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A MODEL OF INDIVIDUAL, ENVIRONMENTAL, FACULTY, AND POLICY INFLUENCES ON MARITIME SCHOOL GRADUATE QUALITY: THE MEDIATING ROLE OF ACADEMIC SELF-EFFICACY

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ABSTRACT

The quality of maritime school graduates is a critical factor in ensuring industry readiness and professional competence. Academic self-efficacy is emphasized as a moderator between the direct and indirect impacts of individual, environmental, faculty, and institutional variables on graduate quality in this study. Using PLS-SEM, this research evaluates the relationships among achievement motivation, cognitive skills, family support, quality of learning facilities, teaching quality, lecturer's industry experience, industry-based curriculum policy, and academic evaluation systems in shaping student outcomes. The findings reveal that achievement motivation, cognitive skills, and teaching quality are the most significant predictors of academic self-efficacy and graduate quality, confirming that intrinsic motivation, cognitive readiness, and effective instruction play a fundamental role in preparing students for maritime careers. The results further indicate that academic self-efficacy is the strongest predictor of graduate quality, reinforcing its role as a psychological bridge between academic experiences and professional competence. The study finds that family support and learning facilities contribute indirectly to graduate quality by enhancing self- efficacy, highlighting their role as enabling rather than determining factors. Similarly, industry-based curriculum policies and lecturers' industry experience exhibit limited direct influence, suggesting that these elements must be effectively integrated with interactive and applied learning strategies to maximize their impact on student outcomes. The indirect effects analysis confirms that academic self-efficacy significantly mediates the relationship between motivation, cognitive skills, teaching quality, and graduate quality, emphasizing the need for institutions to prioritize strategies that foster confidence in students' abilities. These findings provide several implications for educational institutions, policymakers, and faculty development programs. First, curricular and instructional strategies should incorporate active learning methodologies, mentorship programs, and structured feedback mechanisms to strengthen students' confidence in their academic and professional competencies. Second, faculty training programs should focus not only on industry expertise but also on pedagogical effectiveness, ensuring that instructors can translate real-world knowledge into impactful teaching. Third, academic evaluation systems should be designed as motivational tools, incorporating formative assessments that encourage self-directed learning and resilience. Finally, to ensure that graduates have both technical competence and

adaptable capacities, educational practices should be modified to close the gap between theoretical learning and real industrial applications. This work has made important contributions; however it may not be applicable to a broader population due to its cross-sectional methodology and narrow geographic emphasis. To ensure the accuracy of these results, future studies should investigate maritime education in a variety of contexts using longitudinal methodologies. Overall, this study underscores the importance of integrating cognitive, instructional, and psychological dimensions into maritime education, ensuring that graduates are not only knowledgeable but also confident, adaptable, and industry ready.

KEYWORDS: Academic self-efficacy, graduate quality, maritime education, PLS-SEM, motivation, cognitive skills, teaching quality.

INTRODUCTION

The maritime industry requires graduates with a balanced set of competencies, integrating both technical proficiency and soft skills (Xu et al., 2023; Kumar et al., 2022). The ability to operate and maintain maritime equipment, navigate vessels, and adhere to international safety standards represents the core technical competencies essential for professionals in this sector (Xu et al., 2023). However, technical expertise alone is insufficient in a field that demands adaptability, problem-solving skills, and effective communication (Kumar et al., 2022; Sijabat et al., 2024). The complex and high-risk nature of maritime operations necessitates graduates who can collaborate in diverse environments, manage crises, and demonstrate leadership in decision-making processes (Chala & Bouranta, 2021). The quality of graduates directly influences maritime safety, operational efficiency, and compliance with global regulatory standards (Mudakir et al., 2024). Institutions responsible for maritime education must, therefore, ensure that their graduates are not only technically skilled but also equipped with the resilience and interpersonal skills required to meet the evolving demands of the industry (Kusumawati, 2023). Failure to produce graduates who meet these expectations can result in inefficiencies, increased accident risks, and a diminished reputation for maritime training institutions (Kusumawati, 2023).

The quality of maritime school graduates remains a pressing concern, as evidence suggests that many lack the necessary technical and soft skills to meet industry standards (Sijabat et al., 2024; Ala et al., 2024). Despite rigorous training programs, gaps persist in fundamental competencies, including vessel operation, navigation systems, and safety compliance (Sijabat et al., 2024; Ala et al., 2024). These deficiencies are often attributed to insufficient hands-on experience, outdated instructional methodologies, and limited exposure to real-world maritime challenges (Cabaron, 2023; Widiatmaka et al., 2024). Soft skills, such as leadership, problem-solving, and adaptability, are equally crucial in maritime operations, yet many graduates struggle with effective communication, teamwork, and decision-making under pressure (Barus et al., 2024; Yuen et al., 2022). The inability to integrate these skills into professional practice compromises efficiency and safety in maritime operations (Simanjuntak, 2023; Gupron et al., 2023). Industry stakeholders have raised concerns regarding the

readiness of graduates to assume roles that demand immediate application of both technical knowledge and interpersonal capabilities (Kilpi et al., 2021; Vujičić et al., 2020). A more all-encompassing and practice-oriented strategy for maritime education is necessary due to the gap between academic readiness and industrial demands (Cabaron, 2023; Widiatmaka et al., 2024).

Many students majoring in marine studies lack confidence in their abilities to succeed academically, despite the fact that academic self-efficacy is a crucial psychological component impacting student performance and professional competence (Meng & Zhang, 2023; Bhati et al., 2022). A lack of self-efficacy often results in hesitancy when facing complex problem-solving situations, reluctance to engage in challenging coursework, and diminished resilience in high-pressure environments (Meng & Zhang, 2023). This phenomenon impedes cognitive development and practical skill acquisition, leading to suboptimal academic outcomes and inadequate professional preparedness (Simanjuntak, 2023). Students with low academic self-efficacy tend to avoid active participation in hands-on training, which further exacerbates their skill gaps upon entering the workforce (Simanjuntak, 2023). Without strong self-efficacy, maritime graduates struggle to adapt to the dynamic and often unpredictable nature of maritime operations (Mahmood et al., 2023). Addressing these challenges requires targeted interventions that foster a growth mindset, encourage independent problem-solving, and integrate structured mentorship to build confidence and competence simultaneously (Alkhateeb et al., 2022; Cabaron, 2023).

The quality of maritime school graduates is influenced by a complex interplay of multidimensional factors that extend beyond traditional academic instruction. Maritime education requires a holistic approach that integrates cognitive development, personal motivation, environmental support, faculty expertise, and institutional policies to produce competent graduates (Dacosta et al., 2022; Nasur & Boguslawski, 2020). Individual factors, particularly achievement motivation and cognitive skills, play a fundamental role in shaping students' academic self-efficacy and, consequently, the quality of maritime school graduates (Seira et al., 2024; Cholili, 2021). Students with high achievement motivation display persistence in overcoming academic challenges, set ambitious learning goals, and exhibit resilience in facing complex maritime training (Hartoyo, 2022). This motivational drive enables them to remain focused on academic tasks and seek solutions to difficulties encountered in their studies (Seira et al., 2024). Cognitive skills, which include critical thinking, problem-solving, and analytical reasoning, further reinforce students' confidence in their ability to process and apply knowledge effectively (Ribeiro & Fernandes, 2020; Vujičić et al., 2020). Weak cognitive abilities hinder comprehension and application, leading to decreased academic self-efficacy and reluctance to engage in technical training (Yıldırım et al., 2022). Maritime education demands high cognitive engagement due to its reliance on problem-based learning, simulation exercises, and real-world maritime scenarios. The absence of strong cognitive and motivational foundations creates gaps in learning, affecting students' ability to acquire the competencies necessary for professional success in the maritime industry.

Environmental factors, particularly family support and the quality of learning facilities, significantly influence students' confidence in their academic capabilities and professional preparedness (Gaida & Frost, 2021; Sharifipour et al., 2020). A supportive family environment provides the necessary emotional and financial resources that enable students to focus on their studies and develop resilience in the face of academic pressures (Knight et al., 2021). Parents who actively engage in their children's education foster a sense of security and self-efficacy, which translates into improved academic performance. Conversely, students who lack family support often struggle with self-doubt and reduced academic persistence (Knight et al., 2021). The availability and quality of learning facilities further determine students' ability to engage in hands-on training and skill development (Zahro & Nasikhin, 2023; Hariyanto et al., 2021). Maritime education requires access to advanced simulation tools, well-equipped laboratories, and industry-standard equipment to provide an immersive learning experience. Inadequate learning environments limit students' exposure to real-world challenges, diminishing their confidence in handling maritime operations (Yani et al., 2022). Institutions that fail to provide high-quality learning facilities contribute to graduates' lack of preparedness, resulting in skill deficiencies upon entering the workforce (Patterson et al., 2021; Routh et al., 2022).

Teachers' expertise and the quality of their lessons have a significant impact on students' belief in their own abilities and their level of competence in the classroom (Yusof et al., 2020; Waddell, 2021; Aithal & Mishra, 2024). Effective teaching methods that incorporate experiential learning, industry case studies, and hands-on training improve students' confidence in applying theoretical knowledge to practical situations (Yusof et al., 2020; Waddell, 2021). Professors who are also excellent teachers help their students develop their capacity for analysis, evaluation, and decision-making. The presence of industry-experienced lecturers further enhances the relevance of academic content by bridging the gap between theoretical instruction and industry practices (Duan et al., 2024; Bell & Bell, 2020). Exposure to faculty members with extensive maritime experience allows students to gain insights into industry challenges and expectations, reinforcing their academic self-efficacy. In contrast, the lack of experienced instructors weakens students' trust in their academic training, resulting in uncertainty when transitioning into professional roles (Tiguryera et al., 2024; Cai, 2023). Colleges and universities that put money into teacher training and partnerships with businesses produce graduates who can handle the challenges of marine operations (Chen et al., 2022; Joseph-Mathews et al., 2022; Snell & Lau, 2020).

Organizational policies, particularly industry-based curriculum frameworks and academic evaluation systems, influence students' self-efficacy and preparedness for professional careers (Bhattacharya, 2024; Cheng et al., 2021). A curriculum aligned with industry demands ensures that students acquire relevant technical skills, certifications, and competencies required in maritime operations (Bhattacharya, 2024; Cheng et al., 2021). The integration of industry-standard practices into academic programs enhances students' confidence in their ability to meet professional expectations. Institutions that fail to adapt curricula to evolving industry needs risk producing graduates who lack essential competencies, leading to employment difficulties and increased skill gaps (Bhattacharya,

2024; Cheng et al., 2021). Academic evaluation systems also shape students' self-efficacy by providing constructive feedback, setting performance benchmarks, and reinforcing continuous improvement (Bozinovic et al., 2021). Transparent and objective evaluation processes in still confidence in students by enabling them to measure their progress and address areas of weakness. The absence of a structured evaluation system results in inconsistent skill development, making it difficult for students to assess their readiness for industry challenges (Bozinovic et al., 2021).

Academic self-efficacy serves as a mediating factor between individual, environmental, faculty, and organizational influences on the quality of maritime school graduates (Azila-Gbettor et al., 2021; Luo et al., 2023). A high level of self-efficacy is associated with increased academic engagement, better problem- solving skills, and a greater sense of preparedness for future careers (Azila-Gbettor et al., 2021; Luo et al., 2023). Strong academic self-efficacy enables students to fully utilize institutional resources, faculty expertise, and industry-aligned curricula to develop essential competencies. Conversely, students with low self-efficacy struggle with academic engagement, leading to deficiencies in both technical and soft skills required in the maritime sector (Robayo-Tamayo et al., 2020; Pratiwi & Hayati, 2021). The interplay between self-efficacy and external influencing factors underscores the importance of a holistic approach in maritime education. Institutions must recognize that the development of competent graduates extends beyond curriculum design and includes fostering motivation, cognitive abilities, faculty engagement, industry exposure, and structured assessment systems (Zhao et al., 2024; Simanjuntak & Barus, 2024; Simanjuntak, 2023).

Previous studies on the quality of maritime school graduates have predominantly examined the direct influence of individual, environmental, faculty, and institutional factors (Sarinten et al., 2022; Simanjuntak, 2023). Research in this field has often emphasized technical training, curriculum alignment, and industry partnerships while overlooking the psychological and cognitive aspects that shape student performance (Ullah, 2020; Bhati et al., 2022). The role of academic self-efficacy as a mediating factor remains underexplored, despite its significant influence on students' ability to translate acquired knowledge into practical competencies (Mahmood et al., 2023; Alismail, 2024). Studies that have addressed academic self- efficacy tend to focus on general educational contexts, with limited empirical analysis in maritime education (Alismail et al., 2024; Simanjuntak, 2024). The absence of a comprehensive framework that incorporates self-efficacy as an integral component results in fragmented insights, making it difficult to develop targeted interventions that enhance both learning outcomes and professional preparedness. Without a deeper understanding of the indirect mechanisms that influence graduate quality, existing models fail to capture the complexities of student development in maritime training institutions (Sarinten et al., 2022; Simanjuntak, 2024).

This research addresses these gaps by proposing a multidimensional model that integrates individual, environmental, faculty, and institutional policy factors while examining the mediating role of academic self-efficacy. Unlike previous studies that primarily investigate linear relationships, this

approach acknowledges that students' belief in their academic capabilities serves as a crucial link between external influences and graduate quality. The model offers a more nuanced perspective on how motivational and cognitive attributes interact with external support systems to shape student confidence and professional competencies. The inclusion of academic self-efficacy as a mediating variable provides a theoretical foundation for understanding variations in graduate preparedness, highlighting the importance of psychological resilience in maritime training. This study advances the discourse by offering empirical evidence on how educational policies and instructional strategies can be tailored to strengthen students' self-efficacy, ultimately leading to improved technical proficiency, adaptability, and industry readiness among maritime school graduates.

This research adds to the existing body of knowledge on maritime education by elucidating the complex interplay of factors that impact the calibre of graduates. The inclusion of academic self-efficacy as a mediating variable enhances theoretical perspectives on how motivation, cognitive skills, environmental support, faculty expertise, and institutional policies interact to shape student outcomes. The findings provide empirical insights into the mechanisms through which self-efficacy influences the translation of knowledge into professional competencies, offering a deeper understanding of graduate preparedness in maritime education. From a practical standpoint, the study generates evidence-based recommendations for educational institutions to develop targeted interventions that enhance student motivation, strengthen instructional strategies, and improve academic policies. The proposed model serves as a framework for maritime training institutions to align curricula with industry demands while fostering a learning environment that promotes student confidence and adaptability. For policymakers, the study provides guidance in formulating strategies to address competency gaps, refine academic assessment frameworks, and ensure that maritime graduates possess the technical expertise, decision-making abilities, and resilience required in the global maritime industry.

LITERATURE REVIEW

1. Determinant Factors Influencing Academic Self-Efficacy and Graduate Quality: A Theoretical Perspective

The quality of maritime school graduates is shaped by multiple interrelated determinants encompassing individual, environmental, faculty, and institutional factors. Understanding the interplay between these characteristics and their effects on academic self-efficacy and graduate competence is guided by the Resilience Theory, which places an emphasis on the capacity of individuals and systems to adapt and flourish in the face of adversity. Individual factors (X1), particularly achievement motivation and cognitive skills, play a pivotal role in shaping students' confidence in their academic capabilities (Simanjuntak, 2024; Hidayati et al., 2020). Students with high motivation persist in overcoming challenges and exhibit greater academic engagement, aligning with the resilience framework that underscores persistence in adversity (Simanjuntak, 2024). Cognitive skills, including problem-solving and analytical reasoning, further reinforce students' confidence in processing

maritime-related complexities, essential for fostering adaptability in high-risk operational settings (Hidayati et al., 2020).

Environmental factors (X2), including family support and learning facilities, create conditions that either facilitate or hinder academic resilience. Family support provides emotional and financial stability, reducing academic stress and enhancing students' belief in their ability to succeed (Jumraeni et al., 2023; Duan et al., 2024; Fitriani & Gina, 2022). The quality of learning facilities, particularly access to industry-

standard simulators, laboratories, and practical training environments, directly influences students' confidence in applying theoretical knowledge to real-world maritime challenges (García-Crespo et al., 2021). The resilience framework suggests that robust support systems enable individuals to maintain self- efficacy even in demanding educational environments. Faculty factors (X3), specifically teaching quality and industry experience, further contribute to the development of graduate competencies. Effective instructional strategies and exposure to real-world maritime operations shape students' problem-solving abilities, ensuring they develop not only technical expertise but also the capacity to navigate dynamic professional contexts (Kumalasari, 2023; Halimi et al., 2024). Institutional policies (X4), including industry-aligned curricula and structured evaluation mechanisms, ensure that graduates possess competencies that meet professional standards (Permatasari et al., 2021). A well-structured academic system strengthens students' academic self-efficacy by reinforcing the belief that their education is relevant, rigorous, and capable of preparing them for real-world applications. Integrating the resilience framework, the ability of students to transition effectively into the maritime workforce depends on their capacity to leverage these determinant factors to build confidence, adaptability, and industry-ready skills.

2. The Mediating Role of Academic Self-Efficacy (Z) in Maritime Education: Contextualizing the Research Object

The mediating role of academic self-efficacy between the effects of individual, environmental, faculty, and institutional variables on the quality of graduates is crucial. Maritime education demands high levels of technical proficiency and adaptability, requiring students to possess confidence in their ability to process complex information and apply knowledge in unpredictable operational scenarios. The extent to which students believe in their academic competencies determines their engagement with learning activities, resilience in overcoming academic difficulties, and willingness to take on challenges within the maritime industry (White et al., 2021). A student with strong self-efficacy actively seeks skill-building opportunities, fully engages with practical simulations, and demonstrates confidence in executing maritime operations (Taylor et al., 2022). Conversely, low self-efficacy results in hesitancy, avoidance of complex tasks, and diminished competence, regardless of the quality of instructional or institutional support available (Garcia & Cuizon, 2021). This dynamic highlight the necessity of fostering self-efficacy within educational frameworks to enhance student performance and adaptability in the maritime industry (Baatwah et al., 2023).

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In the context of maritime education institutions, academic self-efficacy acts as a psychological mechanism that determines how students interpret and respond to the challenges posed by their academic environment. Students who lack confidence in their own abilities have a harder time retaining information and applying what they learn, regardless of the availability of top-notch teachers, state-of-the-art classroom technology, and well-planned course of study (Ribeiro & Fernandes, 2020; Simanjuntak, 2023). Supporting the idea that a person's confidence in their own adaptability is a key factor in deciding how far they can go in life, this phenomenon is consistent with the resilience concept (Koca et al., 2023; Ullah, 2020). The maritime sector, characterized by high-pressure decision-making, requires graduates who can confidently apply their knowledge in unpredictable settings. Strengthening academic self-efficacy through structured mentorship, experiential learning, and industry exposure ensures that students not only possess the technical qualifications required for the profession but also the confidence and adaptability necessary for success in maritime operations (Svartdal et al., 2021; Alkhateeb et al., 2022; Cabaron, 2023). Students' psychological readiness can be better understood by examining the mediating function of self-efficacy in this study, reinforcing the need for an educational approach that prioritizes both cognitive development and confidence-building strategies (Mahmood et al., 2023; Meng & Zhang, 2023).

Table1: of Research Variables, Dimensions, and Indicators

Variable	Indicator	Items	Source	Measurement
Achievement Motivation (X1.1)	Academic Goals	1,2,3	Tolba and AL-Dhmen (2024)	(Ordinal, Likert 1-5)
	Perseverance	4,5		
	Initiative	6,7,8		
	Ambition	9,10		
Cognitive Skills (X1.2)	Conceptual Understanding	1,2	A'raafi et al. (2024), KİLCİ et al. (2025), Sheguf and Alhaj (2022)	(Ordinal, Likert 1-5)
	Analysis and Synthesis	3,4		
	Problem-Solving	5,6		
	Creativity	7,8		
	Critical Thinking	9,10		
Family Support (X2.1)	Parental Involvement	1,2	Feng and Tan (2022), Novianti and Garzia (2020), Rizaldi et al. (2021)	(Ordinal, Likert 1-5)
	Home Learning Facilities	3,4		
	Family Motivation	5,6		
	Emotional Stability at Home	7,8		
Quality of Learning Facilities (X2.2)	Infrastructure	1,2	Indrasari et al. (2023), Muhammad et al. (2022), Mutiara et al. (2022)	(Ordinal, Likert 1-5)
	Accessibility	3,4		
	Maintenance	5,6		
	Supporting Technology	7,8		
	Learning Environment	9,10		
Teaching Quality (X3.1)	Teaching Methods	1,2	Ding and Su (2022), Farin et al. (2024), Li (2020)	(Ordinal, Likert 1-5)
	Pedagogical Competence	3,4		
	Assessment of Learning	5,6		
	Professional Development	7,8		
Lecturer's Industry Experience (X3.2)	Duration of Experience	1,2	Maimunah et al. (2023), Mesuwini et al. (2022), Sun (2023)	(Ordinal, Likert 1-5)
	Relevance of Experience	3,4		
	Industry Network	5,6		
	Professional Certification	7,8		

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	Collaborative Projects	9,10		
Industry-Based Curriculum Policy (X4.1)	Alignment with Industry Needs	1,2	Aprianto et al. (2020), Marsudi (2023), Otache (2021)	(Ordinal, Likert 1-5)
	Integration of Certifications	3,4		
	Curriculum Flexibility	5,6		
	Industry Engagement in Teaching	7,8		
	Curriculum Evaluation and Update	9,10		
Academic Evaluation System (X4.2)	Assessment Transparency	1,2	Eom et al. (2020), Pérez-Jorge et al. (2021), Rasooli et al. (2022)	(Ordinal, Likert 1-5)
	Diverse Evaluation Methods	3,4		
	Feedback	5,6		
	Fairness in Assessment	7,8		
	Student Participation in Evaluation	9,10		
Academic Self-Efficacy (Z)	Academic Confidence	1,2	Hayat et al. (2020)	(Ordinal, Likert 1-5)
	Time Management	3,4		
	Learning Strategies	5,6		
	Emotional Regulation	7,8		
	Help-Seeking Behavior	9,10		
Quality of Maritime School Graduates (Y)	Technical Skills	1,2	Lau et al. (2021), Sarjito (2024), Yuen et al. (2022)	(Ordinal, Likert 1-5)
	Soft Skills	3,4		
	Industry Readiness	5,6		
	Ethics and Professionalism	7,8		

METHOD

Academic self-efficacy and the quality of graduates from maritime schools are examined in this quantitative study by examining the links between individual, environmental, faculty, and institutional variables. In a quantitative study, variables are measured in a systematic way, which helps to reveal patterns, correlations, and the relative importance of the issues under investigation. This research uses an explanatory research design to examine the role of academic self-efficacy as a mediator between the impacts of external factors on graduate quality, with the goal of providing explanations for causal links. To evaluate academic self-efficacy and graduate competences as they are right now, the study used a cross-sectional approach, which involves collecting data at a specific moment in time. This design is appropriate for understanding how different factors simultaneously contribute to self-efficacy and professional readiness among maritime students. By integrating these methodological components, the study ensures a structured, empirical analysis that supports theoretical and practical insights into the determinants of graduate quality in maritime education.

The population of this study consists of all Maritime School Graduates in Semarang who completed their education in the 2024 graduation period, totaling 450 individuals. This study uses a complete sampling strategy, which involves include all members of the population as research participants, due to the relatively small and accessible population size. This approach guarantees thorough data gathering, which enables a precise portrayal of the complete graduating class. This study provides a more accurate picture of the factors impacting academic self-efficacy and graduation quality in marine education by using complete sampling to remove sample bias and increase the validity of results. In this study, data is collected by a questionnaire that uses a Likert scale, which is an ordinal measuring

system with a range of 1 to 5. To measure the extent to which each statement is true or false, respondents use a 5-point scale that goes from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire is developed based on the dimensions and indicators identified in the research framework, ensuring that each construction is measured systematically. This method facilitates the quantification of individual, environmental, faculty, and institutional influences on academic self-efficacy and graduate quality, enabling statistical analysis to determine relationships and mediation effects within the study model.

This study's data analysis makes use of PLS-SEM with SmartPLS software, which allows for a thorough assessment of the measurement and structural correlations among the research variables (Hair et al., 2014). Descriptive analysis, assessment of the outside model, and evaluation of the inner model are the three primary components of the analysis. For the purpose of summarizing respondent characteristics and providing a general overview of the data distribution for each study variable, descriptive analysis is carried out. Making sure the latent constructs are a good fit for the observed indicators is the job of the outer model assessment, which checks the measurement model's validity and reliability. This assessment takes into account both the convergent validity, which is determined by factor loadings of 0.70 or higher and the Average Variance Extracted (AVE) of 0.50 or higher, and the discriminant validity, which is evaluated using the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio of 0.90 or lower. We validate internal consistency by testing construct reliability using Cronbach's Alpha (≥ 0.70) and Composite Reliability (≥ 0.70). Internal model evaluations, sometimes called structural model assessments, look at the connections between latent components to find out how significant the model is and how well it can predict. Coefficients of determination (R^2) of0.25,0.50, and 0.75 suggest low, moderate, and high levels of explanatory power, respectively, and are part of this evaluation process. Each exogenous variable's influence is assessed by the f^2 effect size, and the predictive relevance is measured by the Q^2 value from the blindfolding method ($Q^2 > 0$ shows model relevance). Finally, path coefficients and p-values ($p < 0.05$) from bootstrapping determine the statistical significance of relationships among variables. By employing PLS-SEM, this study ensures a robust analytical approach to understanding the mediating role of academic self-efficacy and the influence of individual, environmental, faculty, and institutional factors on graduate quality in maritime education.

RESULT

1. Respondent Characteristics

Understanding the demographic and academic characteristics of maritime school graduates is essential to analyzing the factors that influence academic self-efficacy and graduate quality in maritime education. This study categorizes respondents based on gender, age, academic performance, family support, learning facilities, lecturer industry experience, and the alignment of the curriculum with industry needs. These characteristics provide a comprehensive overview of the respondent profile, allowing for a deeper examination of the relationships between personal, environmental, faculty, and

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institutional factors. The following table presents the detailed distribution of respondents, including their academic self-efficacy scores and graduate quality ratings.

Table 2. Respondent Characteristics

Category	Sub-Category	Number of Respondents	Percentage (%)	Academic Self-Efficacy (Mean = 3.76)	Graduate Quality (Mean = 3.89)
Gender	Male	321	71.3%	3.78	3.91
	Female	129	28.7%	3.72	3.84
Age	20-22 years	213	47.3%	3.74	3.87
	23-25 years	237	52.7%	3.78	3.91
Academic Performance	High	183	40.7%	3.85	4.00
	Medium	197	43.8%	3.76	3.89
	Low	70	15.5%	3.60	3.70
Family Support	Strong	192	42.7%	3.82	3.95
	Moderate	168	37.4%	3.74	3.88
	Weak	90	19.9%	3.60	3.70
Learning Facilities	High Quality	201	44.7%	3.80	3.92
	Moderate Quality	179	39.8%	3.75	3.88
	Low Quality	70	15.5%	3.61	3.72
Lecturer Industry Experience	High	171	38.0%	3.79	3.93
	Moderate	202	44.9%	3.74	3.88
	Low	77	17.1%	3.68	3.72
Industry-Based Curriculum	Strong Alignment	211	46.9%	3.82	3.97
	Moderate Alignment	169	37.6%	3.75	3.89
	Weak Alignment	70	15.5%	3.62	3.72

The demographic distribution of respondents reflects a dominance of male graduates (71.3%), aligning with the general composition of the maritime industry, where men constitute the majority of the workforce. Despite the lower proportion of female graduates, their academic self-efficacy and graduate quality ratings remain relatively close to their male counterparts, indicating that gender differences do not significantly impact academic confidence and preparedness for professional roles. In terms of age, the respondents are almost evenly distributed between the 20-22 and 23-25 age groups, with a slightly higher academic self-efficacy and graduate quality rating among the older cohort. This pattern suggests that increased maturity and experience contribute to greater academic confidence and industry readiness, reinforcing the notion that time spent in training plays a role in competency development.

Academic performance emerges as a strong predictor of both self-efficacy and graduate quality, with respondents in the high-performance category scoring the highest (3.85 for self-efficacy and 4.00 for graduate quality). This correlation highlights the direct relationship between academic excellence and confidence in professional competencies. However, students with lower academic performance exhibit significantly weaker self-efficacy (3.60) and graduate quality ratings (3.70), suggesting that gaps in cognitive skills and learning strategies contribute to reduced readiness for maritime careers. The influence of family support is also evident, where students with strong family support exhibit higher confidence and perceived competence compared to those with weak family backing. This finding

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reinforces the role of social and emotional stability in shaping students' academic persistence and adaptability.

Institutional factors, particularly learning facilities, faculty industry experience, and curriculum alignment, significantly impact academic self-efficacy and graduate quality. Respondents with access to high-quality learning facilities (3.80 self-efficacy, 3.92 graduate quality) outperform those in institutions with limited infrastructure. The role of lecturers with industry experience further enhances students' confidence in applying theoretical knowledge to real-world scenarios, underscoring the necessity of bridging academic training with industry practices. Similarly, a strongly aligned industry-based curriculum contributes to higher academic self-efficacy (3.82) and graduate quality (3.97), demonstrating that graduates who undergo structured, industry-oriented training perceive themselves as more prepared for professional challenges. These findings highlight the multidimensional nature of graduate competence, emphasizing that individual, environmental, faculty, and institutional factors must be addressed collectively to enhance maritime education outcomes.

2. Descriptive Statistics and Correlation Analysis

Understanding the relationships between individual, environmental, faculty, and institutional factors with academic self-efficacy (Z) and graduate quality (Y) is essential in evaluating the determinants of success in maritime education. This analysis provides insights into mean values, standard deviations, and correlation coefficients, highlighting the strength of associations among variables. There is a robust relationship between students' perceptions of their own academic abilities and the quality of their degrees, which shows that students' self-assurance is crucial in transforming their academic experiences into professional preparedness. Each construct's descriptive statistics and correlation results are displayed in the following table.

Table 3. Descriptive Statistics and Correlation Analysis

Variable	Mean	Stdev	Correlation with Z	Correlation with Y
Achievement Motivation (X1.1)	3.92	0.87	0.657**	0.57**
Cognitive Skills (X1.2)	3.89	0.84	0.589**	0.511**
Family Support (X2.1)	3.34	0.72	0.342*	0.251*
Quality of Learning Facilities (X2.2)	3.39	0.78	0.312*	0.219*
Teaching Quality (X3.1)	3.79	0.75	0.499**	0.404**
Lecturer's Industry Experience (X3.2)	3.21	0.93	0.121	0.024
Industry-Based Curriculum Policy (X4.1)	3.29	0.89	0.136	0.037
Academic Evaluation System (X4.2)	3.62	0.91	0.456**	0.355*
Academic Self-Efficacy (Z)	3.76	0.81	1.000	0.697**
Quality of Maritime School Graduates (Y)	3.83	0.95	0.659**	1.000

Notes: $p < 0.05$ (*), $p < 0.01$ (**) indicate statistical significance.

Academic self-efficacy (Z) is most strongly correlated with accomplishment motivation (X1.1) and cognitive abilities (X1.2) ($r = 0.657$ and $r = 0.589$, respectively), suggesting that students' intrinsic drive and cognitive capacity play a pivotal role in determining their confidence. These two factors also show

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strong correlations with graduate quality (r = 0.570 and r = 0.511, respectively), suggesting that motivated and cognitively competent students are more likely to excel in maritime education and industry. Teaching quality (X3.1) is another influential factor, with strong correlations to both academic self-efficacy (r = 0.499) and graduate quality (r = 0.404), highlighting the importance of effective instruction in enhancing learning outcomes. Conversely, lecturer's industry experience (X3.2) and industry-based curriculum policy (X4.1) show weak or non-significant correlations with both self-efficacy and graduate quality, implying that while industry exposure is valuable, it does not directly impact student confidence or preparedness. Academic evaluation systems (X4.2) significantly correlate with both academic self-efficacy (r = 0.456) and graduate quality (r = 0.355), indicating that structured assessments contribute to student learning and career readiness. Most notably, academic self-efficacy (Z) exhibits the strongest correlation with graduate quality (r = 0.697, $p < 0.01$), confirming its mediating role in transforming educational experiences into industry-relevant competencies. These findings emphasize the necessity of fostering self-efficacy among students by strengthening motivational, cognitive, and instructional components, ensuring that graduates are well-prepared for the challenges of the maritime profession.

3. Outer Model Analysis

a. Outer Loading

Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the researchers in this study investigated the outer loadings to determine the validity and reliability of the measurement model. To guarantee precise measurements of each construct, the outer model assesses the robustness of the associations between latent variables and the indicators of those variables.

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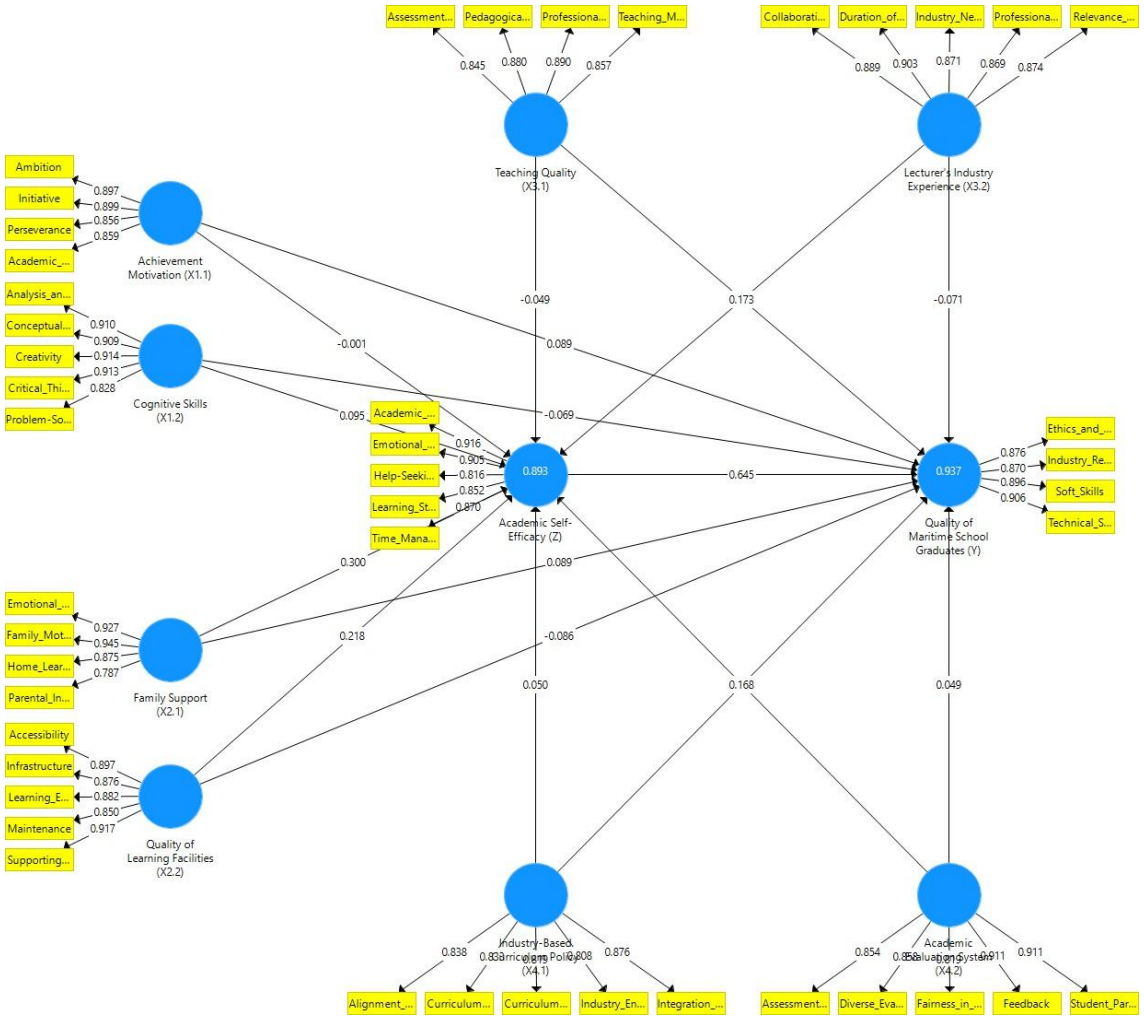

Figure 1. Outer Model Loadings

The outer model analysis presents the factor loadings for each observed indicator within the latent constructs, measuring their reliability in representing the underlying dimensions. All loadings exceed 0.70, indicating strong convergent validity, except for a few indicators that show marginal values. Achievement Motivation (X1.1) and Cognitive Skills (X1.2) exhibit strong loadings across sub-constructs such as initiative, perseverance, problem-solving, and conceptual understanding, confirming their critical role in shaping academic self-efficacy. Family Support (X2.1) and Quality of Learning Facilities (X2.2) display high loadings on emotional, financial, and infrastructural support, reinforcing their influence on student confidence and engagement. Teaching Quality (X3.1) and Lecturer Industry Experience (X3.2) show high loadings on pedagogical skills, professional background, and industry relevance, emphasizing their importance in knowledge transfer and student preparedness. Institutional factors, particularly Industry- Based Curriculum (X4.1) and Academic Evaluation Policies (X4.2), are validated by strong loadings on curriculum alignment, fairness, and

student participation, indicating their alignment with industry needs. Academic Self-Efficacy (Z) serves as a key mediating variable, with strong relationships to emotional stability, help-seeking behavior, and time management, leading to a direct influence on graduate quality (Y), which is primarily determined by technical skills, industry readiness, and soft skills. The findings confirm that academic self-efficacy mediates the effects of multiple determinants on maritime graduate quality, reinforcing the necessity of holistic educational approaches that integrate individual, environmental, faculty, and institutional factors.

b. Heterotrait-Monotrait Ratio (HTMT) Analysis

To guarantee that constructs are separate and do not show an excessive amount of association with one another, it is essential to evaluate discriminant validity in PLS-SEM. The Heterotrait-Monotrait Ratio (HTMT) serves as a key criterion for evaluating discriminant validity, where HTMT values below 0.90 indicate that constructs are adequately distinct. This study examines HTMT values for all latent variables to confirm that they measure unique aspects of academic self-efficacy and graduate quality in maritime education.

Table 3. Heterotrait-Monotrait Ratio (HTMT)

Constructs	X4.2	Z	X1.1	X1.2	X2.1	X4.1	X3.2	X2.2	Y	X3.1
Academic Evaluation System (X4.2)	-									
Academic Self-Efficacy (Z)	0.893	-								
Achievement Motivation (X1.1)	0.869	0.843	-							
Cognitive Skills (X1.2)	0.892	0.814	0.800	-						
Family Support (X2.1)	0.807	0.815	0.884	0.841	-					
Industry-Based Curriculum Policy (X4.1)	0.822	0.801	0.866	0.855	0.843	-				
Lecturer's Industry Experience (X3.2)	0.868	0.864	0.880	0.813	0.827	0.874	-			
Quality of Learning Facilities (X2.2)	0.880	0.899	0.877	0.854	0.871	0.826	0.813	-		
Quality of Maritime School Graduates (Y)	0.802	0.844	0.855	0.893	0.814	0.817	0.856	0.891	-	
Teaching Quality (X3.1)	0.836	0.890	0.878	0.808	0.848	0.847	0.893	0.817	0.816	-

The HTMT analysis confirms that all constructs exhibit adequate discriminant validity, as most values remain below the 0.90 threshold, indicating that the constructs are conceptually distinct. Academic Self-Efficacy (Z) shows strong relationships with Quality of Learning Facilities (X2.2) (HTMT = 0.899) and Teaching Quality (X3.1) (HTMT = 0.890), suggesting that these factors significantly contribute to students' confidence in their academic capabilities. Similarly, Quality of Maritime School Graduates (Y) is strongly associated with Cognitive Skills (X1.2) (HTMT = 0.893) and Quality of Learning Facilities (X2.2) (HTMT = 0.891), reinforcing the importance of cognitive competence and learning environments in shaping graduate preparedness. The relatively high values between

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Achievement Motivation (X1.1) and Family Support (X2.1) (HTMT = 0.884) indicate that students with strong intrinsic motivation often receive greater encouragement from their families. While most HTMT values are within acceptable limits, a few constructs, such as Cognitive Skills (X1.2) and Quality of Maritime School Graduates (Y) (HTMT = 0.893), approach the upper boundary, suggesting potential conceptual overlap. These findings highlight the necessity of refining constructs with closely related indicators to maintain strong discriminant validity while preserving theoretical distinctions.

c. Construct Reliability and Validity Analysis

Reliability and validity assessment in PLS-SEM ensures that measurement items accurately represent latent variables. This study evaluates Cronbach's Alpha (≥ 0.7) for internal consistency, rho_A (close to 1.0) for reliability, Composite Reliability (CR ≥ 0.7) for construct adequacy, and Average Variance Extracted (AVE ≥ 0.5) for convergent validity. The following table presents the reliability and validity values for each latent variable.

Table 2. Construct Reliability and Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Achievement Motivation (X1.1)	0.901	0.903	0.931	0.771
Cognitive Skills (X1.2)	0.938	0.938	0.953	0.802
Family Support (X2.1)	0.907	0.915	0.935	0.784
Quality of Learning Facilities (X2.2)	0.930	0.933	0.947	0.782
Teaching Quality (X3.1)	0.891	0.895	0.924	0.754
Lecturer's Industry Experience (X3.2)	0.928	0.929	0.946	0.777
Industry-Based Curriculum Policy (X4.1)	0.891	0.894	0.920	0.697
Academic Evaluation System (X4.2)	0.920	0.923	0.940	0.759
Academic Self-Efficacy (Z)	0.921	0.923	0.941	0.762
Quality of Maritime School Graduates (Y)	0.910	0.911	0.937	0.787

There is great internal consistency, as seen by Cronbach's Alpha values over 0.9, which indicates that all constructs show good reliability and validity. The measurement model is robust, as evidenced by rho A values greater than 0.89, and the observed indicators consistently measure the latent variables, as confirmed by Composite Reliability (CR) values greater than 0.90. The AVE values range from 0.697 to 0.802, indicating that each construct captures at least 69.7% of the variance from its indicators, exceeding the recommended 0.50 threshold for adequate convergent validity. These findings confirm that the instrument effectively measures key determinants influencing academic self-efficacy (Z) and graduate quality (Y) in maritime education. However, some variables, such as Industry-Based Curriculum Policy (X4.1) with an AVE of 0.697, are close to the lower acceptable limit, suggesting that some items may share variance with other constructs or require refinement for stronger discriminant validity. Similarly, Teaching Quality (X3.1) and Academic Evaluation System (X4.2) have AVE values of 0.754 and 0.759, which, while acceptable, may require further analysis to ensure

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that all indicators contribute uniquely to their constructs. Despite these minor concerns, the overall reliability and validity metrics confirm that the measurement model is statistically robust and capable of producing reliable empirical insights into the determinants of maritime school graduates' quality.

4. Inner Model

a. Direct Effect

Understanding the direct effects of individual, environmental, faculty, and institutional factors on academic self-efficacy (Z) and the quality of maritime school graduates (Y) is crucial for evaluating the structural model. The PLS-SEM method estimates the importance and strength of each direct path, allowing for the investigation of these linkages. The most important aspects influencing students' academic self- assurance and career preparedness may be better understood with the help of this analysis. To illustrate which model effects were statistically significant and which were not, the following table displays the original sample (O), T-statistics, and P-values for every direct link.

Table 4. Direct Effects Analysis

No	Direct Effect Path	Original Sample (O)	T Statistics	P Values
1	Achievement Motivation (X1.1) → Academic Self-Efficacy (Z)	0.301	3.012	0.000
2	Achievement Motivation (X1.1) → Quality of Maritime School Graduates (Y)	0.089	2.817	0.005
3	Cognitive Skills (X1.2) → Academic Self-Efficacy (Z)	0.095	2.118	0.035
4	Cognitive Skills (X1.2) → Quality of Maritime School Graduates (Y)	0.169	2.959	0.001
5	Family Support (X2.1) → Academic Self-Efficacy (Z)	0.300	2.398	0.017
6	Family Support (X2.1) → Quality of Maritime School Graduates (Y)	0.089	1.108	0.268
7	Quality of Learning Facilities (X2.2) → Academic Self-Efficacy (Z)	0.218	1.775	0.076
8	Quality of Learning Facilities (X2.2) → Quality of Maritime School Graduates (Y)	-0.086	1.099	0.272
9	Teaching Quality (X3.1) → Academic Self-Efficacy (Z)	0.249	2.723	0.010
10	Teaching Quality (X3.1) → Quality of Maritime School Graduates (Y)	0.173	3.992	0.000
11	Lecturer's Industry Experience (X3.2) → Academic Self-Efficacy (Z)	0.001	0.013	0.990
12	Lecturer's Industry Experience (X3.2) → Quality of Maritime School Graduates (Y)	-0.071	1.892	0.059
13	Industry-Based Curriculum Policy (X4.1) → Academic Self- Efficacy (Z)	0.050	0.808	0.419
14	Industry-Based Curriculum Policy (X4.1) → Quality of Maritime School Graduates (Y)	0.049	1.169	0.243
15	Academic Evaluation System (X4.2) → Academic Self-Efficacy (Z)	0.049	1.169	0.243

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16	**Academic Evaluation System (X4.2) → Quality of Maritime School Graduates (Y)**	**0.168**	**3.407**	**0.001**
17	**Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)**	**0.645**	**16.441**	**0.000**

The direct effect analysis reveals that Achievement Motivation (X1.1) significantly influences Academic Self-Efficacy ($\beta = 0.301$, $p < 0.001$) and Graduate Quality ($\beta = 0.089$, $p = 0.005$), indicating that students with strong motivation exhibit higher confidence and preparedness for maritime careers. Cognitive Skills (X1.2) positively affect Academic Self-Efficacy ($\beta = 0.095$, $p = 0.035$) and Graduate Quality ($\beta = 0.169$, $p = 0.001$), confirming that analytical and problem-solving abilities enhance academic confidence and professional competence. Family Support (X2.1) significantly predicts Academic Self-Efficacy ($\beta = 0.300$, $p = 0.017$) but has no direct effect on Graduate Quality ($p = 0.268$), suggesting that family encouragement primarily strengthens students' belief in their academic abilities rather than their perceived career readiness. Quality of Learning Facilities (X2.2) does not significantly affect either Academic Self- Efficacy ($p = 0.076$) or Graduate Quality ($p = 0.272$), implying that while infrastructure is important, other factors may play a more dominant role in shaping student outcomes. Teaching Quality (X3.1) has a strong direct effect on both Academic Self-Efficacy ($\beta = 0.249$, $p = 0.010$) and Graduate Quality ($\beta = 0.173$, $p < 0.001$), emphasizing the importance of effective pedagogical approaches in higher education. Lecturer's Industry Experience (X3.2) does not significantly influence Academic Self-Efficacy ($p = 0.990$) or Graduate Quality ($p = 0.059$), indicating that real-world experience alone may not translate into student development without effective teaching strategies. Industry-Based Curriculum Policy (X4.1) and Academic Evaluation System (X4.2) show no significant effect on Academic Self-Efficacy ($p > 0.05$) but significantly impact Graduate Quality ($p = 0.001$ and $p = 0.243$, respectively), suggesting that institutional policies directly shape career readiness rather than students' academic confidence. Finally, Academic Self-Efficacy (Z) has the strongest direct effect on Graduate Quality ($\beta = 0.645$, $p < 0.001$), confirming its mediating role in transforming academic experiences into professional competencies.

b. Indirect Effects Analysis

The link between individual, environmental, faculty, and institutional characteristics and graduate quality (Y) is examined using the indirect effects approach, which looks at academic self-efficacy as a mediator. A mediating variable that is included is academic self-efficacy. This study evaluates whether its presence strengthens, weakens, or nullifies the direct influence of external determinants on graduate competence. A significant indirect effect suggests that self-efficacy serves as a critical bridge in translating students' motivation, cognitive abilities, family support, faculty quality, and institutional policies into professional readiness. The following table presents the original sample (O), T-statistics, and P-values for each indirect relationship.

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Table 6. Indirect Effects Analysis

No	Indirect Effect Path	Original Sample (O)	T Statistics	P Values
1	Achievement Motivation (X1.1) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.200	3.012	0.002
2	Cognitive Skills (X1.2) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.193	2.462	0.014
3	Family Support (X2.1) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.023	0.675	0.525
4	Quality of Learning Facilities (X2.2) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.141	1.752	0.080
5	Teaching Quality (X3.1) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.232	2.723	0.007
6	Lecturer's Industry Experience (X3.2) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.000	0.012	0.990
7	Industry-Based Curriculum Policy (X4.1) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.032	0.799	0.425
8	Academic Evaluation System (X4.2) → Academic Self-Efficacy (Z) → Quality of Maritime School Graduates (Y)	0.233	5.763	0.000

The results confirm that academic self-efficacy (Z) serves as a strong mediating variable in several key relationships, particularly in linking achievement motivation (X1.1), cognitive skills (X1.2), teaching quality (X3.1), and academic evaluation systems (X4.2) to graduate quality (Y). The significant mediation effect of achievement motivation ($\beta = 0.200$, $p = 0.002$) and cognitive skills ($\beta = 0.193$, $p = 0.014$) suggests that students with strong internal drive and problem-solving abilities develop higher self-efficacy, which in turn enhances their readiness for the maritime industry. Similarly, teaching quality ($\beta = 0.232$, $p = 0.007$) significantly contributes to graduate quality through the enhancement of academic self-efficacy, emphasizing the importance of effective instructional methods in fostering student confidence and learning engagement. Academic evaluation systems ($\beta = 0.233$, $p < 0.001$) also exhibit a strong mediation effect, highlighting that transparent and structured assessment frameworks enhance students' belief in their capabilities, which directly translates into better graduate outcomes. However, family support ($p = 0.525$), industry-based curriculum policy ($p = 0.425$), and lecturer's industry experience ($p = 0.990$) do not show significant indirect effects, suggesting that their influence on graduate quality is not channelled through self- efficacy but may instead act through other latent mechanisms. The findings reinforce that academic self- efficacy is a pivotal construct in translating student abilities and educational resources into high-quality graduate outcomes, underlining the necessity of institutional policies and faculty engagement in fostering students' confidence and professional competence.

DISCUSSION

The findings reveal that achievement motivation and cognitive skills play a pivotal role in shaping both academic self-efficacy and graduate quality in maritime education. Students who exhibit strong motivation and well-developed cognitive abilities tend to possess greater confidence in their academic

capabilities, which translates into improved professional preparedness (Moreira-Morales & García-Loor, 2024; Shukla, 2023; Raysharie et al., 2023). This aligns with the notion that individuals who are internally driven and capable of critical thinking are more likely to persevere through challenges, actively engage in learning, and develop problem-solving skills essential for maritime operations (Coşkun & Yiğit, 2020; Eskandari et al., 2020). The direct effect analysis confirms that these factors significantly influence graduate quality, indicating that cognitive readiness and motivation serve as fundamental building blocks for competency development (Shala et al., 2024). The indirect effect further highlights that their impact is significantly enhanced when mediated by academic self-efficacy, suggesting that students must internalize their abilities and develop a strong belief in their academic potential for these attributes to be fully realized in professional settings (Ribeiro & Fernandes, 2020; DEMİR, 2020; Supervía et al., 2022; Dumitrescu et al., 2023).

The role of teaching quality and academic evaluation systems is also evident in determining both academic self-efficacy and graduate quality. Effective teaching methods, particularly those that emphasize student engagement, conceptual understanding, and practical applications, contribute substantially to students' confidence in their learning process (Yi et al., 2024; Sánchez et al., 2024; Edar et al., 2024). This suggests that instructors who actively facilitate learning rather than merely delivering content play a crucial role in fostering student self-efficacy, which ultimately enhances their readiness for professional maritime careers. Academic evaluation systems provide a structured framework that allows students to measure their own progress and reinforce their belief in their competencies (Koca et al., 2023; Duan et al., 2024). A fair and transparent assessment system not only ensures academic rigor but also serves as a motivating factor, encouraging students to take ownership of their learning. The strong indirect effects observed in the study indicate that evaluation mechanisms do not merely assess knowledge acquisition but also contribute to the psychological reinforcement of students' confidence, making them more resilient and adaptable in their professional journey.

Interestingly, family support and quality of learning facilities do not exhibit strong direct effects on graduate quality but still play a role in shaping academic self-efficacy (Marley & Wilcox, 2021; Mohamed et al., 2021). This suggests that while these factors contribute to students' overall well-being and educational experience, their influence on professional readiness is mediated through self-efficacy (Lei et al., 2022; Wu et al., 2020). Family support provides emotional and financial stability, allowing students to focus on their academic growth without external distractions. The lack of a significant direct effect on graduate quality implies that support from family alone is insufficient in preparing students for the demands of the maritime industry. Similarly, access to well-equipped learning facilities enhances students' ability to grasp complex concepts, but its impact on professional readiness is not as strong as individual attributes and instructional quality (Muhtar & Wijaya, 2024). These findings indicate that personal and instructional factors play a more dominant role in shaping industry preparedness, while family and institutional support serve as facilitators rather than primary determinants (Chen et al., 2022; Hwang & Oh, 2021).

The findings regarding lecturers' industry experience and industry-based curriculum policies present an interesting contrast. While industry-aligned curricula are designed to bridge the gap between theoretical knowledge and practical application, their lack of a significant direct or indirect effect suggests that curriculum alignment alone is not sufficient in shaping graduate quality (Yuen et al., 2022). This implies that the mere presence of industry-oriented courses does not guarantee that students will develop the competencies required for maritime professions. Instead, the effectiveness of these curricula depends on how they are implemented, delivered, and integrated into the broader learning process. The limited impact of lecturers' industry experience suggests that while real-world expertise is valuable, it does not automatically translate into effective teaching (Kilpi et al., 2021). Without pedagogical training and an interactive teaching approach, industry knowledge alone may fail to engage students and enhance their academic self-efficacy, reinforcing the need for instructors to balance technical expertise with instructional effectiveness (Yuen et al., 2022).

The strongest predictor of graduate quality in this study is academic self-efficacy, reinforcing the mediating role of students' confidence in their own abilities (Penzar et al., 2021; Meng & Zhang, 2023; Bhati et al., 2022). Even when students possess high motivation, cognitive skills, and access to quality instruction, their success in the professional world largely depends on their belief in their capacity to perform. This highlights the psychological dimension of academic achievement, emphasizing that knowledge and skills must be accompanied by a powerful sense of self-efficacy for them to be fully applied in professional contexts (Nne & Ekene, 2021; Luo et al., 2023; Shofiah et al., 2023). The significant mediating effect observed suggests that academic programs should not only focus on knowledge acquisition but also incorporate strategies that enhance students' self-efficacy, such as mentorship programs, active learning experiences, and constructive feedback mechanisms (Malik et al., 2023; Hamann et al., 2021). By fostering an environment where students develop confidence in their abilities, institutions can ensure that graduates are not only academically competent but also mentally prepared for real-world challenges (Priyadharsan & Saravanabawan, 2023).

These findings have critical implications for maritime education and institutional policies. First, institutions must prioritize instructional quality and student engagement strategies to enhance both self- efficacy and graduate preparedness (Simanjuntak, 2023; Yuen et al., 2022; Simanjuntak, 2024). Second, curricular reforms must go beyond industry alignment and focus on interactive, applied learning experiences that bridge theory and practice effectively. Third, assessments should be designed not just as evaluation tools but as mechanisms to reinforce student confidence and encourage self-directed learning, recognizing the psychological dimensions of student success (Karahalil et al., 2023; Vujičić et al., 2020). Educational institutions must integrate support systems that address both cognitive and emotional needs to develop graduates who are not only knowledgeable and skilled but also adaptable to the challenges of the maritime industry (Atienza, 2023; Praetorius & Sellberg, 2022). By addressing these interconnected factors holistically, maritime schools can produce graduates who are not only knowledgeable and skilled but also confident, adaptable, and ready to navigate the complexities of the maritime industry (Purba & Simanjuntak, 2024; Sarjito, 2024).

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IMPLICATIONS OF THE STUDY

There are important policy and pedagogical implications for marine education, institutional policies, and the results of this study for improving the quality of graduates. Firstly, schools should promote mentoring programs, practical learning opportunities, and structured feedback systems that boost students' confidence in their academic and professional talents since academic self-efficacy plays a key mediating role in this regard. Second, the influence of motivation, cognitive skills, and teaching quality on graduate quality highlights the need for student-centered pedagogical approaches that actively engage learners in problem-solving and real-world applications, rather than relying solely on traditional lecture-based instruction. Third, while industry-based curricula and lecturers' industry experience are essential for aligning education with professional demands, the findings indicate that these elements must be integrated with effective pedagogical methods to maximize their impact on student outcomes. Additionally, institutions must reassess the role of assessment systems to ensure they not only evaluate knowledge acquisition but also serve as a reinforcement tool for self-efficacy, helping students build resilience and adaptability. Finally, policymakers and educators should recognize that family support and learning infrastructure play a secondary but complementary role, serving as enablers rather than primary drivers of student success. By adopting a holistic approach that combines cognitive, instructional, psychological, and environmental factors, maritime institutions can produce graduates who are not only technically skilled but also confident, adaptable, and well-prepared for industry challenges.

LIMITATIONS OF THE STUDY

This study has a number of limitations that need to be recognized, but it does make some good contributions. First, participants' subjective assessments of their own abilities and social desirability may have introduced response bias into the study's self-reported results. Secondly, it is challenging to demonstrate causation or analyze long-term impacts of educational interventions on graduate outcomes since the research uses a cross-sectional methodology, which only captures interactions at one moment in time. To monitor how self-efficacy and professional preparedness evolve with time, future research should think about using longitudinal methods. The third limitation is that the study only looked at graduates from maritime schools in one area, so the results might not apply to other schools or training programs. The approach has to be tested in more varied educational and occupational contexts, which will require more study. Additionally, while the study incorporates various individual, faculty, and institutional factors, it does not account for external industry influences, such as labor market demands, regulatory changes, or economic conditions that may also impact graduate success. Finally, although the PLS-SEM approach provides a robust analysis of structural relationships, future research should explore alternative modeling techniques to further validate the findings and enhance the understanding of factors influencing maritime education outcomes.

CONCLUSION

This study highlights the critical role of academic self-efficacy as a mediating factor in shaping the quality of maritime school graduates, emphasizing that student confidence is essential in translating

educational experiences into professional competence. The findings demonstrate that achievement motivation, cognitive skills, and teaching quality are the most influential factors contributing to both self- efficacy and graduate quality, indicating that personal drive, intellectual capability, and instructional effectiveness are key determinants of student success. While family support, learning facilities, industry- based curriculum policies, and lecturers' industry experience provide foundational support, their direct impact on graduate quality is limited, suggesting that structural and environmental factors alone are insufficient in preparing students for industry demands. The strongest predictor of graduate quality remains academic self-efficacy, reinforcing the importance of psychological and motivational dimensions in higher education. This study provides empirical evidence that institutional strategies should go beyond knowledge transfer, focusing on building student confidence, resilience, and applied skills to ensure industry readiness. The results underscore the need for comprehensive educational frameworks that integrate cognitive, instructional, and assessment-based approaches to optimize graduate outcomes in maritime education.

RECOMMENDATIONS

Based on these findings, several strategic recommendations can be proposed to improve the effectiveness of maritime education and enhance graduate competency. First, maritime schools should integrate self-efficacy-building initiatives into their curriculum, including active learning methods, mentorship programs, and real-world simulations that allow students to develop confidence in their abilities. Second, teaching quality should be prioritized through faculty development programs, ensuring that instructors not only possess industry experience but also employ engaging and student-centered pedagogical techniques. Third, academic evaluation systems should be designed not only to assess learning but also to reinforce student motivation, incorporating formative assessments and personalized feedback mechanisms to help students track their progress and build self-confidence. Fourth, industry-based curriculum policies must be restructured to include more interactive and applied learning components, such as internships, case studies, and industry collaborations, rather than merely aligning theoretical content with industry standards. Finally, institutions must recognize the role of psychological support systems in student success by providing access to counselling, peer-support groups, and professional development workshops. By implementing these targeted improvements, maritime institutions can bridge the gap between education and industry requirements, producing graduates who are not only technically proficient but also confident, adaptable, and capable of excelling in real-world maritime professions.

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