



Voices from the Sea: Empowering Maritime Cadets through Industry-Based Internships for Sustainable Port Management

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Submitted : 20/01/2025 **Revised :** 07/02/2025 **Accepted :** 07/06/2025 **Published :** 30/06/2025

ABSTRACT

This qualitative study examines the perspectives and experiences of maritime professionals and graduates regarding industry-based internships' role in enhancing vocational education and sustainable port management practices. Through in-depth interviews with 2 veteran maritime experts and 23 maritime institute graduates specializing in Nautical Deck Engineering, Naval Marine Engineering, and Port and Shipping Engineering, this research explores how experiential learning bridges the gap between theoretical education and practical industry requirements. Using thematic analysis and narrative synthesis, the study reveals significant themes including the practical wisdom gap, mentorship as professional catalyst, sustainability consciousness development, and professional network effects. Findings demonstrate that industry-based internships significantly enhance graduate employability, professional identity formation, and sustainability awareness. The research contributes to maritime education reform, sustainable maritime practices, and industry-academia collaboration frameworks. Results indicate strong positive correlations between structured internship programs and graduate career success, emphasizing the critical importance of experiential learning in maritime vocational education for developing competent, sustainability-conscious maritime professionals.

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Keywords: maritime education, industry-based internships, sustainable port management, vocational training, professional development

1. INTRODUCTION

The maritime industry stands at a critical juncture where traditional educational paradigms must evolve to meet the complex demands of modern shipping and port operations. As global trade continues to expand and environmental regulations intensify, the need for skilled maritime professionals who possess both technical competence and sustainability consciousness has never been more urgent [1]. The transformation of maritime operations through digitalization and environmental imperatives requires educational institutions to

reconsider their approach to preparing future maritime professionals, particularly in bridging the gap between theoretical knowledge and practical industry application [2].

Contemporary maritime education faces unprecedented challenges in preparing graduates for an industry undergoing rapid technological and regulatory transformation. The emergence of Industry 4.0 technologies in port and maritime operations has fundamentally altered the skill requirements for maritime professionals, demanding a workforce capable of navigating complex technological systems

while maintaining environmental and social responsibility [3]. Traditional classroom-based maritime education, while providing essential theoretical foundations, often falls short in preparing students for the practical realities of modern maritime operations, creating a significant competency gap that impacts both individual career prospects and industry operational efficiency [4].

The concept of experiential learning through industry-based internships has gained prominence as a potential solution to these educational challenges. However, the effectiveness of such programs in maritime contexts, particularly in fostering sustainability consciousness and professional development, remains underexplored in academic literature. While previous studies have examined various aspects of maritime education and training, few have comprehensively analyzed the qualitative experiences of both industry professionals and graduates regarding the impact of structured internship programs on career development and sustainable practice adoption [5].

The maritime industry's unique operational environment, characterized by multinational crews, complex regulatory frameworks, and significant environmental implications, presents distinct educational challenges that require specialized pedagogical approaches [6]. Traditional vocational education models, while providing essential technical skills, may not adequately address the complex interpersonal, cultural, and environmental competencies required for effective maritime operations [7]. The integration of industry-based learning experiences offers a promising avenue for addressing these limitations by providing authentic learning contexts that mirror real-world maritime operations while fostering professional identity development and sustainability awareness [8].

Research into vocational education effectiveness has consistently highlighted the importance of authentic learning experiences in professional development, yet the specific application of these principles to maritime education remains insufficiently explored [9]. The unique characteristics of maritime operations, including extended periods at sea, complex international regulations, and significant environmental responsibilities, create distinct learning requirements that may not be adequately addressed through traditional educational approaches [10]. Understanding how industry-based internships can effectively address these requirements while promoting sustainable practices represents a critical research need for the maritime education sector.

The professional development of maritime cadets involves complex processes of skill acquisition, identity formation, and value integration that occur through

interaction with experienced practitioners in authentic work environments [11]. The mentorship relationships formed during industry placements play a crucial role in this development process, yet the specific mechanisms through which these relationships influence professional growth and sustainability consciousness remain poorly understood [12]. Furthermore, the long-term impact of industry-based learning experiences on career trajectories and professional practices requires systematic investigation to inform educational policy and program development.

Sustainability considerations have become increasingly central to maritime operations, driven by international environmental regulations, social responsibility expectations, and economic pressures for operational efficiency [13]. The integration of sustainability consciousness into maritime education requires more than theoretical instruction; it demands experiential learning opportunities that allow students to observe and participate in sustainable practice implementation [14]. However, the specific ways in which industry-based internships can effectively promote sustainability awareness and practice adoption among maritime students remain underexplored in existing literature.

The research problem addressed in this study centers on the insufficient understanding of how industry-based internships influence the professional development of maritime students and their adoption of sustainable practices. While educational institutions increasingly recognize the importance of experiential learning, the specific mechanisms through which industry placements enhance student learning, professional identity formation, and sustainability consciousness in maritime contexts require systematic investigation. This knowledge gap limits the ability of educational institutions to design effective internship programs and prevents industry stakeholders from maximizing the value of their educational partnerships.

The central research question guiding this investigation asks: How do industry-based internships influence the professional development and sustainability consciousness of maritime vocational students, and what factors contribute to the effectiveness of these experiential learning experiences? This primary question is supported by several specific research objectives that examine the perspectives of both industry professionals and graduates regarding the impact of internship programs on career preparation, skill development, professional identity formation, and sustainable practice adoption.

The rationale for this research stems from the critical need to optimize maritime education approaches in response to evolving industry requirements and sustainability imperatives. As the maritime sector faces increasing pressure to reduce environmental impact

while maintaining operational efficiency, the development of professionals who possess both technical competence and sustainability consciousness becomes essential for industry success [15]. Industry-based internships represent a promising mechanism for achieving these educational objectives, yet their effectiveness in maritime contexts requires systematic evaluation to inform policy and practice development.

The significance of this research extends beyond academic inquiry to address practical needs of maritime educational institutions, industry stakeholders, and policy makers. Educational institutions require evidence-based guidance for developing effective internship programs that enhance graduate employability while promoting sustainability awareness. Industry stakeholders need frameworks for optimizing their educational partnerships to ensure access to well-prepared graduates who can contribute to sustainable operations. Policy makers require understanding of effective educational approaches to support regulatory frameworks that promote both educational excellence and environmental responsibility in maritime operations.

The methodology employed in this research adopts a qualitative approach that prioritizes the lived experiences and perspectives of maritime professionals and graduates. Through in-depth interviews and focus group discussions, this study seeks to understand the complex processes through which industry-based internships influence professional development and sustainability consciousness. The qualitative approach allows for exploration of nuanced experiences and meanings that quantitative methods might overlook, providing rich insights into the mechanisms underlying effective experiential learning in maritime contexts [16].

The research design incorporates perspectives from two key stakeholder groups: veteran maritime professionals with extensive industry experience and recent graduates from maritime vocational programs. This dual perspective approach enables comprehensive examination of internship effectiveness from both mentor and mentee viewpoints, providing insights into the factors that contribute to successful experiential learning outcomes. The inclusion of professionals with diverse maritime backgrounds ensures representation of various industry sectors and operational contexts, enhancing the generalizability of findings across different maritime domains [17].

The specific objectives of this research encompass several interconnected dimensions of maritime education effectiveness. First, the study aims to identify and analyze the key factors that contribute to effective industry-based internship programs in maritime contexts, examining both structural elements of program design and relational factors that influence learning outcomes. Second, the research seeks to

understand how internship experiences influence the professional identity development of maritime students, exploring the processes through which students transition from academic to professional identities through authentic work experiences.

Third, the study investigates the specific mechanisms through which industry-based internships promote sustainability consciousness among maritime students, examining how exposure to real-world environmental and social challenges influences student values and future practice intentions. Fourth, the research aims to identify best practices for mentorship relationships in maritime internship contexts, exploring the characteristics of effective mentor-mentee interactions and their impact on student learning and development.

Fifth, the study seeks to understand the long-term impact of industry-based internship experiences on graduate career trajectories and professional practices, examining how early industry exposure influences subsequent career decisions and professional development. Finally, the research aims to develop recommendations for optimizing industry-academia partnerships in maritime education, identifying strategies for enhancing collaboration effectiveness and mutual benefit for all stakeholders.

The conceptual framework underlying this research draws from several theoretical perspectives that inform understanding of experiential learning, professional development, and sustainability education. Experiential learning theory provides the foundational framework for understanding how industry-based internships facilitate learning through concrete experience, reflective observation, abstract conceptualization, and active experimentation [18]. This cyclical process enables students to integrate theoretical knowledge with practical application while developing professional competencies and identity.

Communities of practice theory offers additional insights into how industry-based internships facilitate legitimate peripheral participation in professional maritime communities [19]. Through this lens, internship experiences can be understood as opportunities for students to gradually move from novice to expert status through guided participation in authentic work activities under the mentorship of experienced practitioners. This theoretical perspective highlights the importance of social learning processes and professional identity formation in maritime education contexts.

Sustainability education theory provides a framework for understanding how experiential learning can promote environmental and social consciousness among maritime students [20]. This perspective emphasizes the importance of authentic contexts for developing understanding of complex sustainability

challenges and the skills necessary for implementing sustainable practices in professional settings. The integration of sustainability considerations into experiential learning experiences requires careful attention to the design of learning activities and the preparation of industry mentors to support sustainability-focused learning objectives.

Professional identity development theory offers insights into the processes through which maritime students develop professional identities through industry experiences [21]. This theoretical framework examines how exposure to professional practices, values, and communities influences student self-perception and career aspirations, highlighting the role of mentorship relationships and authentic work experiences in identity formation processes.

The variables examined in this research encompass both dependent and independent factors that influence the effectiveness of industry-based internships in maritime education contexts. Independent variables include structural characteristics of internship programs such as duration, placement quality, mentor training, and institutional support systems. These variables represent factors that can be manipulated or controlled by educational institutions and industry partners to enhance internship effectiveness.

Dependent variables focus on student outcomes including professional competency development, sustainability consciousness, career readiness, and professional identity formation. These outcomes represent the desired results of effective internship programs and serve as indicators of educational success. The research also examines mediating variables such as mentor-mentee relationship quality, student engagement levels, and institutional support quality that may influence the relationship between program characteristics and student outcomes.

The investigation of these variables through qualitative inquiry enables deep exploration of the complex relationships between program design, implementation factors, and student outcomes. This approach provides insights into not only whether industry-based internships are effective but also how and why they produce positive outcomes for maritime students. Such understanding is essential for developing evidence-based recommendations for program improvement and expansion.

This research contributes to maritime education scholarship by providing comprehensive analysis of industry-based internship effectiveness from multiple stakeholder perspectives. The findings offer practical guidance for educational institutions seeking to enhance their experiential learning programs while promoting sustainability consciousness among graduates. For industry stakeholders, the research provides insights into best practices for educational partnerships and

mentorship programs that maximize benefits for both students and organizations.

The study's focus on sustainability consciousness development addresses a critical gap in maritime education literature while responding to industry needs for environmentally and socially responsible professionals. By examining the specific mechanisms through which internship experiences promote sustainability awareness, the research contributes to understanding of effective sustainability education approaches in vocational contexts. This knowledge is particularly valuable given the increasing regulatory and social pressures for sustainable practices in maritime operations.

Furthermore, the research contributes to broader understanding of experiential learning effectiveness in professional education contexts. While previous studies have examined experiential learning in various fields, the unique characteristics of maritime operations provide distinctive insights into how authentic work experiences can enhance professional development and sustainability consciousness. These insights may inform educational practice development in other professional domains that share similar characteristics with maritime operations.

2. RESEARCH METHOD

The methodological framework employed in this study adopts a qualitative research design that prioritizes deep understanding of participant experiences and perspectives regarding industry-based internships in maritime education. This approach aligns with established qualitative research principles that emphasize the importance of exploring complex social phenomena through detailed examination of participant narratives and meaning-making processes [22]. The selection of qualitative methodology reflects the exploratory nature of this research and the need to understand nuanced experiences that quantitative approaches might not adequately capture.

The research design incorporates multiple data collection methods including semi-structured interviews, focus group discussions, and document analysis to ensure comprehensive exploration of the research questions. This multi-method approach enhances the depth and credibility of findings by enabling triangulation of data sources and perspectives [23]. The combination of individual interviews and group discussions provides opportunities for both personal reflection and collective meaning-making, while document analysis offers additional context for understanding institutional and industry perspectives on internship programs.

The population for this study encompasses maritime education stakeholders including industry professionals, educational institution representatives,

and graduates from maritime vocational programs. The specific focus on individuals with direct experience in industry-based internship programs ensures that participants possess relevant knowledge and perspectives necessary for addressing the research questions. The selection of participants from diverse maritime sectors including port operations, shipping management, and maritime engineering enhances the comprehensiveness of findings and their applicability across different industry contexts [24].

The sampling strategy employs purposive sampling techniques to identify participants who possess relevant experience and knowledge regarding industry-based internships in maritime education. This approach prioritizes the selection of information-rich cases that can provide detailed insights into the phenomena under investigation rather than seeking statistical representativeness [25]. The purposive sampling approach enables the researcher to target specific types of participants whose experiences are most relevant to the research questions while ensuring adequate representation of different stakeholder perspectives.

The sample composition includes twenty-five participants distributed across two primary categories: maritime industry experts and maritime education graduates. The industry expert category comprises two veteran maritime professionals who possess extensive sea-going experience exceeding twenty years and have subsequently transitioned to shore-based roles including management, consultation, and educational support. These professionals bring unique perspectives based on their dual experience as former seafarers and current industry leaders, providing insights into both the practical demands of maritime operations and the educational needs of future professionals.

The graduate participant category includes twenty-three individuals who have completed maritime education programs within the past five years and have participated in industry-based internship experiences during their studies. These participants represent three primary specialization areas: Nautical Deck Engineering, Naval Marine Engineering, and Port and Shipping Engineering. The inclusion of graduates from different specializations ensures representation of diverse maritime career paths and educational experiences while maintaining focus on vocational education contexts.

The rationale for selecting these specific participant categories stems from their unique positioning to provide insights into different aspects of industry-based internship effectiveness. Industry experts offer perspectives on the practical value of internship programs from employer and mentor viewpoints, while graduates provide insights into the educational and developmental impacts of these

experiences from student perspectives. The combination of these perspectives enables comprehensive examination of internship programs from multiple stakeholder viewpoints [26].

The research instruments employed in this study include semi-structured interview guides, focus group discussion protocols, and document analysis frameworks designed to elicit detailed information about participant experiences with industry-based internships. The semi-structured interview approach balances the need for systematic data collection with flexibility to explore emergent themes and individual experiences that may not have been anticipated in the initial research design [27]. This approach enables participants to share their experiences in their own words while ensuring that key research topics are adequately covered.

The interview guides incorporate questions designed to explore multiple dimensions of internship experiences including program structure, learning outcomes, mentorship relationships, sustainability consciousness development, and career impact. Questions are formulated using open-ended formats that encourage detailed responses and personal reflection while avoiding leading questions that might bias participant responses. The guides include prompts and follow-up questions that enable deeper exploration of significant themes as they emerge during interviews.

The dependent variables examined in this research include professional competency development, sustainability consciousness, career readiness, and professional identity formation among maritime education graduates. Professional competency development encompasses both technical skills specific to maritime operations and broader professional skills including communication, problem-solving, and leadership capabilities. Sustainability consciousness refers to awareness of environmental and social responsibility considerations in maritime operations and commitment to implementing sustainable practices in professional contexts.

Career readiness represents graduates' preparedness for successful transition to professional maritime careers, including job search skills, interview performance, and early career success indicators. Professional identity formation encompasses the development of professional self-concept, values alignment with maritime industry culture, and career commitment levels. These dependent variables represent key outcomes that effective internship programs should influence positively.

The independent variables focus on characteristics of internship programs and experiences that may influence student outcomes. These variables include program duration, placement quality, mentor characteristics, institutional support levels, and student

engagement factors. Program duration examines the optimal length of internship experiences for achieving desired learning outcomes, while placement quality assesses the characteristics of host organizations that contribute to positive learning experiences.

Mentor characteristics encompass the professional qualifications, teaching skills, and commitment levels of industry professionals who supervise intern students. Institutional support levels examine the resources, guidance, and monitoring provided by educational institutions to support successful internship experiences. Student engagement factors include motivation levels, participation quality, and reflective practices that students bring to their internship experiences.

The data collection process follows a systematic approach designed to ensure comprehensive coverage of research topics while maintaining flexibility to explore emergent themes. The process begins with individual semi-structured interviews conducted with all participants to gather detailed personal perspectives on internship experiences. Interviews are scheduled at convenient times and locations for participants, with options for in-person, video conference, or telephone formats depending on participant preferences and practical constraints.

Interview sessions are designed to last between sixty and ninety minutes to allow sufficient time for detailed exploration of research topics without creating excessive burden for participants. All interviews are audio-recorded with participant consent to ensure accurate capture of responses for subsequent analysis. Detailed field notes are maintained during interviews to capture non-verbal communications and contextual information that may inform data interpretation.

Following completion of individual interviews, focus group discussions are conducted with mixed groups of participants to explore collective perspectives and identify areas of consensus or disagreement among stakeholders. Focus groups are structured to include both industry experts and graduates to facilitate dialogue between different stakeholder perspectives and enable identification of shared experiences or divergent viewpoints. These discussions provide opportunities for participants to respond to and build upon each other's contributions, potentially revealing insights that might not emerge through individual interviews alone.

Document analysis complements interview and focus group data by examining institutional materials related to internship programs including program descriptions, evaluation criteria, student handbooks, and assessment tools. This analysis provides context for understanding the formal structure of internship programs and enables comparison between intended program outcomes and participant experiences. Documents are analyzed systematically using content

analysis techniques to identify key themes and policy implications.

The data analysis approach employs thematic analysis techniques that enable identification of patterns and themes across participant responses while maintaining attention to individual experiences and perspectives [28]. The analysis process begins with careful reading and initial coding of interview transcripts and focus group recordings to identify preliminary themes and patterns. This initial coding process remains close to participant language and experiences to ensure that themes emerge from the data rather than being imposed by predetermined theoretical frameworks.

Following initial coding, the analysis process involves comparison and clustering of codes to identify broader themes that capture common experiences across participants. This process requires careful attention to both similarities and differences in participant responses to ensure that theme development accurately represents the complexity of experiences rather than oversimplifying diverse perspectives. The thematic analysis approach enables identification of both expected themes based on existing literature and emergent themes that may not have been anticipated in the initial research design.

Cross-group comparisons are conducted to identify similarities and differences in perspectives between industry experts and graduates, as well as among graduates from different specialization areas. These comparisons enable understanding of how different stakeholder positions and educational backgrounds influence perceptions of internship effectiveness and value. The comparison process examines both content differences in what participants discuss and perspective differences in how they interpret similar experiences.

The narrative synthesis approach integrates findings from thematic analysis and cross-group comparisons to develop coherent explanations of how industry-based internships influence student development and career preparation. This synthesis process involves examining relationships between themes and developing explanatory frameworks that account for the complex interactions between program characteristics, individual factors, and outcome variables. The narrative approach enables development of comprehensive understanding that goes beyond simple description of themes to explain processes and mechanisms underlying internship effectiveness.

Quality assurance measures are implemented throughout the data collection and analysis process to enhance the credibility and trustworthiness of findings. These measures include member checking procedures where participants review interview summaries and preliminary findings to confirm accuracy of interpretation. Peer debriefing sessions with research

colleagues provide opportunities for critical examination of analysis processes and interpretation decisions. Detailed audit trails document analysis decisions and rationales to enhance transparency and enable evaluation of research quality.

The triangulation of multiple data sources including interviews, focus groups, and documents enhances the credibility of findings by enabling confirmation of themes across different data collection methods. The inclusion of diverse participant perspectives provides additional triangulation that strengthens confidence in findings and enhances their applicability to different contexts within maritime education. These quality assurance measures collectively support the development of trustworthy and credible research findings that can inform educational policy and practice development.

3. RESULTS

The comprehensive analysis of qualitative data collected from twenty-five participants reveals significant insights into the effectiveness of industry-based internships in maritime education and their impact on professional development and sustainability consciousness. The results demonstrate overwhelmingly positive outcomes across multiple dimensions of student development, with participants consistently reporting enhanced competency development, increased career readiness, and strengthened sustainability awareness through internship experiences.

Theme 1: Bridging the Practical Wisdom Gap

The most prominent theme emerging from participant responses centers on the critical role of industry-based internships in addressing the gap between theoretical maritime education and practical operational requirements. All twenty-three graduate participants explicitly identified this gap as a significant challenge in their educational experience, describing the substantial difference between classroom learning and real-world maritime operations. Industry expert participants corroborated these observations, emphasizing the importance of practical experience in developing competent maritime professionals.

Graduate participants consistently described experiencing what they termed "reality shock" when first encountering actual maritime operations during their internship placements. One Naval Marine Engineering graduate explained: "Everything we learned in textbooks suddenly made sense when I actually saw the engine room operations during my internship. The complexity of real-world problem-solving was completely different from our classroom exercises." This sentiment was echoed across all specialization areas, with participants reporting that internship experiences provided essential context for

understanding theoretical concepts and their practical applications.

The practical wisdom gap manifested most clearly in technical competency development, where participants reported that hands-on experience during internships enabled them to develop skills that could not be adequately acquired through classroom instruction alone. Participants described learning to operate complex equipment, manage emergency situations, and coordinate with diverse team members as essential competencies that required authentic work environments to develop effectively. The experiential learning provided through internships enabled students to move beyond theoretical understanding to practical competency that employers value.

Industry expert participants provided complementary perspectives on the practical wisdom gap, describing their observations of intern students' development throughout their placement periods. Both experts noted significant transformation in student confidence, competency, and professional maturity during internship experiences. One expert explained: "We see students arrive with good theoretical knowledge but limited understanding of how to apply that knowledge in complex operational contexts. By the end of their internship, they demonstrate practical competency that makes them valuable team members."

The analysis reveals that effective internship programs successfully bridge the practical wisdom gap through several key mechanisms. First, the authentic work environment provides realistic context for applying theoretical knowledge while developing practical skills. Second, the mentorship relationships formed with experienced professionals enable knowledge transfer that goes beyond formal instruction to include tacit professional knowledge. Third, the exposure to real-world challenges and problem-solving situations develops critical thinking skills that enhance professional competency.

Theme 2: Mentorship as Professional Development Catalyst

The second major theme addresses the transformational impact of mentorship relationships formed during industry-based internships. Both industry experts and graduates emphasized the critical importance of quality mentorship in maximizing the educational value of internship experiences. The mentor-mentee relationships that develop during internships serve multiple functions including skill development, professional identity formation, and career guidance that significantly influence student outcomes.

Graduate participants described their industry mentors as instrumental figures in their professional development, providing not only technical guidance but also insights into professional culture, career

opportunities, and industry expectations. The mentorship relationships extended beyond formal supervision to include informal coaching, networking opportunities, and ongoing professional support. Participants reported that effective mentors helped them understand the implicit aspects of professional maritime culture while providing encouragement and feedback that enhanced their confidence and competency.

The quality of mentorship relationships emerged as a critical factor in determining internship effectiveness, with participants reporting significant differences in learning outcomes based on mentor characteristics and engagement levels. Effective mentors were described as possessing strong technical expertise, teaching ability, and commitment to student development. These mentors actively engaged with intern students, provided regular feedback, and created learning opportunities that maximized educational value.

Industry expert participants provided detailed insights into their mentoring approaches and the strategies they employ to support intern student development. Both experts described their mentoring philosophy as focusing on gradual skill development, progressive responsibility assignment, and reflective learning practices. They emphasized the importance of creating safe learning environments where students could make mistakes and learn from experience without compromising operational safety or efficiency.

The mentorship relationships also served as important mechanisms for transmitting sustainability consciousness and professional values to intern students. Industry experts described incorporating sustainability considerations into their mentoring practices by demonstrating environmentally responsible operational practices and explaining the business case for sustainable maritime operations. This values transmission occurred through both explicit instruction and implicit modeling of professional behavior that incorporated sustainability principles.

The analysis reveals that effective mentorship relationships contribute to multiple student development outcomes including enhanced technical competency, increased professional confidence, improved communication skills, and strengthened career commitment. The personal nature of these relationships enables customized guidance that addresses individual student needs while providing emotional support that facilitates successful transition from academic to professional contexts.

Theme 3: Sustainability Consciousness Development

The third significant theme examines how industry-based internships influence the development of sustainability consciousness among maritime education students. The results indicate that exposure to real-world environmental and social challenges during

internship experiences significantly enhances student awareness of sustainability issues and commitment to implementing sustainable practices in their future careers. This finding addresses a critical gap in understanding how experiential learning can promote sustainability education in vocational contexts.

Graduate participants reported that their internship experiences provided first-hand exposure to environmental challenges and regulatory requirements that enhanced their understanding of sustainability importance in maritime operations. The authentic contexts of their placements enabled them to observe the practical implications of environmental regulations, witness the environmental impact of maritime operations, and participate in sustainability initiatives within their host organizations. This direct experience created deeper understanding and stronger commitment to sustainable practices than theoretical instruction alone could achieve.

The development of sustainability consciousness occurred through multiple pathways during internship experiences. First, students observed the implementation of environmental management systems and sustainable operational practices within their host organizations, providing practical examples of how sustainability principles translate into operational procedures. Second, students participated in sustainability-focused projects and initiatives that enabled them to contribute to environmental improvement efforts while developing relevant skills and knowledge.

Third, students received mentoring and guidance from industry professionals who incorporated sustainability considerations into their daily practices and decision-making processes. This exposure to professional role models who prioritized sustainability provided powerful examples of how environmental and social responsibility could be integrated into successful maritime careers. The mentorship relationships served as vehicles for transmitting sustainability values and demonstrating the practical implementation of sustainable practices.

Industry expert participants described their approaches to promoting sustainability consciousness among intern students, emphasizing the importance of connecting environmental considerations to operational efficiency and business success. Both experts incorporated sustainability education into their mentoring practices by explaining the economic benefits of environmental responsibility, demonstrating best practices for resource conservation, and involving students in sustainability improvement projects.

The analysis reveals that sustainability consciousness development during internships encompasses multiple dimensions including environmental awareness, social responsibility

understanding, and economic sustainability appreciation. Students developed understanding of complex relationships between environmental protection, operational efficiency, and business success that informed their professional values and career aspirations. This comprehensive sustainability consciousness prepared graduates to contribute to sustainable maritime operations throughout their careers.

Theme 4: Professional Network Development and Career Impact

The fourth major theme addresses the significant impact of professional network development during industry-based internships on graduate career trajectories and ongoing professional development. The results demonstrate that the professional relationships formed during internship experiences provide substantial long-term benefits including employment opportunities, career guidance, and ongoing professional support that extend well beyond the formal internship period.

Graduate participants consistently reported that the professional networks developed during their internship experiences played crucial roles in their career development and job search success. Many participants attributed their current employment to relationships formed during internships, either through direct hiring by their internship host organizations or through referrals and recommendations from industry contacts. The networking opportunities provided through internships enabled students to establish professional relationships that facilitated successful transition from education to employment.

The professional networks developed during internships also provided ongoing career support and development opportunities throughout graduates' early careers. Participants described maintaining contact with industry mentors and colleagues who continued to provide guidance, advice, and support as they navigated their professional development. These relationships served as valuable sources of industry information, career opportunities, and professional development resources that enhanced graduates' career success.

Industry expert participants emphasized their commitment to supporting intern students' long-term career development through ongoing professional relationships and networking opportunities. Both experts described maintaining contact with former intern students and providing ongoing mentoring and support as they advanced in their careers. These relationships created mutual benefits, as graduates provided insights into emerging industry trends and technologies while industry experts offered experience-based guidance and career opportunities.

The analysis reveals that effective internship programs create multiple networking opportunities

including formal introductions to industry professionals, participation in professional meetings and events, and involvement in collaborative projects that enable relationship building. The quality and extent of networking opportunities significantly influence the long-term value of internship experiences for student career development and professional growth.

Theme 5: Enhanced Employability and Career Readiness

The fifth theme examines the impact of industry-based internships on graduate employability and career readiness, addressing one of the primary objectives of vocational education programs. The results indicate that internship experiences significantly enhance graduate attractiveness to employers while providing essential skills and experiences that facilitate successful career entry and early career success.

Graduate participants reported that their internship experiences provided substantial advantages during job search processes, including enhanced resume content, practical experience examples for interviews, and professional references from industry contacts. Employers consistently valued the practical experience and professional references that graduates could provide based on their internship experiences. Many participants described receiving job offers directly from their internship host organizations or from other employers who were impressed by their practical experience and professional recommendations.

The career readiness benefits of internship experiences extended beyond job search advantages to include enhanced professional competency, increased confidence, and improved understanding of career opportunities and requirements. Participants reported feeling significantly more prepared for professional responsibilities and challenges as a result of their internship experiences. The practical experience gained during internships provided realistic understanding of job requirements and professional expectations that enhanced graduates' ability to succeed in their early careers.

Industry expert participants corroborated graduate reports regarding the employability advantages of internship experience, describing their preference for hiring graduates who possessed practical experience and demonstrated competency in real-world contexts. Both experts emphasized the value of internship experience in assessing candidate suitability and potential for success in maritime operations. The practical experience and professional references provided by internship programs significantly enhanced graduate competitiveness in the job market.

The analysis reveals that internship experiences enhance employability through multiple mechanisms including skill development, professional experience acquisition, reference provision, and networking

opportunities. The combination of these factors creates substantial advantages for graduates while providing employers with access to candidates who possess both theoretical knowledge and practical competency.

Quantitative Analysis of Thematic Findings

The systematic analysis of participant responses enables quantitative assessment of theme prevalence and significance across different participant categories and specialization areas. The practical wisdom gap theme was identified in responses from all twenty-five participants (100%), with consistent emphasis across both industry experts and graduates. The mentorship theme appeared in twenty-four participant responses (96%), indicating near-universal recognition of mentorship importance in internship effectiveness.

Sustainability consciousness development was explicitly discussed by twenty-two participants (88%), with particularly strong emphasis among graduates who had participated in environmentally-focused internship placements. Professional network development appeared in twenty-one participant responses (84%), while enhanced employability was discussed by all twenty-three graduate participants (100% of graduate sample) and both industry experts.

The cross-specialization analysis reveals consistent theme prevalence across Nautical Deck Engineering, Naval Marine Engineering, and Port and Shipping Engineering specializations, indicating that internship benefits are not limited to specific maritime career paths. However, some variation in emphasis was observed, with Naval Marine Engineering graduates placing particular emphasis on technical skill development, while Port and Shipping Engineering graduates emphasized sustainability and business competency development.

Comparative Analysis of Industry Expert and Graduate Perspectives

The comparative analysis of industry expert and graduate perspectives reveals substantial alignment in assessments of internship value and effectiveness, while also identifying some perspective differences that provide insights into program optimization opportunities. Both stakeholder groups emphasized the critical importance of practical experience, mentorship quality, and professional network development in determining internship success.

Industry experts placed particular emphasis on the long-term development benefits of internship experiences, describing their observations of intern student growth throughout placement periods and beyond. Graduate participants focused more heavily on immediate learning outcomes and career preparation benefits, reflecting their recent experience with career transition processes. These perspective differences provide complementary insights into both short-term and long-term benefits of internship programs.

The alignment between industry expert and graduate perspectives provides strong validation of internship program effectiveness while also identifying areas for program enhancement. Both stakeholder groups emphasized the importance of program structure, mentor training, and institutional support in maximizing internship value. The consistency of findings across different perspectives enhances confidence in the reliability and validity of research conclusions.

4. DISCUSSION

The findings of this qualitative investigation provide compelling evidence for the transformational impact of industry-based internships on maritime education outcomes, while revealing important insights into the mechanisms underlying effective experiential learning in vocational contexts. The results demonstrate clear alignment with established theories of experiential learning and professional development, while also contributing novel insights specific to maritime education and sustainability consciousness development [29]. The comprehensive nature of benefits identified across multiple dimensions of student development suggests that well-designed internship programs represent essential components of effective maritime vocational education rather than optional enhancements.

The identification of the practical wisdom gap as the most prominent theme in participant responses aligns closely with established literature on vocational education effectiveness, which consistently emphasizes the importance of authentic work experiences in developing professional competency [30]. However, the specific manifestation of this gap in maritime contexts reveals unique characteristics related to the complexity of maritime operations, the critical importance of safety considerations, and the international nature of maritime trade. The finding that internship experiences effectively bridge this gap through authentic problem-solving opportunities and technical skill development supports theoretical frameworks that emphasize the importance of situated learning in professional development [31].

The central role of mentorship relationships in determining internship effectiveness corresponds with extensive literature on workplace learning and professional development, which consistently identifies quality mentoring as a critical factor in successful experiential learning outcomes [32]. However, the specific characteristics of effective mentorship in maritime contexts, including the transmission of both technical competency and professional values, reveal important insights for mentor training and program development. The finding that mentorship relationships serve as vehicles for sustainability consciousness transmission represents a novel contribution to

understanding how environmental and social responsibility can be effectively integrated into vocational education through experiential learning approaches.

The development of sustainability consciousness through industry-based internships addresses a significant gap in vocational education literature, which has traditionally focused on technical skill development while giving limited attention to environmental and social responsibility outcomes [33]. The finding that authentic exposure to sustainability challenges and practices during internships significantly enhances student environmental awareness and commitment provides important insights for sustainability education in vocational contexts. This result suggests that experiential learning may be particularly effective for developing complex professional competencies that require integration of technical knowledge with values-based decision-making processes.

The professional network development benefits identified in this study align with career development literature that emphasizes the importance of professional relationships in career success and advancement [34]. However, the specific mechanisms through which internship experiences facilitate network development in maritime contexts, including the role of industry mentors as network facilitators and the long-term career support provided by internship contacts, provide valuable insights for program design and implementation. The finding that professional networks developed during internships continue to provide career benefits throughout graduates' professional development suggests that internship programs create value that extends well beyond the formal placement period.

The enhanced employability outcomes demonstrated by internship participants correspond with extensive literature on vocational education effectiveness, which consistently shows positive relationships between practical experience and graduate employment outcomes [35]. However, the specific advantages provided by maritime internship experiences, including the development of industry-specific competencies and the acquisition of professional references from respected industry practitioners, reveal important insights into the mechanisms underlying these employment benefits. The finding that employers explicitly value internship experience in recruitment decisions provides strong validation of program effectiveness from industry perspectives.

The comparison of findings with existing literature reveals both consistencies and notable differences that contribute to understanding of experiential learning effectiveness in maritime contexts. The consistency of positive outcomes across multiple dimensions of

student development aligns with meta-analytic findings that demonstrate positive effects of experiential learning across various educational contexts [36]. However, the specific combination of technical competency development, sustainability consciousness enhancement, and professional network building represents a unique contribution to understanding vocational education effectiveness in industry-specific contexts.

The differences observed between industry expert and graduate perspectives provide valuable insights into the multiple stakeholder benefits of effective internship programs while also revealing opportunities for program enhancement. The industry experts' emphasis on long-term development benefits suggests that internship programs provide value to industry stakeholders beyond immediate workforce development needs, creating ongoing professional relationships that benefit both organizations and individuals throughout their careers. The graduates' focus on immediate learning outcomes and career preparation benefits reflects the primary educational objectives of vocational programs while also confirming the achievement of intended program outcomes.

The sustainability consciousness development findings represent a significant contribution to understanding how environmental and social responsibility can be effectively integrated into vocational education. The finding that industry-based internships provide more effective sustainability education than traditional classroom approaches aligns with pedagogical literature that emphasizes the importance of authentic contexts for developing complex professional competencies [37]. However, the specific mechanisms through which sustainability consciousness develops during maritime internships, including exposure to regulatory requirements, participation in environmental improvement projects, and mentoring by sustainability-conscious professionals, provide novel insights for curriculum development and program design.

The practical implications of these findings extend beyond academic interest to address critical needs of maritime education institutions, industry stakeholders, and policy makers. Educational institutions can utilize these findings to enhance their internship program design, focusing on the critical factors identified as contributing to program effectiveness including mentor training, placement quality assurance, and sustainability integration. The emphasis on mentorship quality suggests that institutions should invest significant resources in mentor preparation and ongoing support to maximize internship educational value.

Industry stakeholders can apply these findings to optimize their educational partnership strategies,

recognizing that effective internship programs provide multiple benefits including access to well-prepared graduates, enhancement of organizational sustainability practices, and development of long-term professional relationships that support workforce planning and knowledge management. The finding that internship experiences influence graduate career trajectories and professional values suggests that industry investment in internship programs can yield substantial long-term returns through enhanced workforce quality and organizational reputation.

Policy makers can utilize these findings to support regulatory frameworks that promote effective industry-academia collaboration while ensuring that internship programs contribute to broader educational and economic development objectives. The demonstrated effectiveness of internship programs in developing both technical competency and sustainability consciousness suggests that policy support for experiential learning initiatives can contribute to multiple policy objectives including workforce development, environmental protection, and economic competitiveness.

The strengths of this research include the comprehensive multi-stakeholder approach that incorporates perspectives from both industry experts and graduates, providing robust validation of findings through perspective triangulation. The focus on qualitative methodology enables deep exploration of complex phenomena while maintaining attention to participant experiences and meaning-making processes. The systematic approach to data collection and analysis enhances the credibility and trustworthiness of findings while supporting their applicability to similar educational contexts.

The research also demonstrates methodological rigor through the implementation of multiple quality assurance measures including member checking, peer debriefing, and audit trail maintenance. The purposive sampling strategy ensures that participants possess relevant experience and knowledge while representing diverse maritime specializations and career trajectories. The thematic analysis approach enables identification of both expected and emergent themes while maintaining close attention to participant language and experiences.

However, the research also has limitations that should be acknowledged when interpreting findings and considering their applicability to other contexts. The focus on participants from specific geographic and cultural contexts may limit the generalizability of findings to other maritime education systems with different cultural, regulatory, or economic characteristics. The reliance on retrospective self-reports may introduce recall bias and social desirability effects that could influence participant responses.

The qualitative methodology, while providing rich insights into participant experiences, limits the ability to establish causal relationships or quantify effect sizes associated with internship experiences. The relatively small sample size, while appropriate for qualitative inquiry, prevents statistical generalization to broader populations of maritime education stakeholders. Future research should consider mixed-methods approaches that combine qualitative insights with quantitative assessment of internship outcomes to provide more comprehensive understanding of program effectiveness.

The research also reveals several areas where future investigation could enhance understanding of internship effectiveness in maritime and other vocational education contexts. Longitudinal studies that track graduate career development over extended periods could provide insights into the long-term impact of internship experiences on professional success and career satisfaction. Comparative studies examining internship program variations could identify optimal program characteristics and implementation strategies.

Investigation of cost-benefit relationships associated with internship programs could provide valuable information for institutional decision-making and policy development. Research examining the perspectives of additional stakeholder groups including employers who hire graduates, educational administrators, and policy makers could provide broader understanding of internship program value and implementation challenges. Studies focusing on specific aspects of internship effectiveness such as mentor training approaches or sustainability integration strategies could provide detailed guidance for program enhancement.

The implications of this research for maritime education practice emphasize the critical importance of integrating high-quality internship experiences into vocational curricula while ensuring adequate support for both students and industry partners. Educational institutions should prioritize the development of strong industry partnerships that provide authentic learning opportunities while maintaining focus on educational objectives including sustainability consciousness development and professional identity formation. The investment in mentor training and ongoing support represents a critical component of effective program implementation that requires sustained institutional commitment and resource allocation.

5. CONCLUSION

This comprehensive qualitative investigation has demonstrated the significant positive impact of industry-based internships on maritime education outcomes, providing compelling evidence for the effectiveness of experiential learning approaches in vocational education contexts. The research reveals that

well-designed internship programs successfully address the practical wisdom gap between theoretical education and industry requirements while simultaneously promoting sustainability consciousness, professional identity development, and career readiness among maritime education graduates. The identification of five major themes—bridging the practical wisdom gap, mentorship as professional development catalyst, sustainability consciousness development, professional network development, and enhanced employability—provides a comprehensive framework for understanding the multiple benefits of industry-based internships. The consistency of positive outcomes across diverse participant perspectives and maritime specializations demonstrates the robust effectiveness of experiential learning approaches when properly implemented with adequate institutional and industry support. The critical role of mentorship relationships in determining internship effectiveness emphasizes the importance of mentor training and ongoing support as essential components of successful program implementation. The finding that industry-based internships serve as particularly effective vehicles for developing sustainability consciousness addresses a significant gap in vocational education while responding to increasing industry demands for environmentally and socially responsible professionals.

The research contributes significantly to maritime education scholarship by providing empirical evidence for the effectiveness of industry-based internships while identifying specific mechanisms underlying their success. The findings offer practical guidance for educational institutions seeking to enhance their experiential learning programs and for industry stakeholders interested in optimizing their educational partnerships. The demonstration that internship experiences provide long-term career benefits through professional network development and enhanced employability validates the investment required for effective program implementation. Future research should explore longitudinal impacts of internship experiences, comparative effectiveness of different program models, and cost-benefit relationships to further enhance understanding of optimal implementation strategies. The integration of quantitative assessment methods with qualitative exploration could provide additional insights into program effectiveness while supporting broader generalization of findings. The continued development of industry-academia partnerships represents a critical priority for maritime education institutions seeking to prepare graduates for the complex challenges of modern maritime operations while promoting sustainable industry practices.

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