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Enhancing Safety Culture Through Effective Soft Skills Training in Maritime Education

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Abstract - The maritime industry, fundamental to global trade, faces persistent safety challenges primarily driven by human error. This review explores the role of soft skills training in enhancing safety culture within maritime education. It examines the impact of training in communication, teamwork, leadership, and problem-solving on maritime safety. Effective communication is essential for preventing misunderstandings and ensuring clarity, especially in high-pressure situations. Training programs tailored to address language barriers and cultural differences can significantly improve safety outcomes. Teamwork and leadership skills are crucial for coordinating operations and making informed decisions, particularly during emergencies. Problem-solving training, through simulations and case studies, enhances critical thinking and situational awareness, leading to improved safety performance. The review also offers recommendations for integrating soft skills training into maritime education, emphasizing the need for curriculum development, instructor training, and continuous evaluation. By investing in comprehensive soft skills training, maritime organizations can foster a robust safety culture, reduce the incidence of accidents, and enhance overall operational efficiency.

Keywords: Communication, Maritime Safety, Soft Skills Training, Teamwork, Leadership

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1.0 INTRODUCTION

The maritime industry is a cornerstone of global trade, yet it faces significant safety challenges. Enhancing safety culture through effective soft skills training in maritime education has become a critical focus (Vervoort, 2012). This review explores the impact of soft skills training on maritime safety, emphasizing communication, teamwork, leadership, and problem solving.

Safety culture in maritime operations is shaped by individual and organizational behaviors. Basis research done on behavioral-based safety, the changing of unsafe individual behaviours improves safety performance, as part of a positive safety culture (Ventikos et al., 2014). Also, safety-critical socio-technical systems demand an inherent organizational safety culture for reliable and safe operations (Mallam et al., 2019).

Effective soft skills training can address human error, which is often the root cause of maritime accidents. Basis the reviews carried out on maritime accidents, human error was found to be the main contributing factor and effective soft skills (both interpersonal and cognitive skills) including but not limited to communication, teamwork, leadership and problem-solving skills can reduce the effects of human error (Saeed et al., 2017).Figure 1 shows an organizing framework relating to the levels at which errors can occur, which can develop into precursors to incidents (Hetherington et al., 2006).

This article reviews recent literature to evaluate how soft skills training enhances safety culture and recommends best practices for integrating such training into maritime education programs.

Fig. 1: Organizing framework for human factors which contribute to organizational accidents in shipping adapted from Stanton (1996), Jørgensen (2002), and HSE (1997)

2.0 The Importance of Communication in Maritime Safety

Effective communication is pivotal in maritime safety (Hetherington, Flin, & Mearns, 2006). Miscommunication can lead to catastrophic accidents, highlighting the need for rigorous training programs (Froholdt & Knudsen, 2007). In the context of maritime operations, clear and precise communication is essential for ensuring that all crew members understand their roles and responsibilities. This is particularly important during emergency situations where swift and accurate communication can be the difference between safety and disaster.

Training that enhances verbal and non-verbal communication skills is essential for improving safety culture (Suresh & Krithika, 2023). Verbal communication ensures that instructions are conveyed clearly, while non-verbal cues can provide additional context and reinforce the message. Training programs must address both aspects to ensure comprehensive communication skills among maritime personnel. Effective communication process is required to efficiently respond to maritime incidents and accidents (Nordström et al., 2016).

Moreover, effective communication in a multicultural environment, such as a ship's crew, requires understanding and bridging cultural differences. This includes being aware of language barriers and different communication styles. Addressing these issues through targeted training can significantly reduce misunderstandings and enhance overall safety on board (Haqimin Mohd Salleh et al., 2019)

3.0 Communication Training Programs

Several studies demonstrate the benefits of communication training in maritime settings. For instance, Whal and Kongsvik (2018) highlight the importance of crew resource management (CRM) training, which among others focuses on clear communication and team coordination (Wahl & Kongsvik, 2018). CRM training has been shown to reduce errors and improve safety (Salas et al., 2006).

Training programs must be designed to address the unique challenges of maritime communication, such as language barriers and cultural differences (Horck, 2006). Tailored training can significantly enhance safety outcomes (Frias et al., 2022). For example, simulation-based training provides realistic scenarios that help trainees practice and improve their communication skills in a controlled environment.

In addition to CRM, other communication training programs focus on specific aspects such as assertiveness and active listening (Milić-Beran et al., 2021). These skills are crucial for ensuring that all crew members feel comfortable voicing concerns and suggestions, which can prevent potential safety issues. Continuous improvement and adaptation of these training programs are necessary to keep pace with the evolving demands of the maritime industry.

Training programs must be designed to address the unique challenges of maritime communication, such as language barriers and cultural differences (Haqimin Mohd Salleh et al., 2019). Tailored training can significantly enhance safety outcomes (Helal, 2022).

4.0 Case Studies and Evidence

Evidence from various maritime organizations supports the effectiveness of communication training. For example, the Maritime and Coastguard Agency (MCA) implemented a comprehensive training program that led to a significant decrease in communication-related incidents (MCA, 2015). This program included both theoretical and practical components, ensuring that crew members could apply what they learned in real-world situations.

Similarly, the International Maritime Organization (IMO) emphasizes the importance of communication in its safety management guidelines (IMO, 2018). These guidelines serve as a benchmark for maritime organizations worldwide, encouraging the adoption of best practices in communication training. The success stories from different organizations underline the critical role of effective communication in enhancing maritime safety.

Table 1 shows a summary of communication elements that provide practical strategies to achieve a positive safety culture (Vecchio-Sadus, 2007). There is a need for improvement and adaptation of training programs to meet evolving safety challenges (Lützhöft et al., 2011). By means of regularly updating and refining training programs, maritime organizations can ensure that their crews are always prepared to communicate effectively in any situation.

Table 1: Safety Culture Communication Elements

Safety Culture Element	Requirement	Communication Element
Putting in place methods for controlling hazards	• Everyone shows support	• Displaying rules and procedures to remind everyone to work safely
Management commitment to minimising risks in the operations, and complying with all relevant health and safety legislation	• Accept responsibility for HSE • Become involved in HSE • Provide resources • Change attitude to risk	• Demonstrating the employer's personal commitment, values and expectations • Supervising and monitoring work performance
Employees contribute most effectively in an organisational culture based on trust and cooperation	• Atmosphere of trust, encouragement and reward in terms of HSE	• Assessing competency and providing revision of training when required • Providing feedback on HSE • Motivating staff • Recognising and rewarding achievement
Employees must be provided with the necessary information and training to broaden their knowledge and to gain new skills to behave and operate safely	• Willingness and competence to implement reforms and changes	• Providing instructions on how to work safely with equipment, tools, materials and processes
Employees contribute most effectively in an environment that provides a framework for consultation and communication	• Individuals encouraged and prepared to report errors and near-misses	• Meeting to discuss HSE issues such as hazard and incident reports, risk assessments and operating procedures

5.0 Teamwork and Leadership in Maritime Education

Teamwork and leadership are critical components of an effective safety culture (Hasanspahić et al., 2021). Strong leadership and cohesive teamwork can prevent accidents and improve overall safety performance (Hanzu-Pazara et al., 2012). In the maritime industry, the ability to work as a team is essential for efficient operations, especially during emergency situations where coordination and quick decision-making are crucial.

Effective teamwork ensures that all crew members are aware of their roles and responsibilities, leading to better coordination and fewer misunderstandings. Leadership, on the other hand, provides direction and motivation, helping to maintain high standards of safety and performance. Training programs that focus on these skills are vital for preparing maritime professionals to handle the complexities of their work environment.

Furthermore, leadership in maritime education involves not only managing tasks but also inspiring and guiding team members. Effective leaders can foster a positive safety culture by promoting open communication, encouraging collaboration, and recognizing the contributions of each team member. This holistic approach to leadership training ensures that maritime professionals are equipped to lead their teams effectively.

6.0 Training for Teamwork and Leadership

Training programs that focus on teamwork and leadership skills are essential for maritime safety. Such programs often incorporate simulations, role-playing, and scenario-based exercises to build practical skills (Sellberg, 2018). These interactive training methods help participants develop the skills needed to lead and work within a team effectively, even in high-pressure situations.

Simulations provide a realistic environment where trainees can practice their skills without the risks associated with real-life operations. The exercises help improve decision-making, communication, and coordination among team members. Role-playing and scenario-based training also allow participants to experience different leadership styles and team dynamics, helping them understand the importance of adaptability and flexibility in leadership.

Additionally, continuous professional development is crucial for maintaining and enhancing teamwork and leadership skills. Regular refresher courses and advanced training programs can help maritime professionals stay updated with the latest best practices and developments in the field. This ongoing training ensures that they can lead their teams effectively and maintain high standards of safety and performance.

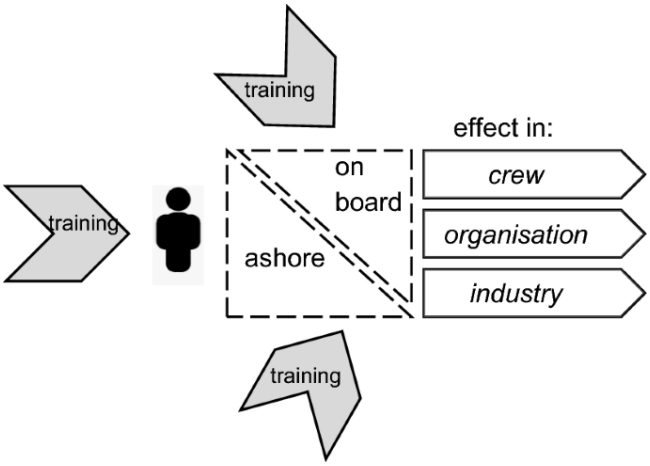

Figure 2: The multi-level leadership training and the effect in merchant shipping

Figure 2 shows that, instilling current and future seafarers with the principles of a leadership mindset, grounded in diverse and evolving leadership practices, holds the potential to generate advantages across all facets of the shipping industry (Progoulaki et al., 2022).

7.0 Evidence from the Field

Several studies highlight the positive impact of teamwork and leadership training. For instance, a study by (Burke et al., 2006) found that teams with enhanced training performed significantly better in crisis situations. This study demonstrated that well-trained teams could manage emergencies more effectively, reducing the likelihood of accidents and improving overall safety outcomes.

Another study by (Ationg et al., 2021) indicate that leadership training can be considered as a training that helps improve leader's decision-making skills and processes. Leaders who received training were better equipped to handle complex situations, make informed decisions, and guide their teams through challenges. These findings stress the importance of investing in leadership development programs to enhance safety and performance in maritime operations.

Real-world examples also highlight the benefits of teamwork and leadership training. For instance, maritime organizations that implemented comprehensive training programs reported significant improvements in safety performance and operational efficiency. These success stories provide valuable insights into the effectiveness of targeted training initiatives and emphasize the need for continuous improvement and adaptation of training programs.

Table 2: Descriptive Analysis of Soft Skills Before and After Training

Std. Deviation	Mean($_b$)	Soft Skills	Mean($_a$)	Std. Deviation
.73	3.83	Emotional Intelligence	4.07	.81
.79	3.64	Customer Handling Skills	4.10	.73
1.01	3.40	Professionalism	4.29	.55
.75	3.98	Planning & Organizing Skills	4.21	.81
1.13	3.26	Communication & Interpersonal Skills	4.02	.68
.94	3.57	Teamwork Skills	4.24	.73
1.01	3.40	Leadership Skills	4.19	.77
.98	3.33	Critical Thinking & Problem Solving Skills	4.12	.83

Table 2 shows a summary of the pre and post training descriptive research evaluating the efficacy of training on tourism graduates' ability to develop soft-skills necessary for professional success, emphasizing the importance of tailored training approaches (Chadha & Sharma, 2018). These programs highlight the need for ongoing assessment and refinement to maintain their effectiveness (Karimi & Pina, 2021).

8.0 Problem-Solving Skills and Safety Culture

Problem-solving skills are essential for managing unexpected situations and maintaining safety in maritime operations (Md. Mehadi Rahman, 2019). Training programs that enhance problem-solving abilities can significantly improve safety culture (Vecchio-Sadus & Griffiths, 2004). In the maritime industry, where unforeseen challenges and emergencies are common, the ability to think critically and solve problems quickly is crucial for ensuring safety and efficiency.

Effective problem-solving requires a combination of knowledge, experience, and critical thinking skills. Maritime professionals must be able to assess situations accurately, identify potential risks, and develop

effective solutions. Training programs that focus on these skills can help individuals become more adept at handling complex and high-pressure situations.

Moreover, fostering a culture that values and encourages problem-solving can lead to significant improvements in safety outcomes. When team members feel empowered to identify and address issues proactively, it reduces the likelihood of accidents and enhances overall operational efficiency. This proactive approach to problem-solving is a key component of a strong safety culture in maritime operations.

10.0 Problem-Solving Training Approaches

Effective problem-solving training involves developing critical thinking, situational awareness, and decision-making skills (Ahmady & Shahbazi, 2020). Simulation-based training is particularly effective in this regard, allowing trainees to practice and refine their skills in a controlled environment (Michael Nnaemeka Ajemba et al., 2024). Simulations provide realistic scenarios that challenge trainees to apply their problem-solving skills and make decisions under pressure.

In addition to simulations, case studies and real-world examples can be used to teach problem-solving. These methods allow trainees to analyze past incidents, understand the factors that contributed to the problem, and develop strategies to prevent similar issues in the future. This analytical approach helps build a deeper understanding of problem-solving techniques and their application in maritime operations.

Collaborative problem-solving exercises are also beneficial. These exercises encourage teamwork and communication, helping trainees learn how to work together to identify and solve problems. By practicing these skills in a training environment, maritime professionals can develop the confidence and competence needed to handle real-world challenges effectively.

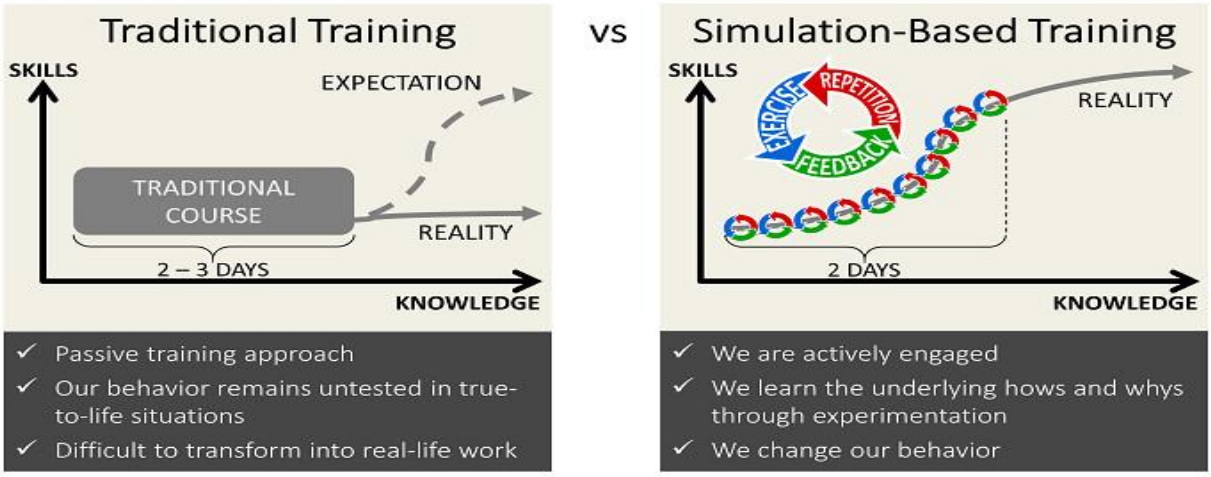

Fig. 3: Traditional Problem-Solving Training vs Simulation Based Training

Figure 3 shows the differences and outcome between traditional way of training and the simulation-based training in improving problem-solving skills. This approach provides realistic scenarios that enhance trainees' ability to manage real-world challenges (Lateef, 2010).

11.0 Real-World Applications and Outcomes

Research supports the effectiveness of problem-solving training. For example, a study by Chang et al (2017) found that simulation-based training improved situational awareness and decision-making skills. Participants who underwent this training were better equipped to handle complex situations, leading to improved safety outcomes and reduced error rates.

Another study by Babaei et al (2018)demonstrated that individuals with problem-solving abilities showed a reduction in errors and improved safety outcomes. Trainees who received comprehensive problem-solving training were more adept at identifying potential issues and implementing effective solutions, resulting in a safer and more efficient work environment.

Real-world applications of problem-solving training also highlight its benefits. Organizations within maritime industry that have integrated problem-solving training into their programs report significant improvements in safety performance and operational efficiency. These outcomes underscore the importance of investing in high-quality training programs to enhance problem-solving skills among maritime professionals.

Table 3: Deviation between Problem-Solving Training (PST) and Control Group at Pre and Post Testing Phases

	PST		Control	
	Pre-test	Post-test	Pre-test	Post-test
SPS	12.6 (1.9)	13.8 (2.1)	12.5 (2.8)	12.7 (2.6)
QoL	13.9 (2.8)	15.5 (3.1)	14.3 (2.4)	14.1 (3.2)
GHQ	12.3 (2.3)	13.92 (3.1)	12.7 (2.1)	12.54 (2.7)

PST=problem-solving training group, SPS=social problem solving, QoL= Quality of life, GHQ=mental health

To investigate the impact of problem-solving training on social problem-solving appraisal, quality of life, and mental health, a 2×2 repeated measures ANOVA was conducted. The intervention group (intervention vs. no intervention) was the between-groups variable, while the testing time (before vs. after the intervention) was the within-groups variable. Table 3 presents the means and standard deviations for these measures (Chinaveh, 2010).

12.0 Recommendations for Integrating Soft Skills Training

Integrating soft skills training into maritime education requires a strategic approach. This section provides recommendations for effective integration, focusing on curriculum development, instructor training, and continuous evaluation (Mohammed et al., 2023). A well-rounded strategy ensures that soft skills training is effectively incorporated into the overall educational framework, enhancing the safety culture within the maritime industry.

13.0 Curriculum Development

Developing a curriculum that incorporates soft skills training is essential. The curriculum should include modules on communication, teamwork, leadership, and problem-solving (Olugbenga, 2022). Using a mix of theoretical and practical training methods can enhance learning outcomes (Wrenn & Wrenn, 2009). This comprehensive approach ensures that trainees develop a solid foundation of knowledge and skills that can be applied in real-world situations.

Incorporating real-world scenarios and case studies into the curriculum can also enhance its effectiveness. These elements provide trainees with practical examples of how soft skills are applied in maritime operations, helping them understand the relevance and importance of these skills. Regular updates to the curriculum based on the latest research and industry practices ensure that it remains current and effective.

Additionally, engaging stakeholders, such as industry experts and experienced professionals, in the curriculum development process can provide valuable insights and ensure that the training meets the needs of the maritime industry. This collaborative approach helps create a curriculum that is both relevant and comprehensive, preparing trainees for the challenges they will face in their careers.

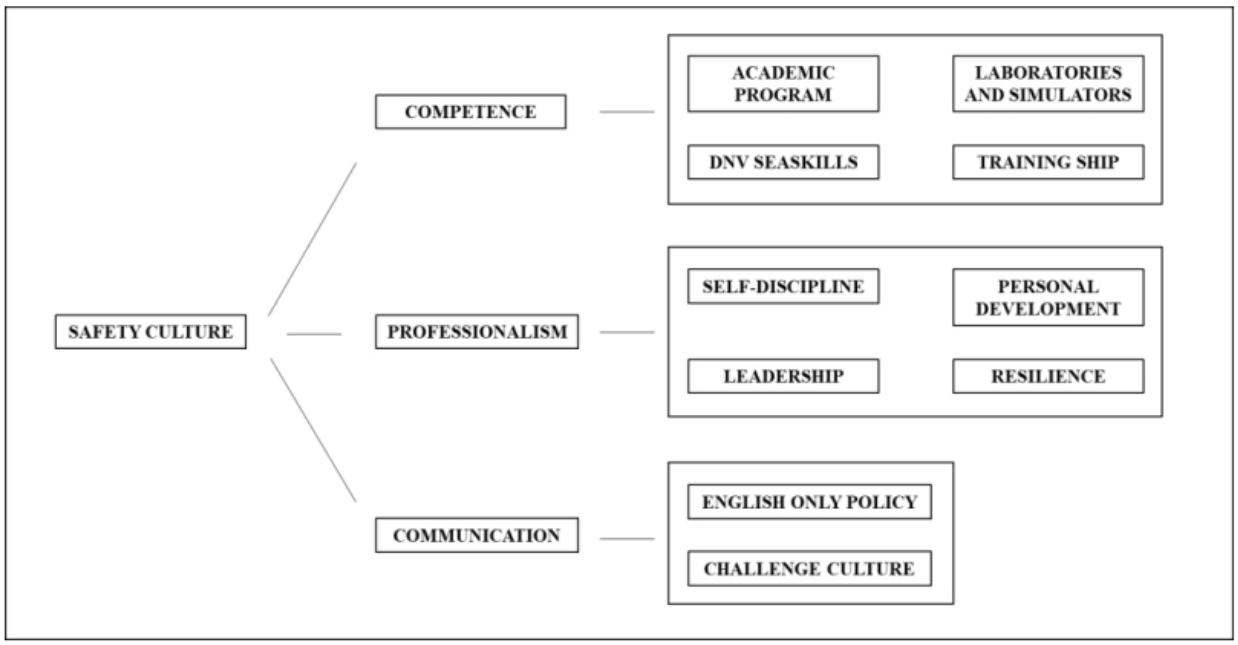

Fig. 4: Factors Contributing to Safety Culture

Figure 4 illustrates the integration of various soft skills training under the categories of competence, professionalism and communication, factors contributing to the enhancement of seafarer safety education. The curriculum should be regularly updated to reflect the latest research and industry practices. Hipol, A. J. V. (2022).

14.0 Instructor Training

Effective training requires skilled instructors. Instructors should receive comprehensive training to deliver soft skills training effectively (Ragusa et al., 2022). This training should include techniques for engaging trainees and assessing their progress (Salas & Cannon-Bowers, 2001). Well-trained instructors can create a dynamic and interactive learning environment that enhances the effectiveness of the training program.

Instructor training should also focus on developing the instructors' own soft skills. By enhancing their communication, leadership, and problem-solving abilities, instructors can serve as role models for trainees. This not only improves the quality of instruction but also reinforces the importance of soft skills in maritime operations.

Continuous professional development for instructors is crucial for maintaining high standards of training. Regular workshops, seminars, and refresher courses can help instructors stay updated with the latest best practices and developments in soft skills training. This ongoing learning ensures that they can deliver effective and relevant training to maritime professionals.

15.0 Continuous Evaluation

Continuous evaluation is crucial for maintaining the effectiveness of soft skills training programs. Regular assessments can identify areas for improvement and ensure that training remains relevant and effective (DEMİREL & BAYER, 2016). By collecting and analyzing feedback from trainees, instructors, and other stakeholders, organizations can gain valuable insights into the strengths and weaknesses of their training programs.

Evaluation methods should include both formative and summative assessments. Formative assessments, conducted throughout the training program, provide ongoing feedback that can be used to make

immediate improvements. Summative assessments, conducted at the end of the program, evaluate the overall effectiveness of the training and identify areas for future development.

In addition to assessments, continuous evaluation should involve monitoring the long-term impact of the training on safety performance and operational efficiency. This can be done through follow-up surveys, performance reviews, and incident reports. By tracking these metrics, organizations can ensure that their soft skills training programs are achieving the desired outcomes and contributing to a safer maritime environment.

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.98	3.33	Critical Thinking & Problem Solving Skills	4.12	.83

Table 4 shows an analysis of graduates' confidence in soft skills ability pre-test mean [Mean(b)] and post-test [Mean(a)]. Based on the assessments and evaluations carried out, an increase in mean scores after four months soft skills training for all the skills was evident (Chadha & Sharma, 2018).

16.0 Conclusion

Enhancing safety culture through effective soft skills training is vital for the maritime industry. Communication, teamwork, leadership, and problem-solving skills are crucial for preventing accidents and improving safety outcomes (Barnett et al., 2003). Integrating comprehensive soft skills training programs into maritime education can significantly enhance safety culture and reduce the incidence of maritime accidents (Olugbenga, 2022).

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