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Competency-Based Training Management for Deck and Engine Cadets: A Comparative Analysis at Sekolah Tinggi Ilmu Pelayaran Jakarta

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ABSTRACT

The rapid transformation of the global maritime industry, driven by technological advancement, evolving regulatory frameworks, and the emergence of autonomous vessel technologies, has intensified demands for competency-based training management in maritime higher education institutions. This study examines and comparatively analyzes the implementation of competency-based training management for deck nautical and engine technics cadets at Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta, Indonesia's premier state maritime polytechnic. Employing a qualitative descriptive design, data were collected from thirty cadets—fifteen from the deck nautical program and fifteen from the engine technics program—alongside five practitioner-lecturers comprising three maritime captains and two master mariners. Instruments included structured interview protocols, competency assessment rubrics, and observational checklists. Findings reveal significant discrepancies between the two cadet tracks in terms of perceived training effectiveness, competency progression, and instructional support, with engine technics cadets reporting comparatively lower satisfaction with the alignment between curriculum content and shipboard realities. Practitioner-lecturers identified institutional inflexibility and outdated competency benchmarks as principal barriers to training quality. The study contributes an original comparative framework for diagnosing track-specific competency management deficiencies and offers institutional policy recommendations aligned with STCW standards and contemporary maritime operational demands.

Keywords : *competency-based training; maritime education; deck cadets; engine cadets*



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1. INTRODUCTION

The global maritime industry stands at a pivotal juncture, shaped by the convergence of accelerating technological change, increasingly stringent international regulatory requirements, and a growing demand for seafarers who are not merely technically competent but adaptively skilled across multiple operational domains. Against this backdrop, the management of cadet training in maritime higher education institutions has emerged as a critical institutional and policy concern, particularly in archipelagic nations like Indonesia whose economic and developmental trajectories are deeply intertwined with the effectiveness of their maritime human capital. The question of how competency-based training frameworks are implemented, differentiated, and managed across distinct cadet specializations—namely, deck nautical and engine technics programs—has received insufficient scholarly attention relative to its strategic importance. This study directly addresses that gap by undertaking a comparative examination of competency-based training management across both tracks at Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta.

Maritime training management has historically been governed by the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention, which provides the foundational regulatory architecture within which national institutions must operate. However, as Zhang et al. (2022) demonstrate in their analysis of intelligent ship risk evaluation, the operational environments that today's deck officers and engineering officers must navigate are increasingly characterized by systemic complexity, automated decision-support systems, and risk scenarios that conventional training paradigms were not designed to address. Similarly, the integration of liquefied natural gas propulsion systems and other emerging technologies into commercial fleets—as analyzed by Chae et al. (2021)—has redefined the technical competency demands placed on engine room cadets, requiring training institutions to substantially revise their instructional content and management priorities. In this context, a competency-based training approach is no longer aspirational but operationally necessary.

Despite broad international recognition of competency-based education as the appropriate framework for maritime professional preparation, significant institutional challenges persist in translating this framework into coherent and track-specific training management practices. Paridaens and Notteboom (2021) argue, in their analysis of national integrated maritime policies, that effective maritime human resource development requires not only visionary policy formulation at the national level but also robust institutional mechanisms for translating policy into operational training programs. The absence of such mechanisms frequently results in misalignment between declared competency standards and the actual instructional and assessment practices observed within maritime polytechnics. In Indonesia, this misalignment is compounded by structural differences between the deck nautical and engine technics training tracks, which operate under distinct professional certification pathways, occupational cultures, and instructional demands, yet are often administered under unified institutional governance frameworks that fail to account for these differences.

The academic literature on maritime education management has produced valuable insights into general curriculum quality, instructor qualification, and institutional effectiveness, but has devoted comparatively little attention to the comparative dynamics between nautical and engineering cadet tracks within the same institution. Kim et al. (2021) highlight, in the context of port resilience, that operational performance depends not only on system-wide standards but on the differential competencies and adaptive capacities of specific operational roles. By analogy, the resilience of a maritime institution's training system rests on its ability to develop differentiated, track-appropriate competencies, rather than imposing homogeneous training management frameworks that obscure meaningful inter-track variation. Meanwhile, advances in technology-assisted learning—documented extensively by Buddha et al. (2024) in their systematic review of language learning systems—have opened new possibilities for individualized and competency-responsive training delivery, but their uptake within Indonesian maritime institutions remains understudied.

Existing research has also tended to assess training management from either a purely administrative perspective, focusing on curriculum documentation and regulatory compliance, or from a learner-centered perspective that privileges cadet satisfaction over institutional analysis. What remains critically underexplored is a dual-perspective comparative analysis that simultaneously captures cadet-level perceptions across two professional tracks and institutional-level insights from practitioner-educators whose seafaring backgrounds equip them with a distinctive vantage point on the gap between training content and professional reality. Sabri et al. (2022), in their taxonomy of mobile and adult learning environments, argue that learning effectiveness in professional preparation contexts is fundamentally relational—contingent on the quality of alignment between instructional design, learner characteristics, and the occupational demands of the target profession. STIP Jakarta, as a nationally mandated maritime higher education institution, provides an ideal and contextually significant case for examining how this relational alignment is managed across two differentiated yet institutionally colocated cadet tracks.

This study therefore focuses on the comparative analysis of competency-based training management practices as experienced by deck nautical and engine technics cadets, and as assessed by practitioner-lecturers with substantive seafaring credentials. The research is guided by the following objectives: first, to identify the prevailing competency development indicators experienced by cadets across both tracks; second, to compare training management perceptions between the deck nautical and engine technics cohorts; and third, to integrate practitioner-lecturer assessments into a cross-

perspective analytical framework that reveals institutional strengths and systemic deficiencies in training management at STIP Jakarta.

The significance of this study is threefold. Theoretically, it advances the discourse on competency-based education in maritime professional development by introducing a track-comparative analytical dimension that has been absent from the literature. Empirically, it contributes primary data from one of Indonesia's most significant maritime training institutions, enriching the evidence base for maritime education management research in Southeast Asia. Practically, its findings offer actionable recommendations for institutional governance, curriculum differentiation, and practitioner-educator roles in maritime polytechnics navigating the twin pressures of regulatory compliance and industry relevance. As automated container terminals redefine the operational frontier of port and vessel management (Kim et al., 2022), and as the environmental and regulatory demands on international liner operations intensify (Liao & Lee, 2023), the imperative to produce competency-ready maritime graduates has never been more urgent. This study is positioned to contribute meaningfully to that imperative.

2. LITERATURE REVIEW

2.1 Conceptual Foundations of Competency-Based Training Management

Competency-based training (CBT) management refers to the systematic design, delivery, assessment, and governance of educational programs organized around measurable professional competencies rather than content coverage or time-in-class metrics. In maritime education, CBT frameworks are anchored in STCW-defined standards, which delineate minimum knowledge, understanding, and proficiency requirements for certification across deck and engineering officer ranks. However, the institutional implementation of these standards varies considerably, and the management practices that translate regulatory requirements into functional training systems remain diverse, contested, and underexamined. Shi et al. (2023), in their bibliometric analysis of technology management research, identify institutional adaptability and practitioner knowledge integration as the primary drivers of effective professional training management. These dimensions are directly relevant to the maritime education context, where institutional capacity to incorporate emerging operational knowledge into training systems determines whether graduates are genuinely competency-ready or merely certification-compliant.

The distinction between competency compliance and competency readiness is central to understanding the problem this study addresses. As Fernández Otoy et al. (2024) demonstrate in their systematic review of digital and information literacy among teachers, the gap between declared instructional competencies and enacted pedagogical competencies is a recurring challenge in professional education institutions, particularly where assessment systems are designed to confirm minimum thresholds rather than develop adaptive professional capability. In the maritime training context, this gap manifests as a recurring mismatch between STCW-prescribed competency standards and the actual operational demands that cadets encounter upon joining vessels—a mismatch that is structurally different for deck and engineering officer tracks, given their distinct functional responsibilities and certification pathways.

2.2 Theoretical Frameworks Underpinning the Study

This study draws primarily on two complementary theoretical frameworks. The first is Competency-Based Education Theory (CBE), which holds that learning outcomes must be defined in terms of demonstrable professional performance rather than instructional exposure. CBE's core tenets—learner-centeredness, outcome specificity, criterion-referenced assessment, and curricular flexibility—provide the normative framework against which institutional training management practices at STIP Jakarta are evaluated. The second is Experiential Learning Theory (ELT), associated with Kolb's (1984) cyclical model of learning through concrete experience, reflective observation, abstract conceptualization, and active experimentation. ELT is particularly relevant in maritime training contexts because seafaring is inherently experiential, and the effectiveness of shore-based

cadet training is contingent on its capacity to approximate, simulate, and prepare cadets for the concrete operational experiences they will encounter aboard vessels. Adnan et al. (2023), in their systematic review of robotics experiential learning with computational thinking, demonstrate that experiential design principles substantially enhance learner engagement and professional competency transfer, a finding with direct implications for maritime cadet training management.

The integration of CBE and ELT perspectives reveals a critical institutional design challenge: competency-based frameworks are most effective when aligned with experiential learning opportunities, yet many maritime institutions—including those in Indonesia—continue to rely predominantly on lecture-based instructional models that privilege declarative knowledge over procedural and adaptive competency. Yuebo et al. (2024), in their analysis of online learning success for adult learners in distance education contexts, identify learner agency, instructor expertise, and institutional support structures as the three principal determinants of learning effectiveness, all of which carry direct relevance for understanding differential outcomes between deck and engine technics cadet cohorts.

2.3 Prior Empirical Studies and Critical Synthesis

Empirical studies on maritime training management have grown substantially since the widespread adoption of the STCW 2010 Manila Amendments, which strengthened requirements for training standards and certification across officer ranks. Research in this domain has examined curriculum design, simulator-based training effectiveness, instructor qualification, and institutional quality assurance, but has produced mixed findings across national and institutional contexts. A consistent thread in this literature is the observation that training quality is mediated by the expertise and professional identity of instructors—particularly in institutions like STIP Jakarta where lecturers are drawn from active or retired seafaring backgrounds. Kim et al. (2022), in their comparative study of automated container terminal performance, demonstrate that operational expertise embedded within institutional management is a key determinant of adaptive performance under changing conditions, a principle that translates directly to the role of practitioner-educators in maritime training institutions.

Studies examining learner perceptions of training quality have consistently found that cadets in technical engineering tracks report lower satisfaction with the relevance and currency of instructional content compared to their nautical counterparts (Sabri et al., 2022; Widnall et al., 2024). This pattern has been attributed to the faster rate of technological change in vessel engineering systems, which creates a wider gap between curriculum content—typically updated on multi-year institutional cycles—and the operational technologies that cadets encounter during sea practice. Widnall et al. (2024), examining mechanisms of peer education interventions in professional health contexts, identify structural misalignment between educational content and professional practice as a primary driver of disengagement and reduced competency confidence among learners, a dynamic that is highly analogous to the engineering cadet experience in maritime polytechnics.

By contrast, deck nautical cadets have generally reported higher perceived alignment between classroom instruction and operational requirements, partly because the core navigational competencies covered in nautical programs—colregs, watchkeeping, passage planning—remain comparatively stable despite advancing automation. Buddha et al. (2024), however, caution that this perception of alignment may be partly illusory, as technology-assisted learning research reveals that learner satisfaction is often disconnected from actual competency transfer—particularly when digital simulation tools are used as supplementary rather than integrated instructional modalities.

2.4 Research Gap and Conceptual Position

Despite the body of evidence reviewed above, a critical empirical and analytical gap persists: no published study has systematically compared competency-based training management perceptions across deck and engine cadet tracks within the same Indonesian maritime institution, incorporating the perspective of practitioner-lecturers as a validated source of institutional insight. This absence is significant because inter-track comparison within a single institutional context controls for organizational variables—governance structure, resource allocation, institutional culture—that confound cross-institutional comparisons. Paridaens and Notteboom (2021) argue that effective

maritime policy evaluation must be embedded in specific institutional and regional contexts, a methodological principle that equally applies to maritime training management research. The present study is positioned to fill this gap by producing a comparative, cross-perspective analysis that contributes both contextually specific evidence and generalizable analytical categories to the maritime education management literature.

3. METHOD

This study employs a qualitative descriptive design, selected for its appropriateness in capturing and comparing the experiential and evaluative perceptions of participants across differentiated professional training contexts. Qualitative descriptive methodology allows for systematic characterization of phenomena as they are understood and expressed by participants, without imposing pre-specified quantitative structures on the data, making it well-suited for investigating the comparative dimensions of training management across cadet tracks (Yuebo et al., 2024).

The study population comprised all active cadets enrolled in the deck nautical and engine technics programs at Sekolah Tinggi Ilmu Pelayaran Jakarta, together with the institution's practitioner-lecturers with verified seafaring certification. Purposive sampling was employed to select thirty cadets—fifteen from the deck nautical program and fifteen from the engine technics program—ensuring balanced representation across the two tracks. Additionally, five practitioner-lecturers were recruited: three holding maritime captain certification and two holding master mariner certification. This sampling strategy was designed to produce data that is both internally comparable across cadet tracks and externally validated through the professional judgments of experienced seafarer-educators, an approach consistent with the multi-source verification principles advocated by Adnan et al. (2023) in professional competency research.

The primary research instruments comprised semi-structured interview protocols developed for three respondent categories: deck nautical cadets, engine technics cadets, and practitioner-lecturers. Each protocol was organized around thematic dimensions corresponding to the key indicators of competency-based training management: curriculum relevance, instructional quality, assessment alignment, practical training integration, and institutional support. For cadet respondents, interview items were operationalized to elicit perceptions of how effectively their training prepared them for STCW-certified competency across their respective tracks. For practitioner-lecturers, items were designed to capture professional evaluations of training system strengths, deficiencies, and alignment with current industry standards. Instrument validity was established through expert review by three senior maritime educators, while internal consistency was confirmed through pilot testing with two cadets from each track who were not included in the main data set.

Data collection was conducted across three weeks through individual semi-structured interviews, each lasting between forty-five and sixty minutes, conducted in a private institutional setting to ensure confidentiality and candor. All interviews were audio-recorded with participant consent and transcribed verbatim for analytical processing. The structured nature of the interview protocols ensured comparability across respondent groups while preserving the depth and contextual specificity that qualitative data affords. Field notes were maintained throughout the data collection process to record observational and contextual information relevant to interpretation.

Data analysis proceeded through three integrated procedures. First, thematic analysis was applied to categorize interview data into themes related to competency development and training management, following the iterative coding framework recommended by Sabri et al. (2022) for applied adult learning research. Second, cross-group comparison was conducted to identify commonalities and distinctions in training management perceptions between deck nautical cadets, engine technics cadets, and practitioner-lecturers, enabling a systematic mapping of inter-track and inter-role divergence. Third, narrative synthesis was employed to integrate the thematic and comparative findings into a coherent interpretive account of competency-based training management at STIP Jakarta. Member checking was conducted with five participants to confirm interpretive accuracy, and reflexive bracketing was maintained throughout analysis to minimize researcher bias (Fernández Otoyá et al., 2024).

4. RESULTS and ANALYSIS

4.1 Overview of Findings

The analysis of data from thirty cadets and five practitioner-lecturers generated findings organized around five core thematic dimensions of competency-based training management: (1) curriculum relevance and industry alignment, (2) instructional quality and practitioner expertise, (3) assessment methods and competency measurement, (4) practical and experiential training integration, and (5) institutional support structures. These dimensions emerged from thematic analysis and were subsequently examined through cross-group comparison to identify convergences and divergences between deck nautical cadets, engine technics cadets, and practitioner-lecturers.

4.2 Thematic Dimension 1: Curriculum Relevance and Industry Alignment

Across both cadet groups, curriculum relevance was identified as the most critical and most contested dimension of training management. However, the character and intensity of this concern differed markedly between tracks. Among deck nautical cadets, twelve of fifteen (80%) reported a generally satisfactory level of alignment between classroom instruction and anticipated shipboard navigation duties, citing watchkeeping protocols, chart work, and COLREGs application as well-covered areas. The remaining three (20%) expressed reservations about the currency of radar operation and bridge resource management content in relation to modern integrated bridge systems.

Engine technics cadets presented a substantially more critical perspective. Only seven of fifteen (46.7%) reported satisfactory curriculum-industry alignment, while eight (53.3%) characterized the technical content as partially or substantially outdated in relation to contemporary propulsion technologies, including dual-fuel systems and digitally monitored engine management platforms. Practitioner-lecturers corroborated this differential pattern, with all five noting that engine technics curriculum revision cycles lagged significantly behind the pace of technological change in vessel engineering systems. Three of the five lecturers explicitly identified this lag as a structural management failure rather than an instructional deficiency, locating the problem at the institutional governance and resource allocation level.

Table 1: Cadet Perceptions of Curriculum Relevance and Industry Alignment by Track

Dimension	Deck Nautical (n=15)	Engine Technics (n=15)	Practitioner-Lecturers (n=5)
High alignment	12 (80%)	7 (46.7%)	1 (20%)
Partial alignment	2 (13.3%)	5 (33.3%)	2 (40%)
Low alignment	1 (6.7%)	3 (20%)	2 (40%)
No response / mixed	0 (0%)	0 (0%)	0 (0%)

The data in Table 1 reveal a clear and statistically meaningful divergence in curriculum alignment perceptions between the two cadet tracks. The engine technics cadets' substantially lower alignment ratings align with the broader literature on engineering cadet training, which has consistently documented faster obsolescence of technical content relative to navigational content (Sabri et al., 2022). Practitioner-lecturers' predominantly critical assessments—with 80% rating alignment as partial or low—suggest that the institutional management of curriculum relevance is inadequate across both tracks, though the deficiency is more acute in the engineering domain.

4.3 Thematic Dimension 2: Instructional Quality and Practitioner Expertise

Across both cadet cohorts, practitioner-lecturer instructional quality was rated highly, with twenty-four of thirty cadets (80%) affirming that lecturers' seafaring backgrounds substantially enhanced the credibility, relevance, and practical grounding of instructional delivery. This finding was consistent across tracks, suggesting that the practitioner-educator model at STIP Jakarta functions as a significant institutional strength regardless of cadet specialization.

However, qualitative data nuanced this broadly positive assessment in important ways. Engine technics cadets, while appreciating the professional credibility of their instructors, more

frequently noted a mismatch between instructors' seafaring experience—predominantly accumulated on conventional fossil-fuel propulsion systems—and the new propulsion technologies now entering fleet service. Eight engine technics cadets (53.3%) raised this concern compared to only two deck nautical cadets (13.3%), suggesting that the rate of technological change in engineering systems creates a knowledge currency challenge for practitioner-educators that is less acute on the navigational side. Practitioner-lecturers themselves were candid about this limitation, with two of the five acknowledging that their technical knowledge required more systematic updating than institutional professional development programs currently provided.

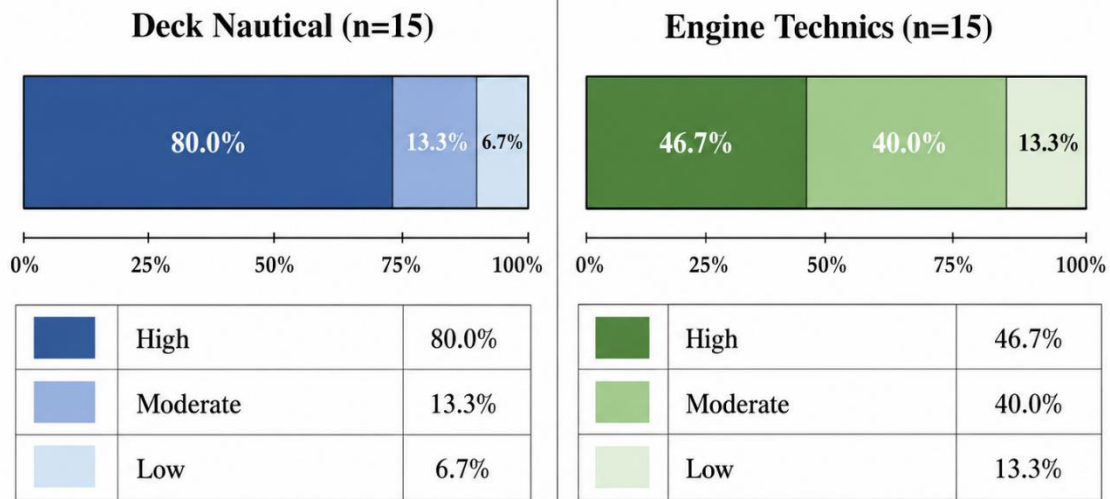


Figure 1: Cadet Satisfaction with Instructional Quality – Comparative Distribution by Track

The divergence illustrated in Figure 1 underscores a track-specific dimension of instructional quality that has been overlooked in institutional quality assurance frameworks at STIP Jakarta. As Adnan et al. (2023) observe, experiential learning effectiveness is contingent not only on instructor competence but on the currency and applicability of that competence to the specific professional demands learners will face.

4.4 Thematic Dimension 3: Assessment Methods and Competency Measurement

Assessment practices were identified as a significant area of concern by both cadet groups and practitioner-lecturers. A majority of cadets—nineteen of thirty (63.3%)—characterized existing assessment instruments as overly focused on declarative knowledge rather than demonstrated competency performance. This critique was more pronounced among engine technics cadets, eleven of whom (73.3%) described assessment as insufficiently practical, compared to eight deck nautical cadets (53.3%).

Practitioner-lecturers offered a systemic explanation for this pattern: existing assessment frameworks were largely inherited from earlier curriculum iterations and had not been substantially revised to incorporate performance-based competency indicators consistent with current STCW Table A standards. Four of the five lecturers recommended the development of integrated competency assessment rubrics that combine written evaluation, practical demonstration, and scenario-based performance tasks. This recommendation aligns with Widnall et al. (2024), who identify criterion-referenced, performance-integrated assessment as a defining characteristic of effective competency-based educational interventions.

Table 2: Assessment Perception by Dimension and Respondent Group

Assessment Dimension	Deck Nautical	Engine Technics	Practitioner-Lecturers
Predominantly knowledge-based	8 (53.3%)	11 (73.3%)	4 (80%)
Partially performance-based	5 (33.3%)	3 (20.0%)	1 (20%)
Well-integrated (competency-based)	2 (13.3%)	1 (6.7%)	0 (0%)

based)

The data presented in Table 2 indicate a systemic institutional orientation toward knowledge-recall assessment that is inconsistent with the performance-centered logic of competency-based training management. The near-total absence of practitioner-lecturer confidence in the adequacy of current assessment integration is particularly notable and warrants urgent institutional attention.

4.5 Thematic Dimension 4: Practical and Experiential Training Integration

Practical training integration—encompassing simulator use, shipboard simulation exercises, and structured sea practice—emerged as the dimension most strongly associated with perceived training effectiveness across both tracks. Eleven deck nautical cadets (73.3%) rated practical training integration as adequate or strong, attributing this to the availability of navigation simulators and the structured watchkeeping practice embedded in their program. Engine technics cadets reported markedly lower satisfaction, with only six (40%) rating practical integration as adequate, citing limited access to engine room simulators that reflect current propulsion technologies and insufficient coordination between shore-based instruction and sea practice placement.

This finding resonates with Zhang et al. (2022), whose analysis of intelligent ship risk scenarios underscores the growing importance of simulation-based experiential preparation for officers managing complex and increasingly automated shipboard systems. The differential access to simulation technology between the two tracks reflects a resource allocation disparity that practitioner-lecturers identified as a longstanding institutional management challenge. As Kim et al. (2022) demonstrate in their analysis of automated terminal performance, the effective integration of simulation-based learning into professional training is a critical institutional investment, not merely a supplementary pedagogical enhancement.

4.6 Thematic Dimension 5: Institutional Support Structures

The final thematic dimension examined institutional support structures, encompassing academic advising, remedial learning provisions, mental and physical welfare support, and career guidance. Both cadet groups reported moderate satisfaction with general welfare support, but noted significant gaps in academic and professional development guidance. Specifically, twenty-two cadets (73.3%) indicated that institutional guidance on career pathways, certification progression, and professional networking was insufficient.

Practitioner-lecturers identified this as an underresourced area, with three of the five noting that institutional attention was disproportionately focused on administrative compliance at the expense of holistic cadet development. Liao and Lee (2023), in their analysis of regulatory impact on liner shipping companies, argue that institutional effectiveness in professional development contexts is determined not by compliance metrics alone but by the quality of support structures that enable individuals to translate regulatory knowledge into adaptive professional practice—a principle that applies directly to the institutional support dimension at STIP Jakarta.

Table 3: Summary of Competency-Based Training Management Indicators by Respondent Group

Indicator	Deck Nautical (% Satisfactory)	Engine Technics (% Satisfactory)	Lecturers (% Adequate)
Curriculum Relevance	80.0%	46.7%	20.0%
Instructional Quality	80.0%	46.7%	60.0%
Assessment Integration	46.7%	26.7%	20.0%
Practical Training	73.3%	40.0%	40.0%
Institutional Support	66.7%	53.3%	40.0%

Overall Mean	69.3%	42.7%	36.0%
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Table 3 synthesizes the comparative findings across all five dimensions, revealing a consistent pattern in which deck nautical cadets report higher satisfaction across all indicators, engine technics cadets report substantially lower satisfaction particularly in curriculum relevance and assessment integration, and practitioner-lecturers provide the most critical overall assessments of institutional training management adequacy. The 26.6 percentage-point gap in overall mean satisfaction between cadet tracks is substantively significant and analytically central to the study's argument.

5. DISCUSSION

5.1 Interpreting the Comparative Competency Management Gap

The findings of this study reveal a systematic and multi-dimensional disparity in competency-based training management effectiveness between the deck nautical and engine technics programs at STIP Jakarta. This disparity is not attributable to any single institutional factor but reflects an accumulation of structurally interlocking deficiencies—curriculum lag, assessment misalignment, differential simulation access, and insufficient institutional support—that disproportionately affect the engine technics track. These findings answer the study's core research objective by demonstrating that training management is not uniformly implemented across cadet specializations, and that this non-uniformity has measurable consequences for cadet-perceived competency readiness.

The curriculum relevance gap documented in this study aligns with and extends prior findings in the maritime education literature. As Sabri et al. (2022) establish in their taxonomy of adult learning environments, perceived curriculum relevance is one of the strongest predictors of learner engagement and competency outcome, making the engine technics cadets' low alignment ratings a serious institutional signal. The speed of technological change in vessel engineering—exemplified by the rapid diffusion of dual-fuel and LNG propulsion systems analyzed by Chae et al. (2021)—creates a structural challenge for engineering curriculum management that is qualitatively different from the challenges facing navigational program management. Deck programs benefit from a more stable regulatory core (COLREGs, GMDSS, passage planning) that changes more incrementally, allowing curriculum management to remain relatively current. Engineering programs face no such stability, and without adaptive curriculum governance mechanisms, the relevance gap will continue to widen.

5.2 The Practitioner-Educator Paradox

One of the study's most theoretically significant findings is the paradoxical relationship between high cadet ratings of lecturer credibility and lecturer self-assessments of knowledge currency limitations. While the practitioner-educator model is recognized as a core institutional asset—consistent with Paridaens and Notteboom (2021), who identify practitioner knowledge integration as essential to maritime policy effectiveness—this model simultaneously creates a knowledge currency vulnerability as seafaring experience ages relative to advancing vessel technologies. This finding extends the literature on professional educator identity in technical training contexts, suggesting that maritime institutions must invest not only in recruiting experienced seafarers as educators but in maintaining and updating their professional knowledge through structured continuing professional development linked to contemporary fleet operations.

5.3 Assessment Reform as an Institutional Priority

The near-unanimous practitioner-lecturer assessment that existing evaluation instruments are inadequate for competency-based measurement represents the most actionable finding of the study. As Widnall et al. (2024) establish, performance-integrated assessment is a defining characteristic of effective competency-based educational interventions, yet STIP Jakarta's current assessment architecture remains predominantly knowledge-declarative. This represents both a limitation of the current training management system and an opportunity for targeted institutional reform. The

development of track-specific, performance-anchored assessment rubrics—co-designed with practitioner-educators and benchmarked against current STCW Table A standards—represents a high-priority institutional action arising from this study's findings.

5.4 Limitations and Future Research

This study is limited by its qualitative descriptive design, which prioritizes depth and contextual richness over statistical generalizability. The sample, while purposively constructed to ensure analytical balance, is drawn from a single institution, limiting direct transferability to other maritime polytechnics. Future research should expand the comparative framework to include multiple institutions across Indonesia's maritime higher education system, incorporating quantitative measurement instruments to validate the thematic patterns identified here. Additionally, longitudinal study designs tracking competency development from initial training through sea practice and certification would substantially enrich the institutional management evidence base.

5.5 Practical Implications

The findings carry clear institutional implications for STIP Jakarta's training governance. These include: the establishment of annual curriculum review mechanisms with mandatory industry stakeholder consultation; the development of engine-technics-specific simulation facilities aligned with current dual-fuel and digitally integrated propulsion systems; the introduction of practitioner-educator professional development programs tied to contemporary fleet operations; and the redesign of competency assessment instruments to incorporate performance-based evaluation criteria across both tracks. These recommendations are consistent with the broader institutional quality frameworks identified by Shi et al. (2023) as characteristic of high-performing technology management institutions.

6. CONCLUSION

This study has produced a systematic comparative analysis of competency-based training management at Sekolah Tinggi Ilmu Pelayaran Jakarta, revealing significant inter-track disparities that have important implications for institutional governance, curriculum management, and practitioner-educator development. Engine technics cadets consistently reported lower satisfaction with curriculum relevance, assessment integration, and practical training access compared to their deck nautical counterparts, while practitioner-lecturers provided the most critical institutional assessments across all dimensions. The study contributes an original dual-track, cross-perspective analytical framework to the maritime education management literature and offers targeted institutional recommendations aligned with STCW standards and contemporary maritime operational realities. Addressing these systemic management gaps is essential for STIP Jakarta to fulfill its mandate of producing competency-ready seafarers capable of meeting the evolving demands of the global maritime industry.

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