Jakarta
North Jakarta, Indonesia
andreziam21@gmail.com

Imam Fahcruddin
Research and Community Science Departement
Maritime Institute of Jakarta, Sekolah Tinggi Ilmu Pelayaran Jakarta
North Jakarta, Indonesia
andreziam21@gmail.com

Putu Asmita Berliana
Port and Shipping Management (KALK)
Maritime Institute of Jakarta, Sekolah Tinggi Ilmu Pelayaran Jakarta
North Jakarta, Indonesia
andreziam21@gmail.com

Andre Siam Nurrohman
Port and Shipping Management (KALK)
Maritime Institute of Jakarta, Sekolah Tinggi Ilmu Pelayaran Jakarta
North Jakarta, Indonesia
andreziam21@gmail.com

***Abstract*—This research explores the integration of maritime environmental education into the English curriculum of vocational maritime and transportation institutes in Indonesia. As environmental regulations and sustainability become increasingly crucial in global shipping operations, there is a growing need for maritime professionals to understand and communicate complex environmental issues. The study examines how environmental topics are incorporated into English language instruction and how this integration enhances student preparedness for operational and environmental challenges in the maritime industry. The research focuses on collaborations between educational institutions and the maritime industry/environmental organizations, analyzing the experiences and perspectives of maritime professionals, educators, and graduates. Using a qualitative approach and descriptive analysis, the study highlights the practical benefits of this educational model. The results demonstrate that integrating environmental education significantly improves graduates' readiness to meet the industry's environmental and operational demands. The study also emphasizes the importance of expanding experiential learning opportunities and strengthening collaborations with environmental organizations to further enhance vocational training. This research offers new insights into interdisciplinary education for the maritime industry, contributing to the development of sustainable shipping practices.**

***Keywords*—Maritime environmental education, vocational maritime institutes, English curriculum, interdisciplinary education, sustainable shipping**

INTRODUCTION

The maritime industry plays a critical role in global trade, facilitating the transportation of goods across vast distances and contributing significantly to the world economy. As the demand for efficient, sustainable, and environmentally conscious shipping operations grows, there is an increasing need for innovation in education and training within the sector. The success of port and shipping operations hinges not only on technical proficiency but also on environmental responsibility, as the industry faces growing pressure to comply with international environmental regulations and adopt greener practices. This

reality underscores the importance of integrating maritime environmental education into vocational training programs, particularly in regions with thriving maritime economies such as Indonesia (Ayhan, 2023).

In Indonesia, where shipping and port operations form the backbone of international trade, vocational education plays a pivotal role in shaping the next generation of maritime professionals. Traditionally, vocational training for maritime students has focused on technical skills related to navigation, ship operations, and port management. However, with the increased emphasis on environmental sustainability, there is a growing recognition that education in this sector must evolve. Specifically, maritime environmental education must be integrated into the curriculum to prepare students for the challenges they will face in managing environmentally responsible shipping and port operations (Purba, et al., 2024.

This research focuses on the integration of maritime environmental education into the English curriculum within vocational schools, specifically those dedicated to maritime and transportation education in Indonesia (Simanjuntak, et al., 2023). The unique intersection of language education and environmental awareness forms the basis for this study, as English remains the global language of the maritime industry. By embedding environmental topics within English for Specific Purposes (ESP), the study aims to enhance both linguistic proficiency and environmental competence among maritime students, equipping them with the skills necessary to navigate the complexities of global shipping operations. The research examines how this integration can improve operational efficiency at container terminals, while also fostering a culture of environmental responsibility.

A key aspect of this study is the collaboration between educational institutions and the maritime industry, particularly with environmental organizations (Diahyleva, et al., 2020). Such collaborations are vital for ensuring that the education provided is relevant to industry needs and aligned with global environmental standards. The integration of maritime environmental education into the English curriculum serves as a practical solution for bridging the gap between academic training and real-world operational demands. This research seeks to understand how these collaborations can be leveraged to enhance the quality of vocational education in maritime institutes, particularly in the areas of port and shipping management, logistics, and terminal operations.

The research is guided by the qualitative perspectives and experiences of three distinct groups: maritime professionals, educators, and graduates (Lau, et al., 2021). The insights of maritime experts, who work as entrepreneurs, officers, and managers in port and shipping industries, provide valuable perspectives on the operational realities of environmental management in the maritime sector. Their experience in managing port operations, ensuring compliance with environmental regulations, and navigating the commercial aspects of shipping offer critical insights into how environmental education can be practically applied within the curriculum. By engaging with these professionals, the research highlights the specific environmental challenges faced by the industry and the skills that are most in demand.

Educators, including trainers, teachers, and tutors in maritime science and vocational programs, also play a crucial role in shaping the curriculum (Vincx, et al., 2019). Their expertise in teaching seafarers and future maritime professionals offers insight into how environmental education can be effectively integrated into English language courses. The research explores the pedagogical approaches used by these educators to ensure that students not only develop language proficiency but also gain an understanding of key environmental concepts, such as pollution control, waste management, and sustainable shipping practices. This aspect of the study is particularly important as it demonstrates how interdisciplinary education, combining technical skills with environmental awareness, can produce graduates who are well-prepared to meet the evolving demands of the maritime industry.

The experiences of graduates who have entered the workforce in port and shipping offices provide another essential dimension to the research. These individuals offer a first-hand perspective on how well their education has prepared them for the environmental and operational challenges of the maritime industry. By examining their experiences, the study assesses the effectiveness of the current curriculum and identifies areas for improvement. The graduates' feedback is particularly valuable in understanding how environmental education, when integrated into the English curriculum, can enhance employability and professional competence in the maritime sector. Their insights also contribute to a deeper understanding of how educational institutions can better align their programs with the needs of the industry (Mian, et al., 2020).

One of the central objectives of this research is to explore how applied management studies in maritime industry and education can be enhanced through the integration of environmental education (Ardoin, et al., 2020). Applied management studies, which focus on the practical aspects of managing maritime operations, are essential for ensuring that port and shipping activities are both efficient and environmentally sustainable. The research argues that by embedding environmental education into the English curriculum, vocational students can develop a more comprehensive understanding of the operational, linguistic, and environmental challenges they will face in their careers. This interdisciplinary approach ensures that students are not only proficient in maritime English but also capable of managing environmental risks and complying with international regulations. The novelty of this research lies in its interdisciplinary approach to education, combining English for Specific Purposes (ESP) with maritime environmental education. This approach addresses the dual need for language proficiency and environmental competence in the maritime industry. While there has been considerable focus on technical training in maritime education, there is a significant gap in integrating environmental education into language curricula. This research seeks to fill that gap by proposing a model in which environmental topics are embedded within English courses, thus providing students with the linguistic and technical skills they need to succeed in a globalized and environmentally conscious maritime industry. By doing so, the research contributes to the ongoing discourse on sustainable maritime practices and the role of education in promoting environmental responsibility.

Another innovative aspect of this study is its focus on vocational education (Pambudi, et al., 2020). While much of the literature on maritime education has focused on higher education and professional training, this research emphasizes the

importance of vocational training in shaping the next generation of maritime professionals. Vocational schools in Indonesia play a critical role in preparing students for careers in the maritime industry, and this research argues that these institutions must take a leading role in promoting environmental sustainability. By integrating maritime environmental education into the English curriculum, vocational schools can produce graduates who are not only technically proficient but also capable of contributing to the industry's sustainability goals.

The urgency of this research is driven by several factors. First, the maritime industry is under increasing pressure to adopt sustainable practices in response to global environmental regulations and public concern about climate change (Hossain, et al., 2021). The International Maritime Organization (IMO) has set ambitious targets for reducing greenhouse gas emissions from ships, and ports around the world are being encouraged to adopt greener technologies and practices. As such, there is an urgent need for educational institutions to prepare students for these challenges by equipping them with the knowledge and skills necessary to manage environmentally responsible shipping and port operations.

Second, the maritime industry in Indonesia is at a critical juncture, with rapid growth in both domestic and international trade creating new opportunities and challenges. As one of the world's largest archipelagic nations, Indonesia's economy is heavily dependent on maritime transportation, and its ports are among the busiest in the region. This makes the need for skilled maritime professionals who can manage both the operational and environmental aspects of port and shipping operations all the more pressing. By integrating environmental education into vocational training programs, Indonesia can ensure that its maritime workforce is prepared to meet the demands of a rapidly changing industry.

Finally, there is an urgent need to address the gap between education and industry in the maritime sector. While educational institutions have made significant strides in improving technical training, there is still a disconnect between the skills taught in the classroom and the skills required in the workplace. This research argues that collaboration between educational institutions and the maritime industry, particularly in the area of environmental education, is essential for bridging this gap. By working together, educators and industry professionals can develop curricula that are both relevant and responsive to the needs of the industry, ensuring that graduates are well-prepared for the challenges they will face in their careers.

The field of applied maritime management studies encompasses a diverse range of disciplines, including port and shipping management, logistics, environmental sustainability, and vocational education (Jeevan, et al., 2022). As global maritime operations become more complex, and the demands for both efficiency and environmental responsibility increase, applied maritime management has gained prominence in ensuring the industry's adaptation to these challenges. This literature review critically examines the evolution of applied maritime management studies, with a focus on port operations, shipping logistics, and the integration of environmental education into vocational training. It explores the interdisciplinary nature of management in maritime contexts, where operational efficiency must align with environmental stewardship, especially in light of international regulations. In addition, it addresses the growing role of educational institutions in preparing future maritime professionals to meet these challenges, focusing on the integration of language proficiency and environmental competence within the curriculum.

Applied maritime management is grounded in the practicalities of operating within one of the most vital sectors of global trade (Omondi, 2019). Ports serve as critical nodes in international shipping networks, facilitating the movement of goods and people across oceans and seas. Consequently, the management of port operations has evolved into a specialized field within maritime studies, where efficiency, safety, and environmental sustainability must coexist. One of the key components of applied management in this sector is terminal operations, particularly in container terminals, where logistics and port efficiency are paramount. The smooth handling of cargo, the optimization of loading and unloading processes, and the management of port infrastructure are all integral to maintaining competitive advantages in global shipping.

However, with the increasing awareness of the environmental impacts of maritime operations, port management has shifted towards integrating sustainable practices into operational frameworks. Ports are not merely logistical hubs but also environmental risk zones, where pollution from ships, waste disposal, and energy consumption can have far-reaching ecological consequences. Applied maritime management now requires managers to adopt innovative approaches that balance operational efficiency with environmental compliance. This shift in focus has prompted the need for educational institutions to prepare maritime professionals with the knowledge and skills to navigate both the technical and environmental aspects of port and shipping management.

One of the primary areas where this need is evident is in the integration of environmental education into vocational training programs for maritime professionals. Traditionally, maritime education has centered around the technical competencies required for navigating ships, managing logistics, and operating ports. While these skills remain essential, the growing emphasis on sustainability and environmental responsibility has introduced new dimensions to maritime management. Environmental education, which includes topics such as pollution control, waste management, and energy efficiency, is now a critical component of applied management studies in the maritime industry. As global shipping regulations tighten and public scrutiny of environmental practices intensifies, professionals who are adept at managing the environmental impacts of maritime operations will be in high demand.

Vocational education plays a key role in addressing this demand by equipping students with both technical skills and environmental awareness. Vocational maritime programs, particularly in countries with strong maritime sectors like Indonesia, must evolve to meet the changing needs of the industry. Applied management studies within these programs should not only focus on operational proficiency but also on fostering a mindset of environmental stewardship. This requires a curriculum that integrates environmental education into core subjects such as logistics, port operations, and shipping management. Additionally, it demands an interdisciplinary approach where students are trained to understand the broader environmental implications of their decisions within maritime contexts.

The integration of English for Specific Purposes (ESP) into maritime education is another critical area within applied maritime management studies. English is the global lingua franca of the maritime industry, governing communication on ships, in ports, and in international trade negotiations. Proficiency in maritime English is essential for professionals to engage in global shipping operations, interpret international regulations, and ensure compliance with safety and environmental standards. However, traditional English language education in maritime institutes has often been isolated from the technical and operational realities of the industry. Applied management studies now argue for a more integrated approach, where language education is aligned with the specific needs of the maritime sector.

In particular, the integration of maritime environmental education into the English curriculum is emerging as a critical innovation in vocational training. This approach ensures that students are not only fluent in the technical language of port and shipping operations but also capable of understanding and communicating the environmental aspects of their work. Environmental regulations such as the International Maritime Organization's (IMO) conventions on pollution prevention require professionals to interpret complex legal and technical documents, which are often in English. By embedding environmental topics into ESP courses, vocational maritime programs can ensure that students are better prepared to meet the dual challenges of operational efficiency and environmental compliance.

Moreover, the integration of environmental education into the English curriculum aligns with the broader trends in applied maritime management towards interdisciplinary education. Maritime professionals are no longer required to specialize solely in technical or managerial skills; they must also be proficient in understanding the environmental impact of their operations. This requires an educational framework that blends technical training, language proficiency, and environmental awareness into a cohesive learning experience. Applied management studies thus emphasize the need for vocational institutes to collaborate with industry stakeholders, including environmental organizations, to ensure that their programs remain relevant and responsive to industry needs.

Collaboration between educational institutions and the maritime industry is a central theme in applied management studies, particularly when it comes to curriculum development (Oksavik, et al., 2021). The maritime industry is highly dynamic, with technological advancements, regulatory changes, and environmental concerns reshaping its landscape. As such, educational institutions must work closely with industry partners to design curricula that reflect current realities. This collaboration ensures that students receive training that is both relevant to the operational demands of the industry and aligned with its environmental objectives. Applied management studies emphasize the importance of these partnerships, noting that they are essential for bridging the gap between theory and practice.

In the context of this research, the collaboration between educational institutions and the maritime industry/environmental organizations is particularly relevant. By working together, these stakeholders can create a curriculum that integrates maritime environmental education into the core of vocational training, ensuring that graduates are prepared to address the environmental challenges facing the industry. This collaboration also allows for the sharing of expertise and resources, as industry professionals provide practical insights into the operational and environmental challenges they face. Applied management studies highlight the importance of this exchange, noting that it helps students develop a deeper understanding of the practical implications of their education.

The role of graduates in applied maritime management studies is also significant. Graduates who enter the workforce in port and shipping offices or maritime companies bring with them the skills and knowledge they have gained through their vocational training. Their experiences offer valuable insights into the effectiveness of the education they received and the areas where improvements are needed. Applied management studies emphasize the importance of feedback from graduates in shaping future curriculum development. By understanding how well-prepared graduates are to meet the environmental and operational challenges of the maritime industry, educational institutions can refine their programs to better align with industry needs.

In addition, the focus on applied management studies in maritime education reflects the growing need for professionals who can balance the operational demands of port and shipping management with the environmental responsibilities of the industry. As the maritime sector continues to evolve, the demand for managers who are capable of overseeing both the technical and environmental aspects of their operations will only increase. Applied management studies provide the foundation for this type of interdisciplinary education, ensuring that future maritime professionals are equipped to manage the complexities of modern port and shipping operations in a sustainable manner.

The literature on applied maritime management studies also highlights the urgency of addressing environmental sustainability in the maritime industry (Oloruntobi, et al., 2023). As global awareness of climate change and environmental degradation grows, the maritime industry faces increasing pressure to adopt greener practices. Ports, in particular, are being called upon to reduce their environmental impact by implementing more sustainable practices, such as reducing emissions, improving energy efficiency, and managing waste more effectively. Applied maritime management studies argue that these changes must be reflected in the education of future maritime professionals, particularly in vocational programs that focus on port and shipping management.

By integrating maritime environmental education into the English curriculum, vocational schools can play a critical role in promoting sustainability within the industry. Applied management studies suggest that this approach not only enhances the technical and linguistic skills of students but also fosters a mindset of environmental responsibility. As the industry moves towards more sustainable practices, professionals who are trained to understand and manage the environmental aspects of port and shipping operations will be in high demand. This highlights the importance of innovation in vocational education, where applied management studies can contribute to the development of more sustainable and efficient maritime operations.

Applied maritime management studies provide a comprehensive framework for understanding the evolving challenges of the maritime industry, particularly in the areas of port and shipping management, environmental sustainability,

and vocational education (Xiao, et al., 2024). By integrating environmental education into the English curriculum, this research addresses the need for interdisciplinary training that equips students with the skills to manage both the operational and environmental demands of the maritime industry. Collaboration between educational institutions and industry stakeholders is essential for ensuring that vocational programs remain relevant and responsive to industry needs, and applied management studies offer valuable insights into how these partnerships can be leveraged to promote sustainability and operational efficiency in the maritime sector.

RESEARCH METHOD

This research employs a qualitative methodology to explore the integration of maritime environmental education into the English curriculum within vocational schools that focus on maritime and transportation education in Indonesia (Simanjuntak, et al., 2023). The qualitative approach was chosen to gain in-depth insights into the experiences and perspectives of maritime professionals, educators, and graduates. This method allows for a rich exploration of the nuanced relationships between maritime education, industry demands, and environmental sustainability, as well as the role of interdisciplinary education in preparing students for the evolving challenges of the maritime sector.

The study specifically focuses on vocational schools in Indonesia, where maritime education plays a critical role in shaping the skills and competencies of future professionals in the shipping and port industries. The qualitative research design is centered on descriptive analysis, which involves collecting and interpreting data from participants with direct experience in the maritime industry. The aim is to understand how maritime environmental education can be effectively integrated into English language teaching, and how this integration can enhance the skills of maritime professionals in meeting both operational and environmental challenges.

The primary data for this research is gathered from three key groups: maritime professionals, educators, and graduates (Ahmmed, et al., 2020). These groups were selected based on their direct involvement in the maritime industry and their unique perspectives on the intersection of education and industry needs.

1. Maritime Professionals: The first group consists of three experts who work as entrepreneurs, officers, and managers in the port and shipping industries. These individuals provide insights into the operational realities of port management, shipping logistics, and environmental compliance. Their experiences are crucial in understanding the specific environmental challenges faced by the maritime sector and the skills that are in demand within the industry. Through interviews, these professionals share their views on the importance of environmental education and how it can be incorporated into the curriculum to better prepare students for the challenges of the maritime industry.
2. Educators: The second group includes three lecturers, trainers, and tutors who are involved in teaching maritime science and vocational programs for seafarers. These educators bring a pedagogical perspective, offering insights into how environmental topics can be integrated into English for Specific Purposes (ESP) courses. Their expertise in curriculum development and teaching methods provides valuable input into how environmental education can be woven into existing language programs. The educators' perspectives help to shape an understanding of how interdisciplinary approaches to education can be effectively implemented in vocational schools.
3. Graduates: The third group consists of three graduates who have completed vocational maritime programs and are now working in the maritime industry, specifically in port and shipping offices or maritime companies. These individuals provide first-hand accounts of how their education prepared them for their roles, particularly in relation to environmental challenges and communication in English. By exploring their experiences in the workforce, the research assesses the effectiveness of current vocational programs and identifies areas where improvements in environmental education are needed.

The data collection process relies primarily on semi-structured interviews with participants from these three groups. Semi-structured interviews were chosen as they allow for flexibility in exploring topics while ensuring that key issues related to maritime education and environmental integration are covered. The interview questions are designed to elicit detailed responses about the participants' experiences and perspectives, focusing on the challenges they face in the industry, the role of environmental education, and the importance of English language skills in maritime contexts.

The interviews are conducted face-to-face where possible, and in some cases, through virtual platforms to accommodate participants' schedules and geographical locations. Each interview is recorded and transcribed for analysis. The transcriptions are then coded to identify recurring themes, patterns, and relationships between the different aspects of maritime management, environmental education, and language proficiency. The coding process is conducted manually, ensuring that the researcher can closely engage with the data and develop a deep understanding of the participants' perspectives.

In terms of data analysis, the study adopts a thematic analysis approach. This method is well-suited for qualitative research as it allows for the identification of key themes that emerge from the data. Thematic analysis involves systematically organizing the data into categories that reflect the main issues being studied, such as the integration of environmental education into the curriculum, the role of industry collaboration in shaping education, and the impact of interdisciplinary learning on students' professional development. The themes are then interpreted to draw conclusions about how maritime environmental education can be improved and how vocational schools can better align their programs with industry needs.

The descriptive nature of the research enables the researcher to explore how the integration of maritime environmental education into the English curriculum can contribute to the development of more environmentally responsible maritime professionals. By focusing on the qualitative experiences of industry professionals, educators, and graduates, the study provides a comprehensive understanding of the practical and pedagogical challenges involved in this integration.

RESULTS AND DISCUSSION

The results of this research focus on the effectiveness of integrating maritime environmental education into the English curriculum for vocational maritime and transportation schools in Indonesia. This section presents the findings from the semi-structured interviews conducted with three distinct groups: maritime professionals, educators, and graduates. The results were analyzed through a thematic approach and are described using qualitative data, along with a scoring analysis, where the effectiveness of the integration was rated on a scale of 1 to 10. Each section below will comprehensively present the findings according to the key indicators established in the research design, supported by relevant tables to illustrate the effectiveness of the program.

Key Indicators for Assessing the Integration of Maritime Environmental Education

The research identified three key indicators for evaluating the effectiveness of the integration of maritime environmental education into the English curriculum:

1. Relevance of Environmental Topics in Maritime English Courses: This indicator assesses how well environmental topics are embedded in the English curriculum and their relevance to real-world maritime industry practices.
2. Collaboration Between Educational Institutions and Maritime Industry: This evaluates the extent and effectiveness of collaboration between educational institutions and the maritime industry/environmental organizations to ensure curriculum relevance and up-to-date training.
3. Graduate Preparedness for Environmental and Operational Challenges: This indicator examines the graduates' perceived level of preparedness to handle environmental responsibilities and operational challenges in the maritime industry, focusing on their language and technical competencies.

Indicator 1: Relevance of Environmental Topics in Maritime English Courses

The first key indicator examines how effectively environmental topics are integrated into English courses within vocational maritime schools. This was measured by assessing the curriculum content, relevance to maritime industry requirements, and the feedback provided by educators, professionals, and graduates.

a) Findings

Based on the feedback from maritime professionals, the integration of environmental topics in maritime English courses was rated highly. The experts emphasized that maritime environmental regulations, such as those from the International Maritime Organization (IMO), require a strong understanding of both technical terms and environmental concepts in English. Educators highlighted the challenges of embedding complex environmental terminology into the curriculum but agreed that it significantly improves students' comprehension of real-world operational tasks. Graduates reported that the courses equipped them with the ability to interpret international regulations and communicate environmental concerns effectively in English within their workplaces.

The overall score for this indicator was 8.5/10, reflecting a strong alignment between curriculum content and industry needs but also highlighting room for further development, particularly in the depth of coverage of environmental issues.

Table 1: Relevance of Environmental Topics in Maritime English Courses (Indicator 1)

Category	Criteria	Score (1-10)	Comments
Curriculum Content	Inclusion of environmental regulations	9	Strong inclusion of IMO regulations and environmental terms in maritime contexts.
Relevance to Industry	Alignment with maritime industry needs	8	Content aligns well but could include more case studies and practical applications.
Educator Feedback	Ease of teaching environmental topics	8	Teachers find the integration effective but challenging due to complex terminology.
Graduate Feedback	Practicality of language skills	9	Graduates feel well-prepared for environmental communication tasks in their professional roles.

Indicator 2: Collaboration Between Educational Institutions and Maritime Industry

The second key indicator focuses on the collaboration between educational institutions and the maritime industry/environmental organizations. This collaboration is vital for ensuring that vocational training programs remain relevant and up-to-date with the latest industry trends and regulations, particularly regarding environmental management.

a) Findings

Maritime professionals and educators highlighted the importance of such collaborations. Professionals noted that partnerships between schools and maritime companies provide valuable internships and training opportunities for students. These opportunities ensure that students gain practical experience in applying the environmental knowledge they have acquired in the classroom. Educators emphasized that collaboration with industry experts allows for curriculum adjustments based on current industry needs, such as evolving environmental regulations.

Graduates who had participated in internships or industry-linked projects reported feeling more prepared for the real-world challenges of their jobs. They specifically mentioned how the practical experience helped solidify their understanding of the environmental aspects of maritime operations, which they had learned about during their coursework.

The overall score for this indicator was 9/10, reflecting the success of these collaborative efforts and their positive impact on both curriculum development and student preparedness.

Table 2: Collaboration Between Educational Institutions and Maritime Industry (Indicator 2)

Category	Criteria	Score (1-10)	Comments
Industry Collaboration	Partnerships with maritime companies	9	Strong collaborations lead to internship opportunities and real-world training.
Curriculum Updates	Responsiveness to industry/environmental changes	9	Curricula are regularly updated based on industry feedback and evolving environmental needs.
Student Engagement	Access to industry-linked projects/internships	9	Students benefit from hands-on experience that complements their classroom learning.
Graduate Feedback	Preparedness for workplace environmental challenges	9	Graduates feel well-prepared, citing practical industry exposure as a key factor.

Indicator 3: Graduate Preparedness for Environmental and Operational Challenges

The third key indicator focuses on the extent to which graduates feel prepared to handle both environmental and operational challenges in the maritime industry. This indicator was measured by assessing the graduates' self-reported preparedness and the feedback from maritime professionals regarding their performance in the workplace.

a) Findings

The interviews with graduates revealed that most felt well-prepared to address environmental challenges in their jobs. They noted that the integration of environmental topics into their English courses helped them understand international regulations and communicate effectively with colleagues and regulatory bodies. Maritime professionals who had employed these graduates also reported high levels of satisfaction with their preparedness, particularly in handling operational tasks that required environmental awareness.

The score for this indicator was 9.2/10, indicating strong graduate preparedness for the demands of the maritime industry, particularly in terms of managing environmental issues and communicating effectively in English.

Table 3: Graduate Preparedness for Environmental and Operational Challenges (Indicator 3)

Category	Criteria	Score (1-10)	Comments
Graduate Preparedness	Ability to handle environmental challenges	9	Graduates feel confident in their ability to manage environmental regulations and practices.
Industry Feedback	Employers' assessment of graduate performance	9.5	Employers are highly satisfied with graduates' technical and environmental competencies.
Operational Readiness	Ability to perform operational tasks effectively	9	Graduates are well-prepared for the operational demands of the maritime industry.
Communication Skills	Proficiency in maritime English, particularly for environmental topics	9.5	Graduates excel in communicating environmental concerns in English, a key industry requirement.

Overall Effectiveness of the Integration

The overall effectiveness of integrating maritime environmental education into the English curriculum was assessed through the analysis of the three key indicators. The qualitative feedback from maritime professionals, educators, and graduates, combined with the scoring analysis, demonstrates that the integration has been largely successful. The average score across all indicators was **9/10**, indicating that the program has effectively prepared students to meet the dual challenges of operational efficiency and environmental responsibility in the maritime industry.

Table 4: Overall Effectiveness of the Integration

Indicator	Average Score	Comments
Relevance of Environmental Topics in Maritime English Courses	8.5	Strong integration, though more practical applications and case studies could enhance learning.
Collaboration Between Educational Institutions and Industry	9	Highly successful collaboration leading to relevant and up-to-date training programs.
Graduate Preparedness for Environmental and Operational Challenges	9.2	Graduates are well-prepared, with strong environmental awareness and communication skills.

Analysis of the Results

The results indicate that the integration of environmental education into the English curriculum has been highly effective in vocational maritime schools in Indonesia. The feedback from all three groups—professionals, educators, and graduates—consistently highlights the positive impact of this integration on both student learning and industry readiness. The high scores across all indicators reflect the alignment between educational content and industry demands, particularly in terms of environmental responsibility and communication skills.

One area for further improvement lies in expanding the practical applications of environmental education. While the theoretical aspects are well-covered, more case studies, simulations, and real-world examples could be incorporated into the curriculum to enhance student learning. Additionally, continued collaboration with the maritime industry and environmental organizations will be essential in keeping the curriculum relevant and responsive to evolving industry needs.

The results of this research underscore the importance of integrating maritime environmental education into the English curriculum for vocational schools. The findings suggest that this integration not only enhances students' technical and communication skills but also prepares them to meet the environmental challenges facing the maritime industry. The strong collaboration between educational institutions and the maritime industry has been a key factor in the success of this program, ensuring that graduates are well-prepared for both operational and environmental responsibilities. With further refinements, particularly in the practical application of environmental topics, the program has the potential to become a model for other vocational maritime schools seeking to integrate sustainability into their curricula.

The findings of this research emphasize the critical importance of integrating maritime environmental education into the English curriculum within vocational maritime and transportation institutes. The results clearly show that this integration has had a positive impact on the preparedness of graduates to meet the dual challenges of operational efficiency and environmental responsibility. This discussion section will critically engage with the results, linking them to broader themes in applied maritime management studies, education, and industry collaboration, and reflecting on the implications for both academia and practice.

Relevance of Environmental Topics in Maritime English Courses

One of the most significant findings from the study is the strong alignment between the integration of environmental topics and the needs of the maritime industry. The incorporation of international environmental regulations, such as those from the International Maritime Organization (IMO), into the English curriculum has proven to be essential for preparing students for real-world challenges. This aligns with the broader objective of applied maritime management studies, which seeks to bridge the gap between theoretical knowledge and industry practice.

Maritime English, as a specialized field, plays a crucial role in the professionalization of future seafarers and port operators. The increasing focus on environmental concerns within the maritime industry, driven by global environmental regulations and the need for sustainable shipping practices, has made it essential for maritime professionals to understand and communicate complex environmental issues. This research confirms that vocational institutes in Indonesia are responding to this need by incorporating relevant environmental topics into their curricula, thus equipping students with the linguistic and technical tools necessary to navigate the industry’s evolving demands.

However, while the integration has been largely effective, there is room for further development. The results indicated that educators and graduates alike called for more practical applications of environmental knowledge, such as case studies and simulations that mirror real-world scenarios. In maritime management studies, experiential learning is critical. Theoretical knowledge alone is insufficient to prepare students for the dynamic and often unpredictable nature of maritime operations. Integrating more hands-on learning opportunities could enhance the depth of student understanding and further align educational outcomes with industry expectations. Additionally, expanding the use of interdisciplinary approaches—combining environmental science, maritime law, and English communication—could further enrich the learning experience.

Collaboration Between Educational Institutions and Maritime Industry

Collaboration between educational institutions and the maritime industry was a standout feature of this research, emerging as a key factor in the successful integration of maritime environmental education into the English curriculum. The findings demonstrate that such collaborations are mutually beneficial. For educational institutions, industry partnerships provide access to up-to-date information on environmental regulations, shipping practices, and technological advancements. For the

maritime industry, these partnerships ensure that the future workforce is adequately trained in both operational and environmental competencies.

The results indicate that industry collaboration has allowed vocational schools to stay relevant and responsive to industry trends, particularly in environmental management. Internships, industry-linked projects, and curriculum input from maritime professionals have all contributed to making the training programs more practical and relevant. This form of collaboration is also consistent with broader trends in vocational education and training (VET) models, where the emphasis is increasingly on aligning educational outcomes with industry needs to produce a job-ready workforce.

In maritime management studies, such collaboration has become essential, particularly in the face of rapidly changing global regulations and the increasing pressure on shipping companies to adopt sustainable practices. The maritime industry is heavily regulated, and environmental compliance is a central concern for companies operating in this sector. As such, the ability of vocational schools to integrate these regulations into the curriculum, through collaboration with industry players, ensures that graduates are not only well-versed in operational tasks but also prepared to meet the stringent environmental standards required in modern shipping and port operations.

Nevertheless, the research also points to areas where this collaboration could be expanded further. While current partnerships between educational institutions and the maritime industry are effective, the collaboration with environmental organizations remains less prominent. Given the increasing emphasis on sustainability within the maritime industry, strengthening partnerships with environmental organizations could provide students with more specialized training in maritime environmental management. This would ensure that graduates are equipped with both the technical skills required for shipping operations and the environmental expertise needed to navigate the sustainability challenges facing the industry.

Graduate Preparedness for Environmental and Operational Challenges

Graduate preparedness is perhaps the most telling indicator of the success of the integration of environmental education into the English curriculum. The results show that graduates feel well-prepared to manage environmental and operational challenges in the maritime industry. This finding reflects a broader shift in maritime education, where there is an increasing focus on producing professionals who are not only technically competent but also environmentally aware.

The maritime industry, particularly in port and shipping operations, is becoming more complex, with greater demands for efficiency, environmental compliance, and communication across international boundaries. Graduates need to be able to navigate these challenges, and the integration of environmental topics into the English curriculum provides a foundation for them to do so. The feedback from graduates suggests that they are able to apply the environmental knowledge they gained in vocational schools to real-world scenarios, particularly when it comes to understanding and implementing international environmental regulations.

This research aligns with the broader literature on maritime management, which emphasizes the importance of preparing graduates for the realities of the modern maritime sector. It highlights the need for a comprehensive approach to maritime education that includes both operational training and environmental education. Maritime professionals are increasingly expected to manage the environmental impact of shipping, and as such, the ability to communicate effectively in English, especially regarding environmental compliance, is a key competency.

However, while graduates reported feeling well-prepared overall, the research also suggests that there is still work to be done in fully equipping them with the practical experience necessary to manage complex environmental challenges. Graduates and professionals alike noted that while theoretical knowledge of environmental regulations is essential, the ability to apply this knowledge in practical settings is equally important. This points to the need for further curriculum development, specifically in the form of more interactive, real-world learning experiences. Such experiences could be facilitated through stronger partnerships with industry players, who can provide students with opportunities to engage directly with environmental management practices in the field.

Implications for Applied Maritime Management Studies

The findings of this research have significant implications for the field of applied maritime management studies. They suggest that vocational maritime education, when aligned with industry needs, can effectively prepare students for both the operational and environmental challenges of the maritime industry. The integration of environmental education into the English curriculum is not just an academic exercise; it has practical, real-world implications for the sustainability of the shipping industry.

One of the key contributions of this research is its focus on the interdisciplinary nature of maritime education. Maritime professionals today need to be well-versed in a range of topics, from technical operations to environmental management and international law. The integration of these topics into the curriculum reflects a broader trend in maritime management studies, where the emphasis is increasingly on producing well-rounded professionals capable of managing the complex challenges facing the industry. This interdisciplinary approach is essential for ensuring that graduates are equipped with the skills needed to navigate the multifaceted nature of modern maritime operations.

The research also underscores the importance of collaboration between educational institutions and the maritime industry. Applied maritime management studies have long recognized the need for such collaboration, and this research confirms its effectiveness in aligning educational outcomes with industry needs. However, it also points to the potential for

expanding these collaborations to include environmental organizations, which could provide students with more specialized knowledge in sustainable shipping practices.

Finally, the research highlights the importance of practical, experiential learning in maritime education. While theoretical knowledge is essential, particularly in understanding environmental regulations, the ability to apply this knowledge in real-world settings is equally important. This finding suggests that vocational schools need to place a greater emphasis on providing students with hands-on learning opportunities, whether through internships, industry projects, or simulations.

Novelty and Contributions to the Field

The novelty of this research lies in its focus on the integration of environmental education into the English curriculum for vocational maritime schools. While there is a growing body of literature on maritime environmental management, few studies have explored how environmental topics can be integrated into language instruction, particularly in the context of vocational education. This research fills that gap, offering a new perspective on how interdisciplinary education can be used to prepare students for the complex challenges of the maritime industry.

Moreover, the research makes a significant contribution to the field of applied maritime management studies by providing a detailed analysis of how industry collaboration can enhance educational outcomes. The findings suggest that vocational schools can benefit from stronger partnerships with both the maritime industry and environmental organizations, ensuring that their curricula remain relevant and responsive to industry trends.

CONCLUSION

This research underscores the importance of integrating maritime environmental education into the English curriculum in vocational maritime institutes in Indonesia. The findings reveal that this integration enhances the preparedness of graduates to meet both operational and environmental challenges in the maritime industry. By aligning the curriculum with international environmental regulations and industry demands, students are better equipped to navigate the complexities of global shipping operations. The study also highlights the value of collaborations between educational institutions and the maritime industry, which ensure that the training remains relevant and practical. Graduates expressed confidence in their ability to apply environmental knowledge in real-world contexts, reflecting the success of this educational model. However, the research also identifies areas for improvement, particularly in expanding practical learning opportunities, such as case studies and simulations that mirror industry challenges. Furthermore, stronger partnerships with environmental organizations would provide students with more specialized training in sustainable shipping practices. Overall, this research contributes to the field of applied maritime management studies by offering an interdisciplinary approach to maritime education that integrates operational, environmental, and communication skills, ensuring that future maritime professionals are well-prepared for the demands of a rapidly evolving industry.

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