Proficiency in Critical Thinking Skills within the MET Program for Thai Seafarers

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Abstract

This research delves into the critical domain of proficiency in necessary thinking skills within the Maritime Education and Training (MET) program for Thai seafarers under STCW convention standards. In ship navigation, it is essential to have a ship's navigator responsible for controlling the ship from the original port to the destination port. Therefore, the competence of seafarers becomes paramount. While conventional seafarer training has emphasized practical skills, there is an evolving balance with cognitive skills, particularly critical thinking? This study seeks to bridge this gap by developing a comprehensive conceptual framework for Proficient essential thinking skills within MET programs. A triangulation approach was employed using qualitative methods, encompassing literature reviews, semi-structured interviews with experts, and observations/surveys involving students, instructors, curriculum experts, and academic institutions. The analysis revealed 48 critical thinking proficiency indicators across four domains: Students, Instructors, Curriculum, and Institutions. Furthermore, in this research, we also present a model of thinking skills for seafarers that will help individuals involved in understanding the components of critical thinking for seafarers in a clear and easily comprehensible manner. This research will enable educational institutions and shipping companies to train seafarers in critical thinking skills. These skills will empower seafarers to navigate complex challenges at sea and respond to emergencies efficiently, enhancing safety and reducing potential maritime accidents.

Keywords: Critical Thinking, Seafarer Training, Maritime Industry, Maritime Education and Training

1. Introduction

1.1 Background and Importance of the Problem

Human activities are depleting available resources at a rate that exceeds their natural replenishment. This phenomenon is particularly pronounced in globalisation, technology, communication, and transportation. Using resources has outpaced the Earth's capacity to generate them in these domains. Numerous transportation mechanisms are employed to distribute resources to meet the demands of global citizens. Christiansen et al. (2007) state that maritime transportation is central to facilitating international trade. However, it is essential to note that a substantial portion of this burden falls upon the world's oceans. Endowed with extensive coastlines and navigable rivers, Thailand has historically relied on its primary port and water-based transportation infrastructure.

The influence of maritime trade on economic growth is pronounced (Ayesu et al., 2023), primarily attributable to the concurrent reduction in transportation costs, propelling economic expansion. Furthermore, a multitude of factors, encompassing maritime, air, and terrestrial transport infrastructure trade facility measures, collectively assume pivotal roles in substantiating their significant contributions to economic growth within nations; consequently, it becomes evident that seaborne trade bears for economic advancement, particularly within those countries endowed with well-established seaport facilities.

The significant facet of maritime transportation revolves around the essential human resources component, which necessitates competency in alignment with the standards delineated by the International Maritime Organization (IMO) within the Standards of Training, Certificate, and Watchkeeping for Seafarers (STCW) framework (Mejia, 2010). Thailand, a signatory state, has ratified the STCW convention, obligating itself to adhere rigorously to the stipulation. The training of Thai seafarers, encompassing the curricula and education institutes, falls under the purview of The Marine Department. This oversight is geared towards ensuring strict compliance with the standards, thereby equipping these individuals with the requisite knowledge and experience of their roles as seafarers upon embarking on their maritime careers.

Seafarer training has traditionally emphasized the acquisition and application of practical skills, with a predominant emphasis on cognitive skills being allocated to facilitating proficiency in task-specific activities (Manuel, 2017). Conversely, academic education is conventionally characterized by its concentration on cultivating profound analytical and critical thinking competencies. The prevailing global trajectory within the maritime realm between these two domains is vocational and academic education. The evolution has engendered certain predicaments in curriculum development, particularly concerning attaining desired learning outcomes within the professional setting. Nevertheless, it is crucial to emphasize that the IMO has established fundamental competencies for seafarer training programs as part of the STCW Convention. Critical thinking skills are of utmost significance among these proficiencies, as they are considered indispensable in every dimension of seafarer training. The pertinence of these skills extends throughout the entire lifelong learning journey that characterizes a seafaring career. Notably, there is currently a notable scarcity of comprehensive research aimed at delineating the precise parameters of Seafarers' training framework by critical thinking skills concept to the unique context of Thai seafarers.

1.2 Research Question

This study explores and constructs a comprehensive conceptual framework for maritime education and training within this framework, focusing on published articles in academic journals and dissertations in this field. The critical thinking skills will be dissected into constituent factors or latent variables that significantly affect seafarers'' productivity and their ability to engage in lifelong learning.

1.3 Research Objective

1. To define the critical thinking necessary for training seafarers.

2. To create a primary model for the critical thinking of seafarers.

2. Literature Review

2.1 Related Concepts and Theories

2.1.1 Critical Thinking Skills

Sriantini and Mega Teguh Budiarto (2022) defines the skill of reviewing and analyzing certain information, identifying evidence, identifying assumption, and applying multiple strategies to conclusions based on assessment standard. It involves interpretation, analysis, evaluation, and conclusion and requires a wise attitude in considering the problem at hand by investigating using critical skills. Also, the other positive thing to support (Alsaleh, 2020) is the technology that can be used to promote students' critical thinking skills, for example, web-based simulation learning frameworks and asynchronous discussion forums in skills. It is important to note that the effectiveness of technology in promoting critical thinking skills depends on how it is integrated into the curriculum and teaching approaches.

The practical teaching approaches for developing critical thinking skills in student problem-based learning, inquiry-based learning, collaborative learning, and writing-to-learn were developed. In addition, rubrics effectively promote one by providing clear criteria for evolution—the result of grade level and integrated into curriculum content to develop successful critical thinkers.

2.2.2 Maritime Education and Training

The port-pandemic period will accelerate the transformation processes of maritime education and training. Milić-Beran et al., (2021). The maritime industry requires highly skilled and specialized crews adapting to ever-evolving technology. (Demirel, 2020) Future seafarers will witness increasing digitalization aboard ships, making proficiency in monitoring computerized systems as crucial as the seafarer's role today. However, these skills must encompass digital literacy, enabling effective operation and troubleshooting of cyber-physical interfaces. Remote work and responsibility for multiple vessels through remote operation may become prevalent.

The adaption of technology-driven lifelong learners (Kataria & Emad, 2022) is essential for the current seafarers in a dynamic industry - integrating technology and training, aligning with the onboard technology. During the COVID-19 pandemic, the rapid incorporation of new technologies into MET disrupted traditional classroom-based methods by paving the way for technologically

enhanced maritime blended and e-learning. Therefore, the traditional seafarer-training model may not suffice for future operators who may not be physically present aboard autonomous vessels.

Education and training are crucial in maintaining maritime security (Prasetyo et al., 2023). To enhance the effectiveness of maritime defense, it is essential to incorporate the principles of a comprehensive maritime defense strategy into education and training programs (Prasetyo et al., 2023). A study focused on quality criteria in maritime education and training. (Yildirim, 2022) The study identified professional and personal development, a sense of professional ethics, publication, research, and compliance with and effective use of course hours as the most fundamental criteria for ensuring quality (Yildirim, 2022). These findings provide valuable insights for educational institutions to evaluate their strengths and weaknesses in terms of quality.

Another research investigated how incorporating maritime culture into a chemistry laboratory influences university students' critical thinking ability (Laksmiwati et al., 2019). The study utilized a quasi-experimental design and found that incorporating maritime culture into laboratory activities positively influenced students' critical thinking ability in titration and chemistry material substance. These studies highlight the importance of quality criteria, the incorporation of maritime defense strategy principles, and the integration of maritime culture in education and training programs for the maritime industry. By considering these factors, educational institutions can enhance the effectiveness and relevance of maritime education and training, ultimately contributing to developing skilled and competent maritime professionals.

2.1.3 Seafarers Training

They are adopted by the IMO (STCW, 2011) to establish minimum training, certificate, and watchkeeping standards for seafarers to ensure their competence and safety at sea. STCW sets forth requirements for various categories of maritime professionals, including deck officers, engineering officers, and other crew members. Key components of the STCW Convention include Minimum Training Standards, Certificates, Watchkeeping Standards, Updating and Refresher Training, Medical Fitness, and Implementation and Compliance.

STCW certification is a crucial element of a seafarer's career as it attests to their competency and ensures that they are qualified to work on ships internationally. It contributes to the safety and efficiency of global maritime operations by setting consistent and high standards for seafarer training and competence. The Marine Department regulates the oversight of MET for Thai Seafarers. (Wongpet & Muangpan, 2021). This regulatory authority ensures the quality standards of learners, instructors, curricula, and educational institutions. Incorporating critical thinking skills into each component represents a strategic orientation towards guiding individuals in their careers and fostering lifelong learning.

2.2 Literature Surveys

Several studies have explored instances of proficient critical thinking exhibited by seafarers. One study (Sanavi & Tarighat, 2014) investigated the influence of instructing critical thinking skills on the speaking proficiency of Iranian learners of English as a Foreign Language (EFL). Employing a mixed-method approach incorporating quasi-experimental techniques, the research revealed a substantial enhancement in speaking proficiency due to explicit critical thinking instruction. (Lau & Ng, 2015) The maritime sector has evolved into a multifaceted domain, necessitating the presence of adept professionals adept at studying and resolving intricate issues. The competencies requisite for

Industry 4.0, encompassing the maritime sector, encompass proficiencies such as critical thinking, analytical reasoning, and resolving intricate problems (Mudzar & Chew, 2022). Simulators are pivotal in cultivating technical, procedural, and operational proficiencies within the maritime industry (Renganayagalu et al., 2019). Maritime education should aspire to enhance the seamless integration of human activities with the ecological intricacies inherent to maritime environments. (Lau & Ng, 2015) Soft skills, such as adaptability, communication, problem-solving, and teamwork, are also essential in the maritime industry and contribute to employee contextual performance (Chala & Bouranta, 2021).

Furthermore, the relationship between critical thinking and job performance among seafarers has also been examined and studied the impact of work-family conflict, job stress, and job satisfaction on seafarer performance. The findings indicated that work-family conflict and job stress negatively affected seafarer performance, while job satisfaction had a positive influence. As well as the quality of maritime education and training programs is also a critical factor. A study in China highlighted the importance of the curriculum offered in educational institutions in Hong Kong in shaping the quality of future officer capability training (Bao et al., 2021). The study emphasized the need for the curriculum to comply with industry standards and meet the demands of the maritime sector.
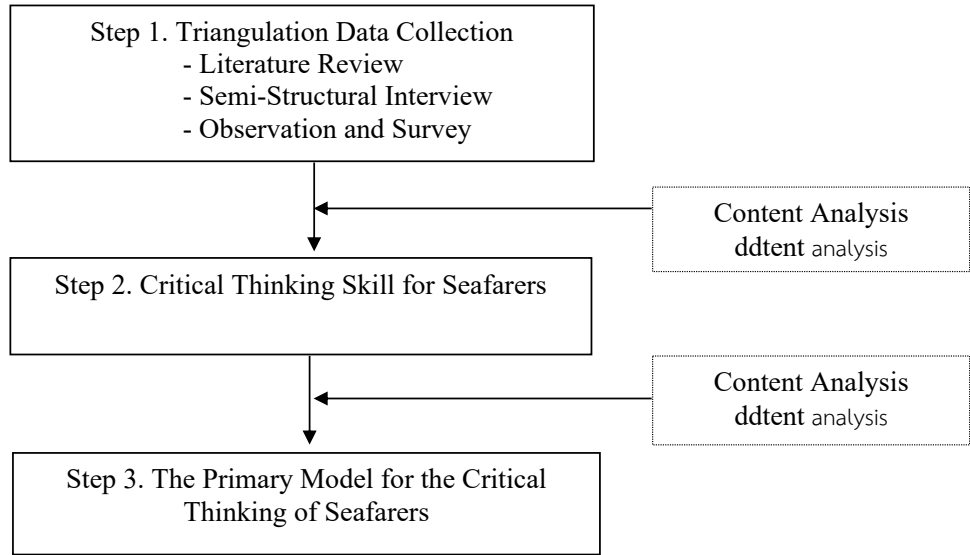
This highlights the importance of teaching critical thinking skills to seafarers and the potential impact on their language proficiency, job performance, and overall development. By enhancing critical thinking, seafarers can improve their communication, problem-solving, and decision-making processes, ultimately contributing to their effectiveness and success in their maritime roles.

3. Research Methodology

This research employed qualitative methodologies to investigate and gather insights into critical thinking skills within the MET framework for Thai seafarers. The preliminary phase of the study entailed the application of the Triangulation method, combining data obtained through comprehensive literature reviews and semi-structured interviews. Subsequently, content analysis techniques were deployed to discern pertinent critical thinking skills and to construct a conceptual model.

3.1 Research Design

The research framework in Figure 1 illustrates that the researchers have divided the process into three steps. In the first step, researchers employ triangulation data collection to gather information. Subsequently, researchers utilize content analysis to analyze the collected data until researchers can identify critical thinking factors specific to seafarers. Following this, the researchers use the gathered insights to construct a primary model for seafarers' critical thinking, aiming to facilitate a more precise and straightforward understanding.

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┌──────────────────────────────────────────┐
│   Step 1. Triangulation Data Collection   │
│          - Literature Review              │
│          - Semi-Structural Interview      │
│          - Observation and Survey         │
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                    │
                    │         ┌────────────────────────┐
                    │◄────────│   Content Analysis      │
                    ▼         │   ddtent analysis       │
┌──────────────────────────────────────────┐ └────────────────────────┘
│  Step 2. Critical Thinking Skill for      │
│          Seafarers                         │
└──────────────────────────────────────────┘
                    │         ┌────────────────────────┐
                    │◄────────│   Content Analysis      │
                    ▼         │   ddtent analysis       │
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│  Step 3. The Primary Model for the        │
│          Critical Thinking of Seafarers    │
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Figure 1 Research Framework

3.2 Population and Sample

This research comprehensively examines academic journal reviews, explicitly focusing on published articles. Various databases were employed to facilitate this process, including Science Direct, Scopus, Emerald Insight, IEEE, Google Scholar, and ThaiJo. These databases facilitated keyword searches on "Maritime Education and Training" and "Critical Thinking Skills." The researchers reviewed academic articles published between 2019 and 2023. The research found 12 articles, among which 36 were in the field of MET. These articles addressed topics such as adherence to the STCW code and IMO model course, in addition to administered by the Thai Marine Department monitoring the standards and prerequisites related to knowledge and competencies expected of Thai seafarers. In the secondary phase, the data analysis examined Critical Thinking Skills.

The researchers selected a sample group for interviews, consisting of individuals meeting specific criteria. The criteria included a minimum of 10 years of work experience in the MET field and ten senior students (5th-year students).

3.3 Research Instruments

This research used open-ended interview guidelines as research instruments covering four key components: the student, instructor, curriculum, and institution. The semi-interviews were conducted with maritime lecturers and students involved in MET.

3.4 Data Collection

This research employed a triangulation data collection approach and utilized content analysis as the primary research methodology. The analysis aimed to discern the fundamental domains and assess the proficiency of critical thinking skills within each domain. This endeavour culminated in the development of a conceptual framework for MET.

3.5 Statistics Used for Data Analysis

Content analysis was a method to examine concepts and conceptual variables. This rigorous scrutiny facilitates a comprehension of the subject matter in question. Such an approach is instrumental in the initial formulation of the theoretical model and an indication of the research objective and requirements. The content analysis enjoys widespread recognition for its capacity to credibility of outcomes, a characteristic that has been substantiated in prior scholarly investigation. (Pariafsai & Behzadan, 2021) Applying this research methodology, the investigators successfully constructed a conceptual framework delineating MET's proficiency levels in critical thinking skills. This endeavour has enhanced our understanding of the essential domains and critical thinking skills necessary for Thai seafarers and the advancement of MET programs.

4. Data Analysis and Findings

4.1 Introduction

The research outcomes are split into two sections. The initial section explicates the level of proficiency exhibited by critical thinking skills within the domain of MET. Meanwhile, the subsequent section provides a comprehensive conceptual model of proficiency in critical thinking skills within the MET program.

4.2 Data Analysis of the Quantitative Data

4.2.1 Proficiency in Critical Thinking Skills within the MET Program from Reviewed Literature

The assessment of the quality control measures in the MET program drew from various authoritative sources, including the STCW Code, the IMO model course guidelines, and official notifications issued by the Thai Marine Department. The research findings revealed that the MET program for Thai seafarers encompasses four domains: students, instructors, curriculum, and institutions. As ascertained through an extensive literature review, proficiency in critical thinking skills within the MET program is presented in Table 1-4 to guide individuals in their career and lifelong learning.

Student proficiency in critical thinking skills is crucial to education and personal development. Critical thinking is analyzing, evaluating, and synthesizing information, ideas, and arguments thoughtfully and logically.

Table 1 Student Proficiency in Critical Thinking Skills

Domain	Proficiency	Reference
Student (ST)	ST01: Importance of critical thinking	(Boulougouris et al., 2019; Rimiene, 2002)
	ST02: Developmental Stages	(Ennis, 1987; Paul & Elder, 2006)
	ST03: Educational Approaches	(Goel, Chen, & Wierman, 2017)
	ST04: Assessment	(Paul & Elder, 2006)
	ST05: Encouraging critical thinking	(Halpern, 2014)
	ST06: Interdisciplinary Learning	(Council, 2012; Paul & Elder, 2006)
	ST07: Real-world application	(Quieng, Lim, & Lucas, 2015)

	ST08: Feedback and Reflection	(Halpern, 2014; Paul & Elder, 2006)
	ST09: Cultural and Global Perspective	(PA Facione, 2015; Paul & Elder, 2006)
	ST10: Continuous Improvement	(P. A. Facione, 2011; Paul & Elder, 2006)

Instructor proficiency in critical thinking skills is equally important as student proficiency. Effective educators with strong critical thinking skills can teach these skills to their students and be role models for applying them in various contexts.

Table 2 Instructor Proficiency in Critical Thinking Skills

Domain	Proficiency	Reference
Instructor (IN)	IN01: Understanding Critical Thinking	(Hairunnisa, Zaini, Badruzsaufari, Aufa, Warnida, & Hasbie, 2022; Sapulete & Sopacua, 2021)
	IN02: Modeling Critical Thinking	(P. A. Facione, 2011; Paul & Elder, 2006)
	IN03: Continuous Learning	(PA Facione, 2015; Halpern, 2013)
	IN04: Effective Questioning Techniques	(Goel, Chen, & Wierman, 2017; Kwon, 2008)
	IN05: Providing Constructive Feedback	(P. A. Facione, 2011; Paul & Elder, 2006)
	IN06: Designing Critical Thinking Exercises	(Goel, Chen, & Wierman, 2017; Klebba & Hamilton, 2007; Kwon, 2008)
	IN07: Encouraging Diverse Perspectives	(P. A. Facione, 2011; Halpern, 2014; Paul & Elder, 2006)
	IN08: Real-World Application	(Quieng, Lim, & Lucas, 2015)
	IN09: Self-Reflections	(Halpern, 2014; Paul & Elder, 2006)
	IN10: Collaboration	(PA Facione, 2015; Halpern, 2013; Paul & Elder, 2006)
	IN11: Assessment	(Peter Facione, 1990; Paul & Elder, 2006)
	IN 12: Professional Ethics	(Innabi & Sheikh, 2006; Kwon, 2008)

Curriculum proficiency in critical thinking skills refers to the effectiveness of an educational curriculum in fostering and developing students' critical thinking abilities. A well-designed curriculum should provide opportunities for students to engage in activities, assignments, and experiences that promote acquiring and applying critical thinking skills.

Table 3 Curriculum Proficiency in Critical Thinking Skills

Domain	Proficiency	Reference
Curriculum (CU)	CU01: Defined Learning Objectives	(Ennis, 1987; Halpern, 1998)
	CU02: Progressive Development	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)
	CU03: Interdisciplinary Approach	(Goel, Chen, & Wierman, 2017; Ritter & Scott, 2007; Ünaldı & Yuce, 2020)
	CU04: Active Learning Strategies	(Goel, Chen, & Wierman, 2017; Ritter & Scott, 2007)
	CU05: Assessment Alignment	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)
	CU06: Incorporation of Diverse Perspectives	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)
	CU07 Real-World Relevance	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006; Quieng, Lim, & Lucas, 2015)
	CU08: Teacher Training and Support	(Ünaldı & Yuce, 2020)
	CU09: Integration of Technology	(Goel, Chen, & Wierman, 2017)
	CU10: Feedback Mechanisms	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)
	CU11: Flexibility	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)
	CU12: Continuous Improvement	(Ennis, 1987; Peter Facione,1990; Halpern, 1998; Paul & Elder, 2006)

Institutional proficiency in critical thinking refers to an educational institution's capacity to effectively promote, teach, and assess critical thinking skills among its students, faculty, and staff. Achieving institutional proficiency in critical thinking skills is essential for providing a well-rounded and holistic education.

Table 4 Institutional Proficiency in Critical Thinking Skills

Domain	Proficiency	Reference
Institutional (IN)	IS01: Mission and Values	(P. A. Facione, 2011; Halpern, 2013)
	IS02: Curriculum Integration	(Sanavi & Tarighat, 2014)
	IS03: Faculty Development	(Goel, Chen, & Wierman, 2017; Sanavi & Tarighat, 2014)
	IS04: Assessment and Accountability	(PA Facione, 2015; Halpern, 2013)
	IS05: Diversity and Inclusivity	(P. A. Facione, 2011; Paul & Elder, 2006)
	IS06: Interdisciplinary Initiatives	(PA Facione, 2015; Halpern, 2013)
	IS07: Experiential Learning	(PA Facione, 2015; Halpern, 2013)
	IS08: Technology Integration	(P. A. Facione, 2011; Paul & Elder, 2006)
	IS09: Student Support Services	(P. A. Facione, 2011; Paul & Elder,

		2006)
	IS10: Assessment of Institutional Practices	(PA Facione, 2015; Halpern, 2013)
	IS11: Community Engagement	(P. A. Facione, 2011; Paul & Elder, 2006)
	IS12: Research and Scholarship	(Goel, Chen, & Wierman, 2017; Sanavi & Tarighat, 2014)
	IS 13: Leadership and Administration	(Goel, Chen, & Wierman, 2017; Sanavi & Tarighat, 2014)
	IS14: Continuous Improvement	(GENCER & DOĞAN, 2020; Manalo & Sheppard, 2016; Sanavi & Tarighat, 2014; Ünaldı & Yuce, 2020)

4.2.2 Proficiency in Critical Thinking Skills within the MET Program from Semi-Structural Interviews

The researchers investigated, building upon the proficiency in critical thinking skills ascertained through an extensive literature review. In order to validate and enrich their findings, they sought the perspectives of five experts in the field. The data from these expert interviews revealed a unanimous consensus regarding the paramount significance of discerning proficiency in critical thinking skills within the MET context. Furthermore, the experts emphasized adhering to the standards outlined in the STCW convention.

The experts underscored the imperative need for ongoing development of these critical thinking skills to invigorate seafarers' competencies and instill lifelong learning. Additionally, the researchers delved deeper into the facets of critical thinking skills pertinent to MET, where the experts echoed congruent viewpoints. They accentuated the pivotal role of seafarers as perpetual learners and their capacity to adapt to real-world challenges. The experts also underscored the indispensability of self-reflection to foster these critical skills and the importance of collaboration and teamwork in this context. To sum up, the insights gleaned from the expert interviews resonated harmoniously with the outcomes from the comprehensive literature review, collectively reinforcing the importance of identifying and nurturing the requisite proficiency in critical thinking skills within the MET Program. The research undertaken by the investigators encompassed a multifaceted approach, encompassing observations and surveys involving a cohort of ten students, five instructors, four curriculum experts, and representatives from 2 academic institutions. The observational component of the study was centered on the dynamic interactions between students and instructors during the teaching and learning processes. This comprehensive research initiative aimed to foster critical thinking skills and reinforce MET practices to enhance career productivity, including cultivating lifelong learning capabilities.

4.2.3 Proficiency in Critical Thinking Skills within the MET Program from Observation and Survey

The survey aspect of the study shifted its focus towards curriculum development and institutional considerations, seeking to establish connections between these components and the cultivation of critical thinking skills necessary to address contemporary global challenges. Drawing from an extensive review of the existing literature, the research identified 48 proficiencies deemed essential for optimal performance in MET among Thai seafarers. Additionally, an emphasis was placed on the integration of critical thinking skills within MET programs across various domains.

The research outcomes were derived from a meticulous analysis of data collected from the three primary sources, culminating in a comprehensive content analysis. The findings revealed that the proficiency in critical thinking skills within the context of MET could be categorized into four key components: Students (comprising ten proficiencies), Instructors (comprising 12 proficiencies), Curriculum (comprising 12 proficiencies), and Institutions (comprising 14 proficiencies). These additional proficiencies in critical thinking skills were thoughtfully defined and found to be highly suitable for practical implementation, as expounded in Table 1-4. It is imperative to underscore the significance of enhancing and nurturing critical thinking skills within the career trajectory of seafarers. Once the researchers have collected data using the triangulation technique as previously mentioned and employed content analysis to analyze the data, researchers can summaries the findings and confirm all the domains and factors related to critical thinking for seafarers. Subsequently, the researchers use these findings to create a primary model for seafarers' critical thinking to enhance clarity and simplicity in understanding.

4.2.4 The Conceptual Model of Proficiency in Critical Thinking Skills within the MET Program for Thai Seafarers

The conceptual framework plays a pivotal role in elucidating a comprehensive depiction of the cultivation of critical thinking proficiencies across various domains within the MET program tailored for Thai seafarers. This conceptual model is instrumental in facilitating comprehension and practical applicability. It offers a lucid depiction of the interconnections between the domains and their association with MET. The aptitude for critical thinking is classified into four distinct domains, namely: Student (ST), Instructor (IN), Curriculum (CU), and Institutional (IS), as delineated in Figure 2.
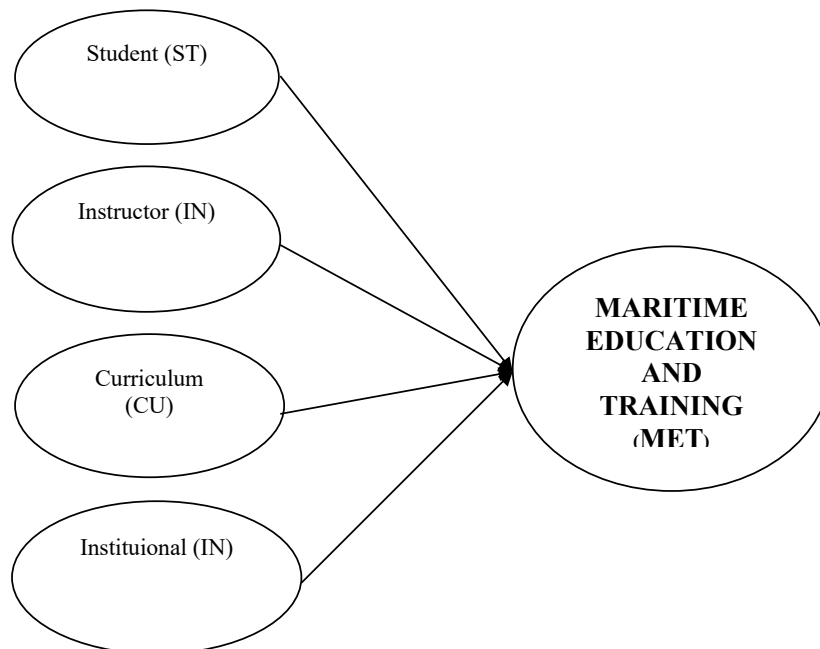
Source: Analyzed and concluded by the authors

Figure 2 Conceptual Model

The MET programs equip individuals with the requisite skills and knowledge to pursue maritime sector careers. These programs necessitate alignment with students' aspirations, incorporating interdisciplinary training and adaptability to the dynamic industry landscape. It is imperative to gain insight into students' motivations and expectations, alongside the assurance of curriculum quality, as these factors are pivotal in determining the effectiveness of MET programs. For Thai seafarers, adherence to standards regulated by the Thai Marine Department serves as a crucial oversight mechanism within the MET domain.

Furthermore, the MET framework seeks to establish benchmarks for standards and enhance productivity by integrating critical thinking skills assessment within each domain, measured through pertinent variables.

First domain: **Student.** Cultivating critical thinking skills among students significantly enriches their academic and personal lives. Proficiency in critical thinking necessitates a comprehensive approach. This framework encompasses a category of proficiency including (ST01) Importance of critical thinking, (ST02) Developmental Stages, (ST03) Educational Approaches, (ST04) Assessment, (ST05) Encouraging critical thinking, (ST06) Interdisciplinary Learning, (ST0) Real-world application, (ST08) Feedback and Reflection, (ST09) Cultural and Global Perspective, (ST10) Continuous Improvement.

Second domain: **Instructor** proficiency in critical thinking skills is essential for reinforcing a learning environment. Critical thinking skills empower students to analyze information, evaluate arguments, and make informed decisions. Instructor proficiency in critical thinking encompasses a category of proficiency as follows: (IN01) Understanding Critical Thinking, (IN02) Modeling Critical Thinking, (IN03) Continuous Learning, (IN04) Effective Questioning Techniques, (IN05) Providing Constructive Feedback, (IN06) Designing Critical Thinking Exercises, (IN07) Encouraging Diverse Perspectives, (IN08) Real-World Application, (IN09) Self-Reflections, (IN10) Collaboration, (IN11) Assessment, (IN12) Professional Ethics.

Third domain: **Curriculum** proficiency in critical thinking skills is essential for educational institutions among students. Developing critical thinking skills in students is a fundamental objective of contemporary education. Curriculum proficiency in critical thinking skills encompasses several essential proficiency as follows: (CU01) Clearly Defined Learning Objectives, (CU02) Progressive Development, (CU03) Interdisciplinary Approach, (CU04) Active Learning Strategies, (CU05) Assessment Alignment, (CU06) Incorporation of Diverse Perspectives, (CU07) Real-World Relevance, (CU08) Teacher Training and Support, (CU09) Integration of Technology, (CU10) Feedback Mechanisms, (CU11) Flexibility, (CU12) Continuous Improvement.

Fourth domain: **Institutional** proficiency in critical thinking is crucial for fostering a culture of intellectual rigor, analytical reasoning, and informed decision-making within an educational institution. Institutional proficiency in critical thinking signifies a collective and deliberate effort within an educational institution to priorities and promote this essential skill. Institutional proficiency in critical thinking encompasses a category of proficiency as follows: (IS01) Mission and Values, (IS02) Curriculum Integration, (IS03) Faculty Development, (IS04) Assessment and Accountability, (IS05) Diversity and Inclusivity, (IS06) Interdisciplinary Initiatives, (IS07) Experiential Learning, (IS08) Technology Integration, (IS09) Student Support Services, (IS10) Assessment of Institutional Practices, (IS11) Community Engagement, (IS12) Research and Scholarship, (IS13) Leadership and Administration, (IS14) Continuous Improvement.

MET programs in the maritime sector require alignment with student aspirations, interdisciplinary training, and adaptability. Proficiency in critical thinking is essential at the student, instructor, curriculum, and institutional levels, encompassing various facets that contribute to developing this crucial skill. Each domain contributes to the overarching goal of nurturing critical thinking abilities in students and preparing them for success in the maritime industry.

The research findings confirm the achievement of the specified research objectives, which involve identifying proficiency levels in critical thinking skills, as delineated in Table 1- 4. Furthermore, these findings have culminated in developing a comprehensive conceptual model representing Proficient critical thinking skills within the MET program for Thai seafarers, as illustrated in Figure 2. The study has unveiled 48 proficiency indicators distributed across the four domains under investigation.

5. Conclusion, Discussion, and Recommendation

5.1 Conclusion

This research underscores the significance of Proficiency in critical thinking skills within the context of the MET program tailored for Thai seafarers, adhering to the standards set forth by the STCW convention and overseen by the Thai Marine Department. (IMO, 2017) Prior studies have established that Proficiency in critical thinking empowers seafarers to meticulously analyze information, assess diverse alternatives, and make well-informed decisions. This attribute assumes paramount importance, particularly during maritime emergencies, wherein prompt and accurate decision-making not only safeguards lives but also averts potential accidents, constituting a measurable factor in the proficiency of seafarers within the student domain.

To further enhance and expand upon these findings, it becomes imperative to extend the scope of Proficiency in critical thinking skills, encompassing the entirety of the MET program and to the specific needs of Thai seafarers, taking into account the regulatory oversight of the Thai Marine Department. This comprehensive investigation culminates in identifying 48 distinct proficiency indicators, collectively shaping a comprehensive framework for cultivating critical thinking skills within the MET program, thereby fortifying the competence of Thai seafarers across various domains.

5.2 Discussion

Maritime education and training programs significantly influence students' preparedness for a prospective career within the maritime industry. The quality of these programs is imperative in ensuring that prospective maritime professionals acquire the requisite skills and knowledge for excelling in their roles. Enhanced performance standards, long-term skill development, and pursuing career excellence are intrinsically linked.

Critical thinking skills have emerged as a central component of the proficiency advantage for seafarers despite the ongoing evolution of frameworks that cultivate proficiency in critical thinking skills. The literature review has unveiled a deficiency in assessing critical thinking skills within the context of the Maritime Education and Training (MET) program. This study adopts a widely embraced conceptual framework for the implementation of learning. Nevertheless, it is noteworthy that this framework imposes limitations by categorizing key assessment dimensions into four domains: student, instructor, curriculum, and institutional.

Utilizing a mixed-method approach encompassing a comprehensive literature review, survey administration, observational analysis, semi-structured interviews, and expert evaluations, this study has successfully discerned pivotal metrics of proficiency in critical thinking skills within the Maritime Education and Training (MET) program. These identified measures have been subsequently restructured and grouped into four distinct categories, denoted as ST (Student), IN (Instructor), CU (Curriculum), and IS (Institutional), thereby constituting a refined framework for evaluating the proficiency in critical thinking skills among Thai seafarers enrolled in the MET program.

The findings of this research underscore the significance of Proficiency in critical thinking skills within the maritime industry, presenting many envisioned advantages and applications. This study delves into the prospective benefits and practical applications of cultivating critical thinking skills among seafarers. Notably, the IMO has recognized the pivotal role of critical thinking skills in this context. It has introduced a model course on proficiency in critical thinking skills for seafarers. (IMO, 2012) The comprehensive examination of proficiency in critical thinking skills within each domain of MET has yielded 48 distinct proficiency indicators. These findings contribute substantially to developing a comprehensive and practical educational framework within the maritime sector.

The expected proficiency in critical thinking equips Thai seafarers with the skills to analyze complex maritime challenges, fostering practical problem-solving abilities essential for safe navigation and efficient operations at sea. In an emergency, Seafarers use critical thinking to assess and respond to emergencies such as fires, collisions, and man-overboard situations, optimizing safety and minimizing damage.

5.3 Recommendation

This research holds significant importance within Thailand and the global maritime industry due to the limited number of prior studies addressing enhancing skills and lifelong learning abilities among Thai seafarers. It is the most recent and comprehensive investigation conducted in Thailand, focusing on developing Proficiency in critical thinking skills within the MET program. The primary objective of this research is to explore how such proficiency can empower Thai seafarers to adapt to the evolving career landscape in the contemporary world.

Notably, this study serves a dual purpose: it contributes to the academic body of knowledge and holds practical implications for the maritime industry. As one of the latest research endeavors in this field, it provides valuable insights that can be referenced by scholars and researchers exploring related topics. Moreover, industry practitioners, policymakers, and educators to inform decision-making, curriculum development, and training programs within the maritime sector can leverage the findings of this research. Consequently, this research holds the potential to catalyze advancements in both the theoretical and applied facets of maritime education and training, ultimately benefitting the industry and its workforce.

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