

Navigating Complexity: Maritime English Discourse in ECDIS-Based Watch-Keeping Practices Among Cadet Officers

Yayu Nopriani Martha^{1*}, Siska Yoniessa²

¹⁻² Maritime Institute, Sekolah Tinggi Ilmu Pelayaran Jakarta, North Jakarta, Indonesia

Email: yayu.nopriani.martha@stipmail.ac.id

Abstract. *The integration of Electronic Chart Display and Information System (ECDIS) into modern bridge operations has fundamentally transformed maritime navigation, introducing a complex layer of multimodal technical discourse that demands sophisticated linguistic competence from seafarers. Despite its centrality to contemporary watch-keeping, the Maritime English embedded within ECDIS interfaces, alert systems, and associated technical documentation remains critically underexplored from an English for Specific Purposes (ESP) and multiliteracy perspective. This study examines the discourse features of ECDIS-based watch-keeping communication and investigates the Maritime English literacy challenges encountered by Indonesian deck cadet officers at Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta. Drawing on qualitative data from ECDIS interface text analysis and semi-structured interviews with cadets, lecturers, and navigation experts, the study employs thematic analysis, cross-group comparison, and narrative synthesis. Findings reveal that ECDIS discourse is characterized by high terminological density, imperative-modal structures, and layered multimodal meaning-making that cadets are systematically underprepared to navigate. The study argues for the integration of a multiliteracy-informed pedagogical framework within Maritime English and ECDIS training curricula, with concrete implications for maritime educators, curriculum designers, and institutional policymakers.*

Keywords: *ECDIS; Maritime English; multiliteracy; watch-keeping discourse; deck cadet officers*

1. INTRODUCTION

The relationship between maritime safety and communicative competence has long constituted a subject of urgent scholarly and institutional concern. Landmark maritime disasters—from the *Herald of Free Enterprise* (1987) to the *Costa Concordia* (2012)—have repeatedly foregrounded linguistic breakdown, miscommunication, and the inadequate interpretation of navigational information as critical contributing factors to tragedy at sea (Pyne & Koester, 2005). Yet as the maritime industry undergoes profound digital transformation, the nature of communicative demand on the bridge has shifted in ways that existing frameworks for Maritime English education and competency assessment have been demonstrably slow to address. At the center of this transformation stands the Electronic Chart Display and Information System (ECDIS)—a mandated navigational technology under the International Maritime Organization's (IMO) Standards of Training, Certification and Watchkeeping (STCW) Convention—whose complex, multimodal discourse environment constitutes a largely uncharted frontier in English for Specific Purposes (ESP) scholarship and maritime pedagogy (IMO, 2011; Simanjuntak, 2025). The absence of sustained scholarly engagement with this environment is not merely an academic lacuna; it represents a practical and institutional failure with direct consequences for navigational safety and officer competency.

ECDIS has been mandatory for new vessels under SOLAS since 2012, representing one of the most consequential shifts in bridge watch-keeping practice in the history of

maritime navigation (IMO, 2017). Its interfaces integrate nautical charts, automated alert hierarchies, route planning modules, sensor data feeds, and technical procedural documentation—all rendered primarily in English, irrespective of a seafarer's first language or cultural background. This creates a communicative environment that is simultaneously technical, multimodal, and linguistically demanding, requiring seafarers to decode not merely verbal and textual meaning but also spatial, symbolic, procedural, and audio-visual semiotic systems operating in layered and often simultaneous ways (Kress, 2010; Kress & van Leeuwen, 2006). For cadet officers trained in non-English-speaking maritime nations, this environment is particularly challenging. Studies consistently indicate that misinterpretation of ECDIS alerts, navigational parameter readings, and system prompts contributes meaningfully to navigational incidents, underscoring the urgency of addressing the linguistic and literacy dimensions of ECDIS competency as a matter of professional and institutional priority (Porathe, 2012).

Within the established field of Maritime English, scholarly attention has historically clustered around spoken register—particularly the IMO Standard Marine Communication Phrases (SMCP), radio communication protocols, and bridge team interaction—while written and multimodal maritime texts have received comparatively limited analytical scrutiny (Pritchard, 2003; Trenkner, 2004). This scholarly asymmetry is consequential. As navigational environments have grown increasingly technologized, the communicative demands placed on seafarers have expanded beyond spoken interpersonal interaction into complex text-technology interfaces that require what Gee (2012) conceptualizes as "discursive literacy"—the capacity to interpret and deploy simultaneously the language, symbols, values, and social practices of specialized institutional domains. English for Specific Purposes scholarship has made considerable advances in analyzing genre, register, and discourse in professional and academic contexts (Swales, 1990; Hutchinson & Waters, 1987; Biber & Conrad, 2009), yet the specific discursive architecture of navigational technology interfaces—particularly ECDIS—has not been systematically analyzed as a site of Maritime English meaning-making. This represents a meaningful gap at the intersection of maritime communication, ESP, and digital literacy studies.

The multiliteracy framework offers a theoretically productive and analytically powerful lens for investigating this gap. Originating in the foundational work of the New London Group (1996) and subsequently elaborated and refined by Cope and Kalantzis (2009), the multiliteracies paradigm reconceptualizes literacy not as a singular, decontextualized verbal skill but as a complex set of situated, multimodal, and culturally mediated meaning-

making practices. Applied to maritime navigational contexts, this framework draws critical attention to the ways in which cadet officers must simultaneously process linguistic (verbal text), visual (chart symbology, color-coded alert systems), spatial (navigational geometry and course plotting), gestural (interface interaction), and auditory (alarm signal differentiation) meaning resources in integrated, real-time watch-keeping tasks (Simanjuntak, 2025; Kress, 2010). Maritime English pedagogy, however, has largely operated within a residually monomodal conception of language—privileging written and spoken verbal communication while systematically neglecting the multimodal literacy competencies that digital navigational technology environments demand and that, in practice, determine whether a cadet officer can function safely and effectively at the helm (Lewkowicz & Forey, 2020).

This research gap carries specific and compounded pedagogical consequences in the Indonesian maritime education context. Indonesia, as the world's largest archipelagic state and one of the most significant sources of maritime labor in the global shipping industry, trains thousands of deck officers annually through its network of specialized maritime institutions, including Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta, the nation's flagship maritime training academy under the Ministry of Transportation. Indonesian cadet officers operate within a multilingual and multicultural educational context in which English functions as the language of professional maritime instruction, international certification, and operational communication at sea, yet it remains a foreign language for the overwhelming majority of trainees (Simanjuntak, 2025). The typological distance between Indonesian and English—encompassing phonological, morphological, and syntactic systems with minimal structural overlap—combined with the elevated technical complexity of ECDIS discourse, places Indonesian cadets in a position of compounded communicative vulnerability. This vulnerability is structurally reinforced by the architecture of current STCW-mandated ECDIS type-specific training courses, which emphasize operational competency in equipment handling while largely bypassing the language and multimodal literacy development necessary for meaningful discourse comprehension in complex navigational scenarios (IMO, 2011; Hyland, 2006).

The discourse of ECDIS interfaces and associated technical documentation also exhibits distinctive linguistic features that warrant systematic analytical investigation from a functional and critical discourse perspective. Functional analysis of ECDIS alert language—the most communicatively critical register within the ECDIS environment—reveals a consistent prevalence of imperative mood constructions, modalized deontic structures ("MUST verify position before entering TSS"), nominalization ("Cross-track error deviation

detected"), elliptical abbreviations ("XTE > 0.5 NM"), and high-frequency technical lexis embedded within condensed, visually framed textual units (Halliday & Matthiessen, 2014; Fairclough, 2003). These features collectively constitute a high-density, cognitively demanding linguistic register that requires the deployment of specific interpretive strategies—strategies grounded not merely in vocabulary knowledge but in deep familiarity with the procedural logic, institutional norms, and semiotic conventions of bridge watch-keeping practice. The interaction between these linguistic features and the visual-spatial semiotic systems of the nautical chart display, radar overlay, and route monitoring graphic creates a meaning-making environment of considerable complexity that conventional Maritime English instruction—typically organized around SMCP vocabulary lists, formulaic dialogue practice, and grammar-translation exercises—does not adequately prepare cadets to navigate with confidence or precision (Widdowson, 1983).

Given these intersecting concerns—the centrality of ECDIS to contemporary watch-keeping practice, the multimodal complexity of its discourse environment, the linguistic vulnerability of non-native English-speaking cadets, the institutional gaps in current Maritime English pedagogy, and the practical safety implications of communicative failure in navigational technology contexts—the present study addresses a central research question: *What are the defining discourse features of ECDIS-based watch-keeping communication, and what Maritime English literacy challenges do Indonesian deck cadet officers encounter in navigating this environment?* To address this question, the study pursues three specific objectives: first, to analyze the linguistic and multimodal discourse features of ECDIS interfaces, alert systems, and associated technical documentation; second, to identify and characterize the Maritime English literacy competency gaps experienced by Indonesian deck cadets in ECDIS-based watch-keeping simulation and practice; and third, to examine how maritime English lecturers and senior navigation experts perceive the current adequacy of training frameworks in preparing cadets for the discourse demands of ECDIS operation.

The significance of this study operates on three levels. Theoretically, it extends the multiliteracy framework into a specialized maritime technology context, demonstrating the analytical productivity of multimodal discourse theory for understanding navigational communication in an era of pervasive digital instrumentation. Empirically, it generates contextually grounded, institution-specific evidence about the linguistic and literacy challenges of ECDIS discourse among Indonesian cadets—evidence that is currently absent from the existing research literature. Practically, the findings provide a principled empirical basis for reforming Maritime English curricula and ECDIS training programs to address the

integrated linguistic-technological competencies that modern watch-keeping practice demands of entry-level deck officers. The paper proceeds as follows: Section 2 presents the methodological framework and research procedures; Section 3 provides systematic results and analytical interpretation; Section 4 discusses findings in relation to theory and prior literature; and Section 5 synthesizes the study's core contributions and suggests future research directions.

2. METHOD

This study adopted a qualitative research design grounded in discourse analysis and interpretive inquiry, a methodological choice reflecting the study's aim of understanding the linguistic properties and communicative challenges of ECDIS-based watch-keeping from multiple stakeholder perspectives. Qualitative approaches are particularly appropriate for studies that seek to analyze textual phenomena, interpret participant meaning-making, and develop theoretically generative explanations of complex educational and professional contexts (Braun & Clarke, 2006). The research was conducted at Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta, selected purposively as Indonesia's leading maritime academy with fully equipped ECDIS simulation laboratories and a well-established deck officer training program.

The study involved three participant groups selected through purposive sampling to enable meaningful cross-group analysis. The first group comprised thirty final-year deck cadets enrolled in the Nautika study program, selected on the basis of having completed all ECDIS type-specific training modules required under the STCW 2010 Manila Amendments. This group represented the primary population of interest—near-graduates whose competency profiles reflect the culminating outcomes of the current training framework. The second group consisted of eight maritime English lecturers and navigation instructors at STIP Jakarta with direct experience in ECDIS-related pedagogy, selected to provide expert pedagogical perspectives on cadet language and literacy development. The third group comprised five senior deck officers and maritime practitioners with active seagoing experience on ECDIS-equipped vessels, recruited to offer industry-level insight into the real-world discourse demands of ECDIS-based watch-keeping. Together, these three groups enabled comparative analysis across pedagogical, institutional, and professional dimensions of the research problem.

Data were collected through two primary instruments. The first was a structured discourse analysis protocol applied to a corpus of ECDIS interface texts, including alarm and

alert messages drawn from two ECDIS simulators in use at STIP, the associated operator manuals, and the IMO ECDIS Guidance for Good Practice document (IMO, 2017). This protocol examined linguistic features including modality patterns, sentence structure, lexical density, nominalization frequency, and multimodal semiotic integration. The second instrument was a semi-structured interview guide, administered individually to all three participant groups, targeting perceptions of linguistic difficulty, communicative comprehension strategies, pedagogical adequacy, and the relationship between language proficiency and ECDIS operational competency. Cadet interviews were further supplemented by direct observation of four ECDIS simulator sessions to contextualize reported challenges within authentic navigational practice.

Data analysis proceeded through three integrated analytical procedures aligned with the study's multi-perspective design. Thematic analysis was conducted on the full interview and observation dataset, following the systematic six-phase procedure recommended by Braun and Clarke (2006), generating themes related to discourse comprehension competency, linguistic challenge types, and multiliteracy demands. Cross-group comparison was then applied to examine convergences and distinctions across the cadet, lecturer, and practitioner datasets, identifying areas of shared concern as well as perspective-specific insights. Finally, narrative synthesis was employed to integrate the discourse analysis findings with the interview-derived competency themes into a coherent interpretive account, connecting textual evidence to stakeholder experience in a theoretically informed manner (Cope & Kalantzis, 2009). This triangulated design—combining textual, interview, and observational data across three analytical procedures—strengthened the validity and interpretive depth of the study's conclusions.

3. RESULTS AND ANALYSIS

The findings of this study are organized around three analytically distinct but interrelated dimensions: the discourse features characterizing ECDIS interface communication, the Maritime English literacy challenges identified among deck cadets, and the cross-group perspectives on current training adequacy. Together, these dimensions provide a comprehensive and multi-layered account of the communicative landscape that ECDIS-based watch-keeping constitutes for cadet officers in training.

3.1 Discourse Features of ECDIS Interface Communication

Systematic analysis of the ECDIS interface corpus—comprising 214 discrete textual units drawn from alarm messages, navigation prompts, route monitoring texts, and system

status notifications—revealed a consistent set of linguistic and semiotic features that collectively characterize ECDIS discourse as a distinctive and demanding register. Five dominant discourse features were identified, as presented in Table 1.

Table 1 *Linguistic and Semiotic Features of ECDIS Interface Discourse (N = 214 textual units)*

Discourse Feature	Description	Illustrative Example	Prevalence
Imperative mood structures	Direct command forms requiring immediate officer response	<i>"ACKNOWLEDGE ALARM" / "VERIFY POSITION NOW"</i>	Very High (82%)
Deontic modality	Obligation/necessity expressions with safety-critical force	<i>"Officer MUST confirm before proceeding"</i>	High (71%)
Technical nominalization	Process-to-noun transformation creating lexical density	<i>"Cross-track error deviation monitoring"</i>	High (68%)
Elliptical constructions	Grammatically incomplete but contextually dependent units	<i>"XTE > 0.5 NM" / "HDOP: Degraded"</i>	Very High (87%)
Multimodal semiotic layering	Integrated text + symbol + color-code + sound alarm systems	Red icon + flashing text + alarm tone + "DANGER ZONE"	High (74%)

The prevalence of elliptical constructions (87%) and imperative structures (82%) is particularly significant. These features create a register characterized by extreme compactness and urgency—communicatively efficient for experienced officers, but cognitively and linguistically taxing for cadets who lack the procedural and lexical background knowledge required to reconstruct full propositional meaning from abbreviated forms. The high frequency of multimodal semiotic layering (74%) further compounds this challenge: ECDIS alerts rarely operate through verbal text alone, but instead demand the simultaneous integration of linguistic, visual, symbolic, and auditory meaning resources within tight decision-making timeframes. This finding aligns directly with the multiliteracy framework's emphasis on the multimodal constitution of contemporary professional discourse environments (Kress & van Leeuwen, 2006; New London Group, 1996).

Technical nominalization also emerged as a structurally consequential feature. Phrases such as "route monitoring deviation threshold exceedance" and "anti-grounding alarm acknowledgement pending" condense multiple propositional layers into single nominal units, requiring cadets to perform significant semantic unpacking under real-time operational pressure. This type of nominalized, register-dense language is well-documented as a source of comprehension difficulty for non-native English speakers in technical professional contexts (Halliday & Matthiessen, 2014; Hyland, 2006), yet it appears to receive negligible attention in current Maritime English curricula reviewed during the study.

3.2 Maritime English Literacy Challenges Among Deck Cadets

The thematic analysis of cadet interview data and simulator observation notes generated five major challenge categories, reflecting both linguistic and multimodal literacy dimensions. Table 2 presents the frequency and expert-rated severity of each challenge, alongside a composite training gap score derived from cross-group assessment.

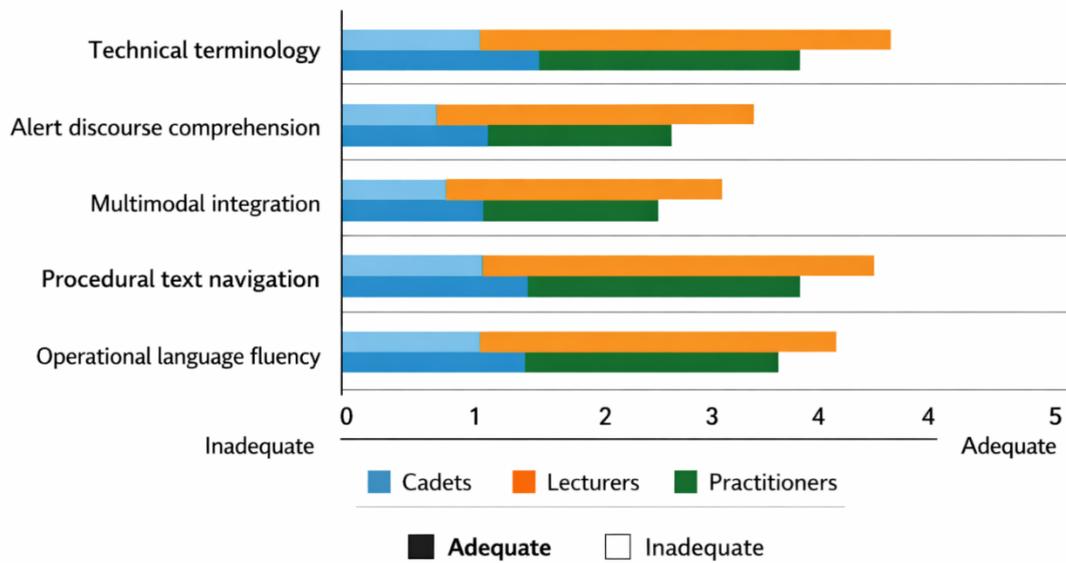
Table 2 *Maritime English Literacy Challenges in ECDIS Watch-Keeping: Cadet Frequency, Expert Severity, and Training Gap Scores*

Challenge Category	Cadet-Reported Frequency	Expert Severity Rating (1–5)	Training Gap Score (1–5)
Technical terminology interpretation	87%	4.2	4.3
Real-time alert prioritization and response	79%	4.5	4.5
Multimodal symbol-text-sound integration	81%	4.1	4.2
Procedural documentation comprehension	68%	3.7	3.8
Alarm acknowledgement and log language	73%	4.0	4.0

The highest training gap scores were recorded for real-time alert prioritization and response (4.5) and technical terminology interpretation (4.3), indicating that these challenges represent not only areas of significant cadet difficulty but also areas where current training provision is most demonstrably inadequate. Cadets consistently reported uncertainty about whether specific ECDIS alarms represented warnings, alarms, or cautions—a distinction with direct navigational safety implications—largely because the English lexical differentiation between these alert categories was not explicitly addressed in their training. As one cadet expressed during interview: "I understand the word 'alarm' but I cannot always understand why some alarm is more serious than other alarm. The system uses many different words but in class we only learn basic vocabulary."

Multimodal integration challenges (81% reported frequency) were also pervasive. Observation data showed that cadets frequently focused on the textual alert message in isolation, neglecting to integrate the simultaneously activated visual icon system, color-coding hierarchy, and auditory differentiation signals that together constitute the complete ECDIS alarm communication. This pattern reflects a persistent monomodal orientation in language processing—a tendency to treat textual content as the primary or sole channel of meaning—that multiliteracy theorists identify as a fundamental limitation of traditional literacy education (Cope & Kalantzis, 2009; Kress, 2010).

3.3 Cross-Group Perspectives on Training Adequacy



Note: Ratings represent group consensus based on semi-structured interview synthesis.

Figure 1: Cross-Group Perception of Current Training Adequacy Across Five Competency Dimensions

The cross-group comparison revealed consistent convergence among all three participant groups regarding the inadequacy of current ECDIS-related Maritime English training, though with notable differences in emphasis and explanatory framing. Cadet perceptions of training adequacy were uniformly low across alert discourse comprehension and multimodal integration dimensions, which cadets attributed primarily to a perceived disconnect between classroom Maritime English instruction—focused on SMCP phrases and general nautical vocabulary—and the specific discourse demands of ECDIS operation. Lecturers acknowledged this disconnect while attributing it partly to the speed of ECDIS technology development relative to curriculum revision cycles and partly to the absence of explicit multiliteracy pedagogical frameworks within maritime English methodology. Navigation practitioners consistently rated cadet competency even lower than cadets themselves, with several indicating that newly certificated officers joining vessels demonstrate significant discomfort with ECDIS-mediated communication in the first months at sea. This cross-group convergence on training inadequacy constitutes strong triangulated evidence that the identified gap is not a matter of individual cadet variation but a systemic outcome of current curriculum design.

4. DISCUSSION

The findings of this study illuminate a significant and consequential mismatch between the discourse demands of ECDIS-based watch-keeping and the communicative competencies currently developed through Maritime English and ECDIS training programs in the Indonesian maritime education context. This mismatch has both theoretical and practical dimensions that warrant careful interpretive engagement.

From a theoretical standpoint, the dominance of elliptical constructions, imperative structures, technical nominalization, and multimodal semiotic layering in ECDIS interface discourse confirms that navigational technology communication constitutes a specialized register whose linguistic properties are distinctive, complex, and systematically different from the spoken interactional registers that Maritime English pedagogy has traditionally prioritized. This finding extends and empirically substantiates the register-analytic insights of Biber and Conrad (2009) into a maritime technology context, while reinforcing the discourse-analytic argument, advanced by Fairclough (2003), that institutional texts embed power, procedural logic, and social practice in ways that non-initiated readers must be explicitly equipped to decode. The prevalence of multimodal semiotic layering, in particular, provides strong empirical support for the application of the multiliteracy framework to maritime technology education: ECDIS communication cannot be adequately understood or taught through verbal text analysis alone (New London Group, 1996; Kress & van Leeuwen, 2006). This study's findings thus offer a theoretically grounded argument for repositioning ECDIS literacy as an integrated multimodal competency rather than a purely operational-technical skill.

The patterns of cadet challenge documented in this study are broadly consistent with, yet contextually more specific than, prior research on Maritime English difficulties among non-native English-speaking seafarers. Lewkowicz and Forey (2020) and Pritchard (2003) have identified vocabulary and register comprehension as persistent barriers in maritime professional communication, while Porathe (2012) has documented human factors challenges in ECDIS usability more broadly. The present study extends these lines of inquiry by specifying the particular discourse features—elliptical constructions, deontic modality, nominalization—that generate comprehension difficulties, and by locating these difficulties within the distinctive context of ECDIS simulator training at an Indonesian maritime academy. This contextual specificity is both the study's strength and one of its acknowledged limitations: the findings reflect conditions at STIP Jakarta and may not be fully generalizable to maritime academies in other national or institutional contexts, where language proficiency

profiles, curriculum designs, and simulator resources may differ meaningfully.

The cross-group convergence on training inadequacy is perhaps the study's most practically significant finding, and it complicates any interpretation that locates the problem primarily at the level of individual cadet linguistic ability. When lecturers acknowledge curriculum-technology misalignment and practitioners report consistent communicative discomfort among newly certificated officers, the evidence points toward a structural gap in how Maritime English and ECDIS competency are conceptualized and integrated within training frameworks—a gap that curricular reform, rather than remedial language instruction, is the appropriate response to address. This finding aligns with the argument advanced by Simanjuntak (2025) that multiliteracy pedagogy offers a more institutionally adequate framework for Maritime English development than current ESP approaches, which tend to isolate linguistic competency from the multimodal, technological, and situational contexts of maritime professional practice.

The study's practical implications are consequential for multiple stakeholder groups. For maritime educators and curriculum designers, the findings suggest an urgent need to redesign ECDIS training modules to incorporate explicit linguistic and multimodal literacy instruction—including analysis of ECDIS alert register, multimodal meaning-making strategies, and procedural text navigation—alongside technical operational training. For maritime English lecturers specifically, the findings point toward the value of genre-based and multimodal pedagogical approaches (Swales, 1990; Cope & Kalantzis, 2009) that engage directly with ECDIS interface texts as the primary discourse objects of instruction, rather than relying on generalized nautical vocabulary development. For institutional policymakers and accreditation bodies, the evidence of systematic training gaps carries regulatory implications, suggesting that STCW's current ECDIS type-specific training requirements may need supplementation with explicit language and multimodal literacy benchmarks. Future research should investigate these implications across broader institutional and national contexts, examine the effectiveness of specific multiliteracy-informed pedagogical interventions in ECDIS training environments, and explore the potential of AI-assisted tools for developing ECDIS discourse comprehension competency among maritime cadets.

5. CONCLUSION

This study has demonstrated that ECDIS-based watch-keeping communication constitutes a linguistically and semiotically complex discourse environment characterized by technical nominalization, imperative and deontic modality, elliptical constructions, and

layered multimodal meaning systems that Indonesian deck cadet officers are systematically underprepared to navigate under current training frameworks. The convergent evidence from discourse analysis, cadet interviews, lecturer perspectives, and practitioner assessments establishes that the gap between ECDIS discourse demands and cadet Maritime English literacy is not an individual deficiency but a structural outcome of curricula that have not kept pace with the communicative realities of digitalized bridge environments. By applying a multiliteracy analytical framework to this underexplored site of maritime professional communication, the study contributes a theoretically grounded, empirically substantiated argument for integrating explicit multimodal literacy pedagogy into Maritime English and ECDIS training, with direct implications for curriculum design, instructor development, and maritime education policy in Indonesia and beyond.

REFERENCES

- Biber, D., & Conrad, S. (2009). *Register, genre, and style*. Cambridge University Press.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Cope, B., & Kalantzis, M. (2009). "Multiliteracies": New literacies, new learning. *Pedagogies: An International Journal*, 4(3), 164–195. <https://doi.org/10.1080/15544800903076044>
- Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. Routledge.
- Gee, J. P. (2012). *Social linguistics and literacies: Ideology in discourses* (4th ed.). Routledge.
- Halliday, M. A. K., & Matthiessen, C. M. I. M. (2014). *Halliday's introduction to functional grammar* (4th ed.). Routledge.
- Hutchinson, T., & Waters, A. (1987). *English for specific purposes: A learning-centred approach*. Cambridge University Press.
- Hyland, K. (2006). *English for academic purposes: An advanced resource book*. Routledge.
- International Maritime Organization. (2011). *STCW: Including 2010 Manila Amendments*. IMO Publishing.
- International Maritime Organization. (2017). *ECDIS – Guidance for good practice* (MSC-FAL.1/Circ.3). IMO Publishing.
- Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.
- Kress, G., & van Leeuwen, T. (2006). *Reading images: The grammar of visual design* (2nd ed.). Routledge.
- Lewkowicz, J., & Forey, G. (2020). *Maritime English in a changing world: Challenges and*

- new directions. *English for Specific Purposes*, 58, 1–14.
<https://doi.org/10.1016/j.esp.2019.09.001>
- New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60–92.
<https://doi.org/10.17763/haer.66.1.17370n67v22j160u>
- Porathe, T. (2012). Human factors issues with ECDIS usability. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 56(1), 1212–1216.
<https://doi.org/10.1177/1071181312561241>
- Pritchard, B. (2003). Maritime communication and the Standard Marine Communication Phrases. In *Proceedings of the International Maritime English Conference (IMEC 15)*. World Maritime University.
- Pyne, R., & Koester, T. (2005). Identifying sources of error and accident in maritime environments. *Cognition, Technology & Work*, 7(4), 204–210.
<https://doi.org/10.1007/s10111-005-0198-0>
- Simanjuntak, M. B. (2025). Multiliteracy framework for Maritime English communication: Pedagogical implications for Indonesian seafarer education. *TransNav: The International Journal on Marine Navigation and Safety of Sea Transportation*, 19(4).
<https://doi.org/10.12716/1001.19.04.14>
- Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. Cambridge University Press.
- Trenkner, P. (2004). Maritime English: Where are we going? In *Proceedings of the International Maritime English Conference (IMEC 16)*. World Maritime University.
- Widdowson, H. G. (1983). *Learning purpose and language use*. Oxford University Press.