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Effectiveness of ECDIS Technology on Career Readiness of the Third Year Maritime Transportation Students

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Abstract

ECDIS (Electronic Chart and Display Information System) technology plays a crucial role in developing the skills and confidence needed for career readiness. This study aimed to evaluate the impact of ECDIS technology on the career readiness of third-year Maritime Transportation students at Misamis University for the 2024-2025 academic year. This study utilized a correlational quantitative research design to examine the relationship between students' perception of ECDIS technology and their career readiness. Conducted at Misamis University, the research focused on 131 purposively selected third-year maritime students who had prior exposure to ECDIS. Data were gathered through two validated five-point Likert scale questionnaires assessing the perceived effectiveness of ECDIS and students' career readiness. Descriptive statics (mean and standard deviation) and Pearson's correlation coefficient were used for data analysis. Surveys were administered within the university campus, with voluntary participation and strict confidentiality. The study found a significant positive relationship between students perceived effectiveness of ECDIS technology and their readiness for maritime careers. Effective ECDIS training enhances students' confidence and equips them with essential skills for real-world navigation challenges. Maritime institutions should enhance ECDIS training by integrating hands-on simulations and updating equipment to meet current industry standards.

Keywords: *ECDIS, Effectiveness; Hands-On; Simulations; Students' Confidence; Training*

INTRODUCTION

Background of the Study

The maritime world is facing significant changes rapidly, especially in the development and implementation of navigation technology. ECDIS, or "Electronic Chart Display and Information System,"

is a tool that provides navigation information through its function and system. (Masrupah et al.,2024). The Electronic Chart Display and Information System (ECDIS) is a development in the navigational chart system used in naval vessels and ships. With the use of the electronic chart system, it has become easier for a ship's navigating crew to pinpoint locations and attain directions.

The ECDIS complies with International Maritime Organization (IMO) Regulation V/19 & V/27 of the International Convention for The Safety of Life At Sea (SOLAS) convention as amended by displaying selected information from a System Electronic Navigational Chart (SENC). ECDIS equipment complying with SOLAS requirements can be used as an alternative to paper charts (Bhattacharjee, 2021). The Electronic Chart Display Information System (ECDIS) on board ships is one of the latest amendments stipulated by the International Maritime Organization (IMO) since 2008 and was widely adopted in 2012. The primary purpose of implementing ECDIS was to utilize modern technology to enhance ship operations, ensuring a safe navigational watch and a safe approach and mooring in ports (Shehata et al., 2023).

The Electronic Chart Display and Information System, as the primary navigation system on board a ship, is one of the most significant developments in the maritime industry in recent years. Training deck officers for its use is a key element in ensuring safe and practical work. According to international requirements, two types of training are required to cover the system: Operational Use of Electronic Chart Display and Information System and Type-Specific Training (Komitov et al., 2021). Over the past three decades, the Electronic Chart Display and Information System (ECDIS) has evolved from its initial purpose to become a complex navigation support tool. The transition from paper to electronic charts represents a substantial step in navigation, contributing to a reduction in the navigator's workload, the ease of executing navigational tasks, and the integration of information and data fusion (Brčić et al., 2019).

The use of electronic equipment for navigation is widely regarded as both necessary and beneficial. The introduction of electronic charts and ECDIS equipment has substantially reduced the workload previously burdened on officers by paper chart navigation. The amount of time previously spent handling and correcting paper charts during navigational watch provides a sense of the effort required by traditional paper navigation (Acomi, 2016). Electronic navigational systems have become a focal subsystem for the appraisal, planning, execution, and monitoring steps of safe and efficient navigation. As a result of high-level integration and interaction between navigation components on a unique ECDIS display, the quantity and complexity of data and information available to the Officer of Watch (OOW) is dramatically increased. (Asyali 2012). Electronic Chart Display and Information System (ECDIS) training is considered extremely important for ensuring safety in modern navigation. At present, two types of training are required for deck officers. Operational use of ECDIS is mandatory training for deck officers, conducted in accordance with the International Maritime Organization (IMO) Model Course 1.27. (Komitov et al., 2023). Deck officers' acceptance of and proficiency in using Electronic Chart Display Information Systems (ECDIS) could enhance navigation safety. This study applied the popular technology acceptance model (TAM) to assess seafarers' acceptance of ECDIS. (Tsai, 2016).

In the maritime industry, the increasing complexity of operations and the need for high levels of safety and efficiency necessitate advanced training methods for students. Traditional maritime education methods are often limited in their ability to effectively simulate real-world scenarios, potentially impacting the preparedness of graduates for actual maritime careers. Simulator-based learning technologies have emerged as a promising solution, offering an immersive and realistic training environment.

This research aimed to address this gap by evaluating the effectiveness of using ECDIS technology in improving career readiness for maritime students. Specifically, it investigated how these technologies

enhance students' practical skills, decision-making abilities, and overall job readiness. The study aimed to determine whether simulator-based training leads to improved performance in maritime careers compared to traditional education methods and to identify best practices for integrating such technologies into maritime curricula.

This problem statement highlights the need for research on the impact of using ECDIS technology on maritime student's career readiness, emphasizing the importance of understanding how these tools can bridge the gap between education and real-world application.

CONCEPTUAL FRAMEWORK

The conceptual framework of this study explains the connection between the effectiveness of ECDIS technology and the career readiness of third-year maritime students. The study (Fig.1) examines the impact of ECDIS effectiveness, encompassing its usability, relevance to real maritime tasks, and quality of training, on students' preparedness for their future careers.

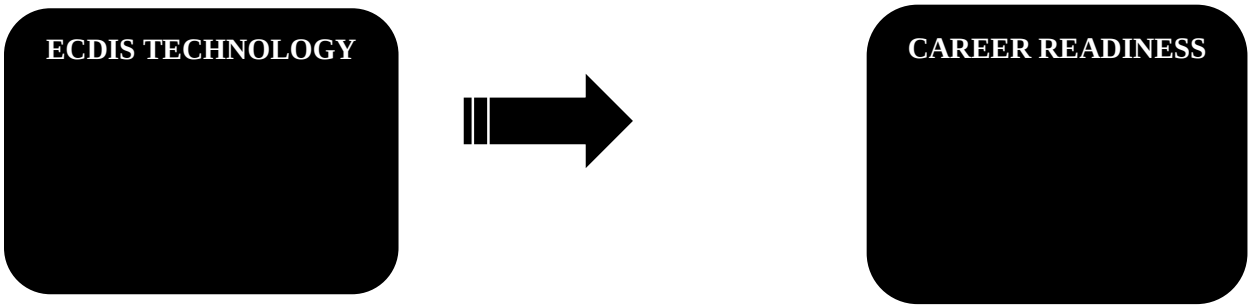

Figure 1. Conceptual Framework

ECDIS technology. The Electronic Chart Display and Information System (ECDIS) represents a transformative advancement in maritime navigation, fundamentally changing the way vessels are navigated by replacing traditional paper charts with dynamic digital systems. This technology integrates multiple components, including GPS data, electronic navigation charts (ENCs), and sophisticated navigation software, to deliver comprehensive and accurate information for safe and efficient voyage planning and execution.

ECDIS eliminates many of the limitations associated with paper charts. Traditional navigation required manual plotting of positions and time-consuming updates to ensure charts were current. With ECDIS, navigators gain access to an automated system that not only displays precise real-time positions but also overlays critical information such as hazards, water depths, and traffic patterns.

One of the standout features of ECDIS is its ability to enhance situational awareness. By providing an integrated display of data from various sensors, such as radar, AIS (Automatic Identification System), and GPS, ECDIS enables mariners to gain a clearer understanding of their surroundings. This comprehensive view significantly reduces the likelihood of collisions, groundings, and other navigational errors, contributing to improved maritime safety.

ECDIS streamlines navigation processes by automating tasks that were previously labour-intensive. For instance, calculating routes, estimating arrival times, and identifying optimal paths are simplified through the system's advanced algorithms. The reduction in manual input not only saves time but also minimizes human errors that can arise during complex navigation procedures.

Another significant advantage of ECDIS is its ability to receive real-time updates. Mariners can download the latest chart corrections and updates from authorized sources, ensuring they always have the most current information. This capability eliminates the need for manual corrections, which were often prone to delays and errors, thus boosting operational efficiency and accuracy.

ECDIS technology not only revolutionizes navigation but also sets a new standard for maritime safety. Its adoption has been widely mandated in the global shipping industry, with international regulations requiring ECDIS training and certification for seafarers. Ensures that navigators are proficient in using the system to its full potential, further reinforcing its role in creating safer seas.

Career readiness. Career readiness refers to the state of being adequately prepared with the knowledge, skills, and attitudes required to succeed in one's chosen profession. For students, especially in technical fields such as maritime transportation, career readiness involves not only acquiring theoretical knowledge but also gaining practical experience and developing problem-solving skills that align with industry standards. It encompasses a broad spectrum of competencies, such as critical thinking, effective communication, teamwork, adaptability, and technical proficiency. These attributes are essential in ensuring that students transition seamlessly from academic environments to the demands of professional workplaces.

In the maritime industry, career readiness is particularly significant due to the high-stakes nature of the work, where errors can have serious consequences for safety and efficiency. For maritime students, career readiness encompasses mastering navigation tools such as ECDIS (Electronic Chart Display and Information System), understanding international maritime laws, and developing the ability to handle emergencies on board. Practical training through simulations and internships plays a vital role in bridging the gap between classroom instruction and real-world application. Such experiences enable students to build confidence, refine their technical skills, and adapt to the dynamic and challenging conditions of maritime operations.

Ultimately, career readiness serves as a foundation for lifelong learning and professional growth. It not only equips students with the tools to excel in their first roles but also fosters the resilience and flexibility needed to navigate an evolving job market. In fields such as maritime transportation, where technology and global regulations are continually advancing, a strong foundation in career readiness ensures that students remain competitive and capable of contributing to the industry's progress. This holistic preparation benefits not only the students but also the broader maritime sector by ensuring a skilled and confident workforce.

Objectives of the Study

This study aimed to evaluate the impact of ECDIS technology on the career readiness of third-year Maritime Transportation students at Misamis University for the 2024-2025 academic year. Specifically, it aimed the following :

1. determine the level of effectiveness of ECDIS technology to 3rd-year Maritime Transportation students;
2. determine the level of career readiness of 3rd-year maritime transportation students; and
3. determine the significant relationship between the effectiveness of ECDIS technology and career readiness of 3rd-year maritime transportation students.

Significance of the Study

The significance of studying the effectiveness of ECDIS technology in relation to the career readiness of third-year maritime students lies in its potential to enhance educational outcomes and better prepare students for the evolving demands of the maritime industry. By evaluating how well ECDIS training equips students with essential navigational skills, critical thinking, and decision-making abilities, this research can identify best practices and areas for improvement within maritime curricula. This study not only contributes to the academic discourse on maritime education but also aims to facilitate a smoother transition for students into successful maritime careers, ensuring they are equipped with the knowledge and skills necessary to thrive in a technologically advanced environment. The results of this study would be beneficial to Third-year, third-year maritime students.

Transportation students, Misamis University Teachers, and future researchers. For maritime transportation students, the integration of ECDIS technology into their training can directly impact their career preparedness. The study has the potential to enhance their understanding of ECDIS technology's role in their careers, ensuring they graduate with relevant, in-demand skills. For Misamis University teachers, the research provides valuable insights into how ECDIS training impacts the career readiness of students. It offers insights to refine teaching methods, adapt curricula, and better meet the needs of students and the maritime industry. Teachers can use this information to advocate for the inclusion of ECDIS as a core component of the curriculum. Thus, this study helps foster stronger connections with the maritime industry.

For future researchers, the study provides a foundation for further exploration into the role of technology in maritime education. It offers a valuable case for examining the relationship between technological training and career outcomes. They can use the study's findings to compare the effectiveness of ECDIS with other maritime technologies or teaching methods. It could open avenues for research on how different types of technology influence various aspects of students' skills, such as leadership, teamwork, and problem-solving. Suppose the study reveals that ECDIS training enhances career readiness. In that case, future researchers may explore how academic institutions and maritime companies can collaborate more effectively to bridge the gap between classroom learning and real-world application; this could involve studying internship programs, onboard training, or industry-driven curriculum development.

METHODOLOGY

Research Design

This study employed a correlational quantitative research design to examine the relationship between student's perceptions of the effectiveness of ECDIS (Electronic Chart Display and Information System) technology and their sense of preparedness for future careers. A survey was administered to 131 third-year maritime students, asking them to rate the usefulness and ease of use of ECDIS, its relevance to real-world maritime tasks, and their confidence in using it for activities such as voyage planning and interpreting digital charts. The results were analyzed to determine whether students who perceive ECDIS as more effective also feel better prepared for their careers. Participation in the study was voluntary, and all responses were kept confidential. The findings provided valuable insights for improving ECDIS training and better-equipping students for their future roles in the maritime industry.

Research Environment

This study was conducted at Misamis University in Ozamiz City, focusing on the assessment of the effectiveness of ECDIS (Electronic Chart Display and Information System) technology within the university's maritime program. Specifically, it examined the utilization of the simulation laboratory and its influence on students' preparedness for their maritime careers. The research aimed to explore how ECDIS technology, integrated into maritime education and training, contributes to enhancing students' career readiness and their potential for success in the maritime industry.

Respondents of the Study

A total of 131 maritime students participated in this study. The respondents were selected using purposive quota sampling. The inclusion criteria specified that respondents must be third-year maritime transportation students who have been exposed to ECDIS (Electronic Chart Display and Information System) technology as part of their coursework or training. Students who had not been exposed to ECDIS or were not in their third year of the program were excluded from the study. These criteria were designed to ensure that the study focused on students with relevant experience in ECDIS and who are actively preparing for careers in the maritime industry.

Research Instrument

Data for this study were gathered using two different sets of questionnaires:

A. ECDIS Technology Questionnaire. The questionnaire was designed using a five-point Likert scale, allowing participants to express their level of agreement or disagreement with each statement. To ensure the robustness of the instrument, the questionnaire was undergone a rigorous evaluation process led by subject matter experts. These experts critically reviewed the questionnaire for both its content validity, ensuring that it adequately captures the intended concepts, and construct validity, confirming that it accurately measures the targeted constructs. Furthermore, the researcher conducted pilot testing and achieved a Cronbach's Alpha reliability coefficient of 0.79, indicating strong internal consistency.

In assessing the level of Effectiveness of the ECDIS Technology Questionnaire, the following scale was used:

Responses	Continuum	Interpretation
5 – Always	4.20 – 5.00	Highly effective
4 – Often	3.40 – 4.19	Somewhat effective
3 – Sometimes	2.60 – 3.39	Neutral
2 –Rarely	1.80 – 2.59	Somewhat ineffective
1 –Never	1.0 – 1.79	Not effective

B. Career Readiness Questionnaire. The questionnaire was also designed using a five-point Likert scale, allowing participants to express their level of agreement or disagreement with each statement. To ensure the robustness of the instrument, the questionnaire was undergone a rigorous evaluation process led by subject matter experts. These experts critically reviewed the questionnaire for both its content validity, ensuring that it adequately captures the intended concepts, and construct validity, confirming that it accurately measures the targeted constructs. Furthermore, the researcher conducted a pilot test and achieved Cronbach's Alpha reliability coefficient of 0.80, indicating strong internal consistency.

In assessing the level of the Career Readiness Questionnaire, the following scale was used:

Responses	Continuum	Interpretation
5 – Always	4.20 – 5.00	Very Confident
4 – Often	3.40 – 4.19	Confident
3 – Sometimes	2.60 – 3.39	Uncertain
2 –Rarely	1.80 – 2.59	Not confident
1 –Never	1.0 – 1.79	Very not Confident

Data Analysis

The mean and standard deviation were calculated for each variable. It provides an overview of students' perceptions. Pearson's correlation coefficient was used to examine the relationships between the variables. The correlation between ECDIS Technology and career readiness of 3rd-year maritime students was calculated to determine if significant correlations exist.

Data Gathering Procedure

Before gathering the data, the researcher obtained permission from the Dean of the Maritime Department to conduct the study. After obtaining approval, the researcher requested permission from the Dean to survey the selected respondents. After obtaining the necessary approvals, the researcher will prepare the consent form for the respondents and explain the study's importance to them. Data gathering was conducted solely on the school premises. The researcher will personally administer the survey questionnaires among the respondents. The answered questionnaires were retrieved immediately. The gathered data was tailed for statistical analysis. Interpretation of the results followed.

Ethical Considerations

In conducting the study on the effectiveness of ECDIS technology in relation to the career readiness of third-year maritime students, several ethical considerations were prioritized. Firstly, ensuring informed consent was crucial; participants were fully aware of the study's purpose, procedures, and any potential risks involved, allowing them to voluntarily choose to participate, confidentiality was maintained, protecting the identities and responses of students to promote the development of a safe environment for honest feedback. The research was conducted with integrity, avoiding any bias that might have influenced the results and ensuring that findings were reported transparently and accurately. Lastly, the study should minimize any potential negative impacts on students' academic performance or mental well-being, providing support resources if needed. By adhering to these ethical principles, the research contributed to a trustworthy and respectful exploration of ECDIS technology's role in maritime education.

RESULTS AND DISCUSSION

Effectiveness of ECDIS Technology

Table 1 shows the level of effectiveness of ECDIS technology to students. A weighted mean of 4.51, which falls within the "Highly Effective" category, suggests that students strongly perceive technology as a valuable and impactful component of their training. The relatively low standard deviation of 0.18 indicates consistency in the responses, reflecting a general agreement among the students about the effectiveness of ECDIS.

Table 1. Effectiveness of ECDIS Technology and level of career readiness

Statements	MeanNn	SD	Remarks
It helped me better understand navigational hazards in real-time.	4.61	0.54	Highly Effective
Gained a strong theoretical understanding of electronic navigation through ECDIS.	4.52	0.54	Highly Effective
It is relevant to my future career as a maritime professional.	4.56	0.56	Highly Effective
Equipped me to handle real-world navigational scenarios.	4.41	0.61	Highly Effective
It prepared me well for the maritime navigation assessments.	4.40	0.64	Highly Effective
Improved my ability to plan efficient navigation routes.	4.39	0.64	Highly Effective
I am more prepared to handle adverse weather conditions due to my training in ECDIS technology.	4.37	0.72	Highly Effective
It enhances my decision-making capabilities when navigating complex situations.	4.48	0.58	Highly Effective
Made it easier to comply with international maritime regulations.	4.51	.054	Highly Effective
Reduces the workload during navigation.	4.51	0.64	Highly Effective
Overall Result	4.51	0.18	Highly Effective

Legend: 4.20-5:00 Highly Effective *1.80-2.59- Somewhat ineffective*
3.40-4.19- Somewhat effective *1.0-1.70- Not Effective*
2.60-3.39- Neutral

The results of the evaluation reveal that the participants perceived the ECDIS (Electronic Chart Display and Information System) training as highly effective across multiple dimensions. The overall mean score of **4.51**, supported by a low standard deviation of **0.18**, indicates a strong and consistent agreement among respondents that the training made a significant contribution to their development as future maritime professionals. The consistently high ratings across all individual statements reflect a general satisfaction and confidence in the program's effectiveness.

Among the specific aspects evaluated, the statement *"Helped me better understand navigational hazards in real-time"* received the highest mean of **4.61**, suggesting that the real-time application of ECDIS is a powerful component of the training. Similarly, statements like *"Relevant to my future career as a maritime professional"* and *"Gained a strong theoretical understanding of electronic navigation through ECDIS"* were also rated very highly, indicating the program's strength in blending theory with practical career relevance. These results highlight the training's alignment with both academic and professional competencies expected in the maritime field.

However, some items received relatively lower—though still "Highly Effective"—ratings. For instance, *"More prepared to handle adverse weather conditions due to my training in ECDIS technology"* scored **4.37**, the lowest in the list, followed by statements related to efficient route planning and

assessment preparedness. These areas, although positively rated, may benefit from further instructional enhancement, particularly given the higher standard deviations associated with them, which suggest more varied experiences or levels of confidence among learners.

Based on the overall result, the training on ECDIS has been highly effective in equipping students with essential navigational knowledge and skills. The consistently high scores reflect both the quality of the instructional content and its perceived relevance to real-world maritime operations. However, the slightly lower ratings on weather condition preparedness and route planning highlight opportunities for targeted improvements. Addressing these aspects could make the program even more robust and better aligned with the dynamic challenges of modern navigation.

Students likely value ECDIS technology for its ability to simulate real-world scenarios, enhance understanding of navigation hazards, and provide hands-on experience with digital navigation tools, all of which are critical for their roles in the maritime industry. (Buot, et al, 2024).

Level of Career Readiness

Table 3 presents the level of career readiness among students, with a weighted mean of 4.48, categorized as "Very Confident," indicating a strong sense of preparedness among the participants. Students feel capable and well-equipped to handle maritime tasks such as planning voyages, reading digital charts, and responding to emergencies. The standard deviation of 0.20, while slightly higher than that of ECDIS effectiveness, still indicates a relatively consistent perception of confidence in career readiness across the group.

Table 2. Level of Career Readiness

Statements	Mean	SD	Remarks
The ECDIS training I receive is directly relevant to my future career as a maritime professional.	4.61	0.54	Very Confident
ECDIS skills are essential for advancing in a maritime career.	4.52	0.54	Very Confident
Proficiency in ECDIS will give me an advantage when applying for maritime jobs.	4.56	0.56	Very Confident
ECDIS training has prepared me to handle real-world navigational tasks.	4.41	0.61	Very Confident
I am confident in applying the ECDIS skills I have learned to real-life maritime operations.	4.40	0.64	Very Confident
ECDIS training has equipped me with the skills necessary to work effectively in a professional maritime environment.	4.39	0.64	Very Confident
My ECDIS training will enable me to navigate challenging situations at sea with greater effectiveness.	4.37	0.72	Very Confident
I can meet industry standards for electronic navigation using ECDIS.	4.48	0.58	Very Confident
I am fully prepared to work with ECDIS in my future maritime career.	4.51	0.54	Very Confident
ECDIS training has increased my confidence in pursuing a career in maritime navigation,	4.51	0.64	Very Confident
Overall Result	4.48	0.20	Very Confident

Legend: 4.20-5:00 Very Confident *1.80-2.59- Not Confident*
3.40-4.19- Confident *1.0-1.70- Very Not Confident*
2.60-3.39- Neutral

The results of the evaluation indicate that participants expressed a very high level of confidence in the relevance and effectiveness of their ECDIS (Electronic Chart Display and Information System) training in preparing them for their future careers in the maritime industry. With an overall mean of 4.48 and a low standard deviation of 0.20, it is clear that the respondents share a consistent and positive view

of how ECDIS training enhances their career readiness. The high level of confidence reflects both the perceived value of ECDIS skills in maritime operations and the quality of instruction they received.

Among the individual items, the statement *"The ECDIS training I receive is directly relevant to my future career as a maritime professional"* received the highest mean score of 4.61, followed closely by *"Proficiency in ECDIS will give me an advantage when applying for maritime jobs"* (4.56) and *"ECDIS skills are essential for advancing in maritime career"* (4.52). These results suggest that students recognize the direct and immediate applicability of ECDIS training to their career goals, job competitiveness, and long-term professional growth. The training is seen not only as a requirement but also as a strategic asset in a competitive industry.

On the other hand, while still rated "Very Confident," the items with slightly lower mean scores include *"I believe my ECDIS training will help me navigate challenging situations at sea"* (4.37) and *"ECDIS training has provided me with the skills needed to work effectively in professional maritime setting"* (4.39). These responses, coupled with their relatively higher standard deviations (up to 0.72), indicate that some students feel less confident when applying skills in high-stress or complex real-world scenarios, such as emergencies or adverse sea conditions. It suggests a potential area for curriculum enhancement through more scenario-based or simulation-intensive training.

Overall, the evaluation shows that ECDIS training is highly successful in building confidence and aligning with industry standards and expectations. The participants feel well-prepared and equipped to enter the maritime field with a solid foundation in electronic navigation. Strengthening training in high-pressure application scenarios could further boost confidence across all areas. These findings validate the continued investment in ECDIS training as a core component of maritime education and professional development.

This level of confidence likely stems from the integration of ECDIS technology into their training, which allows students to gain practical experience and apply theoretical knowledge in realistic settings.

Significant Relationship Between ECDIS Technology and Career Readiness

Table 3 illustrates the relationship between the effectiveness of ECDIS technology and the career readiness of third-year students in maritime transportation. The significant relationship between the effectiveness of ECDIS (Electronic Chart Display and Information System) technology and the career readiness of third-year maritime students underscores the critical role that ECDIS training plays in preparing students for professional success in the maritime industry. The finding suggests that as students perceive ECDIS technology to be more effective, their confidence and preparedness for real-world maritime tasks increase correspondingly. This relationship underscores the importance of integrating advanced navigation technologies, such as ECDIS, into maritime education.

Table 3. A significant relationship between the effectiveness of ECDIS Technology and career readiness of 3rd-year maritime students.

		ECDIS	Career
ECDIS	Pearson Correlations	1	.212
	Sig (2- tailed)		-015*
	N	131	131
Career	Pearson Correlation	.212	1
	Sig (2-tailed)	. 015*	
	N	131	131

Significant @p<0.05

ECDIS serves as a practical tool that bridges the gap between theoretical knowledge and hands-on experience (Buot et al., 2024). By simulating real-world navigation scenarios, the technology helps students develop essential competencies, including interpreting digital charts, planning voyages, managing navigation hazards, and responding to emergencies. These skills are directly linked to their career readiness, as they align with the demands of modern maritime operations. The significant result indicates that students who rate ECDIS training highly are likely to feel more confident in their ability to handle the responsibilities of a maritime career. (Buot, et al, 2024)

This outcome also highlights the importance of ongoing investment in and improvement of ECDIS training programs. Ensuring that the technology is effectively taught and utilized can maximize its impact on students' preparedness. Moreover, the finding highlights the broader implication that integrating advanced technologies into educational curricula not only enhances learning outcomes but also directly contributes to building a skilled and confident workforce. For the maritime industry, this relationship reinforces the value of adopting innovative tools to ensure that future professionals are well-equipped to meet industry standards and challenges.

CONCLUSION AND RECOMMENDATION

The study highlights the significant relationship between the perceived effectiveness of ECDIS (Electronic Chart Display and Information System) technology and the career readiness of third-year maritime students. The findings suggest that students who perceive ECDIS as highly effective tend to feel more confident and better prepared for their future roles in the maritime industry. It highlights the importance of ECDIS technology as a vital tool in maritime education, bridging the gap between theoretical knowledge and practical application. By enhancing situational awareness, reducing navigation errors, and simulating real-world tasks, ECDIS training equips students with the critical skills and competencies necessary for navigating complex maritime environments.

The results emphasize that integrating ECDIS technology into the maritime curriculum plays a pivotal role in fostering students' readiness to meet industry demands. Students gain not only technical proficiency but also the confidence to handle real-world challenges, such as planning voyages, managing emergencies, and ensuring safe navigation. These outcomes affirm the value of advanced navigation systems, such as ECDIS, in preparing students to excel in their future careers while contributing to maritime safety and operational efficiency.

In light of the study's findings, it is strongly recommended that maritime education institutions take proactive measures to further strengthen their Electronic Chart Display and Information System (ECDIS) training programs. This enhancement should be approached through a multifaceted strategy that includes the integration of comprehensive hands-on training, the use of high-fidelity simulation environments, and the incorporation of dynamic and current scenarios that mirror evolving industry standards and operational challenges. To ensure that the training remains relevant and practical, institutions should commit to continuous professional development programs for instructors, focusing on both pedagogical advancement and technological proficiency. Equally important is the investment in cutting-edge ECDIS equipment and software, which not only aligns with industry expectations but also prepares cadets to competently navigate complex maritime operations in real-world settings. By adopting these measures, maritime education institutions can significantly improve the quality and impact of ECDIS training, thereby fostering a higher standard of competence and safety among future maritime professionals.

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