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Analysis of the Alignment of the Port Management and Maritime Logistics Vocational Education Curriculum with Industry Competency Requirements: A Case Study of Patimban Port

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Abstract

This study aims to analyze the alignment of the vocational curriculum in the Port Management and Maritime Logistics study program with competency requirements in the Patimban Port industrial ecosystem. The development of vehicle terminals, container terminals, vessel services, port information systems, and logistics-supporting areas requires human resources with operational, logistics, digital, safety and security, documentation, and professional communication competencies. This study adopts a qualitative descriptive approach using document review and competency gap analysis. Secondary data are drawn from the curriculum and available semester learning plans (RPS), vocational education regulations, official government publications on Patimban Port, and scholarly literature on maritime competencies and port digitalization. The analysis identifies relevant competency domains, maps them preliminarily against learning areas, and evaluates alignment qualitatively. Since only part of the curriculum documentation is currently available and no primary data have been collected from employing companies, the mapping is presented as a preliminary document-based analysis rather than an empirical measurement of workforce demand or a comprehensive evaluation of all courses. The review indicates that port management, terminal operations, maritime logistics, safety, customs, information systems, and professional communication should be integrated through practical learning, case studies, terminal-process simulations, industry-based projects, and regular RPS updates. The study recommends strengthening partnerships with terminal operators and port stakeholders to validate the competency map and further develop a work-oriented curriculum.

Keywords: Vocational Education, Curriculum, Port Management, Maritime Logistics, Industry Competencies, Patimban Port

INTRODUCTION

Ports are important nodes in the transportation and trade system because they connect sea transport with land transportation networks, warehousing, distribution, and supply chains. The role of a modern port is not limited to providing berthing facilities and loading and unloading activities; it also includes managing the flow of goods, information, documents, vessel services, safety, security, and coordination among stakeholders. These changes have implications for the types and levels of competency required of the port workforce.

Patimban Port in Subang Regency, West Java, has been developed as strategic infrastructure that supports connectivity and logistics activities, including a vehicle terminal and a container terminal. Publications by the Ministry of Transportation explain that the

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Patimban facilities include a vehicle terminal, a container terminal, an inspection area, supporting facilities, and online port services. Official government information also shows that port facilities and capacity are being developed in stages. These characteristics create learning needs that are oriented not only toward general port knowledge, but also toward an understanding of terminal operational processes, logistics flows, documentation, and the use of information technology (Kementerian Perhubungan Republik Indonesia, 2024; 2026).

Vocational education has a mandate to produce graduates who are competent and relevant to the needs of the world of work. Presidential Regulation Number 68 of 2022 emphasizes the revitalization of vocational education and vocational training by increasing relevance to labor market needs and aligning with business, industry, and the world of work (Republik Indonesia, 2022). Accordingly, vocational curricula need to be developed through an evaluation process that takes into account changes in business processes and job competencies.

In the maritime sector, digitalization is changing work processes, skill requirements, and coordination patterns. The literature shows that maritime logistics professionals need a combination of technical, managerial, business, and digital competencies (Li et al., 2023). Studies on digital transformation in the maritime sector also highlight the challenges of human resource management in adapting to technology (Theotokas et al., 2024). Therefore, port vocational education needs to pay attention to data literacy, information systems, digital communication, and problem-solving skills.

Akademi Teknologi Maritim Patimban provides education in the field of Port Management and Maritime Logistics. As an institution located in a port development area, the study program has the opportunity to link learning to the operational context of Patimban. However, curriculum alignment cannot be based solely on general assumptions about industry needs. Mapping needs to be carried out systematically by comparing relevant competency areas with the content of the curriculum, the semester learning plans (*Rencana Pembelajaran Semester*, RPS), and official reference sources.

Based on these conditions, this study is directed at answering three questions:

1. Which competencies are relevant to the characteristics of Patimban Port activities based on the available documents and literature?
2. To what extent are the learning areas in the reviewable Port Management and Maritime Logistics curriculum related to these competencies?
3. Which aspects of the curriculum need to be strengthened so that learning is more oriented toward work requirements?

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The purpose of this study is to develop a preliminary analysis of the alignment between the curriculum and industry competency requirements, to identify areas that need strengthening, and to provide recommendations for developing a vocational curriculum that is contextual to the Patimban Port ecosystem.

LITERATURE REVIEW

Vocational Education and Alignment with the World of Work

Vocational education emphasizes mastery of applied knowledge, skills, professional attitudes, and the ability to carry out tasks according to occupational standards. Aligning vocational education with the world of work requires stakeholder involvement, curriculum renewal, practical learning, work experience, and quality evaluation mechanisms. Presidential Regulation Number 68 of 2022 serves as the national policy basis for increasing the relevance of vocational education to labor market needs (Republik Indonesia, 2022).

The guidelines for developing higher education curricula position graduate learning outcomes, study materials, learning processes, and evaluation as elements that need to be designed coherently. Thus, curriculum alignment cannot be assessed merely from the similarity between course names and job terms; it must be examined through the linkage between learning outcomes, materials, practical methods, and forms of assessment (Direktorat Jenderal Pendidikan Tinggi, 2024).

Human Resource Competencies in Maritime Logistics

Competencies in the maritime logistics sector are multidimensional. Li et al. (2023) identified the importance of competencies for shore-based maritime logistics executives in the digital era, which combine professional, managerial, and digital aspects. In the context of port vocational education, these competencies can be translated into the ability to understand vessel service processes, terminal operations, planning and control of cargo flows, documentation, supply chain coordination, and the use of information systems.

Competency requirements are also influenced by digital transformation. Theotokas et al. (2024) discussed the challenges of maritime human resource management in the transition to shipping digitalization. Meanwhile, Zeng et al. (2025) reviewed the enablers and barriers of digitalization in the maritime logistics industry. Both studies reinforce the importance of technological adaptation, information management, and organizational readiness competencies.

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Characteristics of Patimban Port Activities and Facilities

Publications by the Ministry of Transportation state that the facilities and activities of Patimban include a vehicle terminal, a container terminal, an inspection area, a stacking area, vessel service facilities, and support for customs, immigration, quarantine, and port procedures. Online vessel services through Inaportnet and terminal support facilities indicate that digital competencies and an understanding of document flows are important parts of the learning context (Kementerian Perhubungan Republik Indonesia, 2024).

The staged development of the port also means that competency requirements may change as new facilities come into operation and the scale of services increases. Therefore, the curriculum competency map should be treated as a dynamic document that is reviewed periodically, rather than as a fixed list of competencies.

Competency Gap Analysis

Competency gap analysis is the process of comparing expected competencies with the competencies that have been facilitated by the curriculum or possessed by learners. In this study, the analysis was carried out at the level of curriculum documents, not at the level of the individual abilities of students or graduates. The alignment assessment was conducted by identifying the relationship between industry competency areas, the learning areas listed in the available documents, and learning evidence in the form of materials, practice, projects, or assessments.

To maintain accurate interpretation, the alignment categories in this study were used as a preliminary mapping tool:

1. **Indicated as relevant**, if there is a learning area that is directly related.
2. **Needs strengthening**, if the area requires more practice, greater depth of material, or a more specific industry context.
3. **Cannot yet be assessed**, if the RPS or learning evidence is not yet available for review.

METHOD

Approach and Research Design

This study used a qualitative descriptive approach with document study and competency gap analysis methods. The approach was chosen because the study aims to examine the alignment of curriculum content with relevant competencies based on curriculum documents, regulations, official publications, and scientific literature. This study did not use questionnaires, interviews, or statistical measurement of respondents.

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Data Sources

The data sources consist of secondary data grouped as follows:

1. Internal educational documents, namely the curriculum structure and the RPS available in the Port Management and Maritime Logistics Study Program.
2. Policy documents, particularly Presidential Regulation Number 68 of 2022 and the guidelines for developing higher education curricula.
3. Official government publications on the facilities, services, and development of Patimban Port.
4. Scientific articles discussing maritime logistics competencies and the digitalization of the maritime sector.

The curriculum documents and RPS available at the time of writing did not yet cover all courses and all learning elements. Therefore, the curriculum analysis in this study is preliminary and limited to the information that could be reviewed. The study does not claim to have conducted a comprehensive audit of all study program documents.

Data Collection Techniques

Data were collected by searching, sorting, and recording the content of documents. The information recorded included learning objectives or outcomes, course names or study areas, relevant materials, listed practical activities, and the competencies referred to in regulations and literature. Government publications were used to describe the context of the facilities and service processes of Patimban Port, not to infer the number of workers needed or to project workforce demand.

Data Analysis Techniques

The analysis was carried out in four stages. First, competencies relevant to the characteristics of port and logistics activities were identified. Second, the competencies were grouped into the domains of port operations, terminals and cargo, logistics and supply chain, digitalization and information, documentation and customs, safety and security, and communication and management. Third, the competency domains were preliminarily mapped against the learning areas that could be recognized from the available curriculum documents and RPS. Fourth, the gaps were interpreted and recommendations for strengthening were formulated.

The mapping results are presented qualitatively. No validity or reliability tests, linear regression, t-test, F-test, or coefficient of determination were performed because the study did not collect questionnaire data and did not use quantitative measurement instruments.

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Accordingly, this study does not produce claims of causal relationships or statistical significance.

Research Limitations

The study is limited to the analysis of documents and literature available at the time of writing. There are no primary data yet from terminal operators, logistics companies, shipping companies, government agencies, or graduate users in the Patimban area. Therefore, the term "industry competency requirements" in this article refers to competency requirements identified from the characteristics of port activities, policy documents, and literature, not the results of a direct survey of companies. Industry validation needs to be carried out in further research.

RESULT AND DISCUSSION

Overview of the Patimban Port Competency Context

The characteristics of Patimban Port as a port with vehicle and container terminal services shape a diverse competency context. At the vehicle terminal, work processes relate to vehicle receipt, inspection, arrangement in the stacking area, control of vehicle movements, loading and unloading of vessels, and documentation. At the container terminal, work processes relate to stacking planning, management of container movements, coordination of loading and unloading equipment, control of truck flows, and recording of container status.

Beyond terminal activities, vessel services, port administration, document processing, safety, security, and inter-agency coordination are also part of the port ecosystem. The use of online services and information systems shows that digital skills do not stand alone but are integrated with operational and administrative work. This picture is supported by publications of the Ministry of Transportation on the facilities and services of Patimban Port (Kementerian Perhubungan Republik Indonesia, 2024).

Mapping of Relevant Competency Domains

Based on the characteristics of port facilities and services and the literature reviewed, the relevant competency domains can be grouped as follows. This mapping is a conceptual synthesis and is not intended as an official competency standard or a list of positions approved by companies.

1. Port Management and Services

The scope of learning includes port functions, vessel services, stakeholder coordination, administration, and port governance.

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2. Vehicle and Container Terminal Operations

The scope of learning includes receiving and delivery flows, *yard operation*, *terminal planning*, loading and unloading activities, and work area safety.

3. Maritime Logistics and Supply Chain

The scope of learning includes cargo flow planning, multimodal transportation, warehousing, distribution, and supply chain coordination.

4. Cargo Handling and Equipment

The scope of learning includes cargo characteristics, cargo handling principles, terminal equipment, productivity, and operational risks.

5. Documentation, Export-Import, and Customs

The scope of learning includes vessel and cargo documents, export-import processes, customs, quarantine, immigration, and CIQP (Customs, Immigration, Quarantine, and Port) coordination.

6. Digitalization and Information Systems

The scope of learning includes port information systems, Inaportnet, data exchange, data management, and basic information security.

7. Safety, Security, and Environment

The scope of learning includes occupational safety and health (*K3*/HSSE), hazard identification, risk control, port security, emergency response, and environmental compliance.

8. Communication, Language, and Leadership

The scope of learning includes Maritime English, workplace communication, customer service, teamwork, problem solving, and leadership.

Preliminary Mapping of the Curriculum to Competency Domains

The initial research documents identified learning areas related to port management, terminal operations, maritime logistics, supply chain management, cargo handling, port documentation, export-import and customs, information systems, K3/HSSE, port security, Maritime English, as well as leadership and professional communication. Conceptually, these areas are related to the competency domains required in the Patimban ecosystem.

The preliminary mapping of the relationship between learning areas and competency domains is described as follows.

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1. Port Management and Services

The identified learning area is Port Management. This area is relevant to port management and service competencies. However, the learning outcomes, vessel service case studies, and materials on coordination with stakeholders need further review.

2. Vehicle and Container Terminal Operations

The identified learning area is Terminal Operations. This area is relevant to terminal operation competencies. It needs to be ensured that the learning scope covers vehicle terminals, container terminals, *yard operation*, and the flow of operational activities.

3. Maritime Logistics and Supply Chain

The identified learning areas are Maritime Logistics, Supply Chain Management, and Multimodal Transport Management, where listed in the curriculum. These areas are relevant to maritime logistics and supply chain competencies. Strengthening can be directed at the integration of transport modes, warehousing, distribution, and cargo flow planning.

4. Cargo Handling and Equipment

The identified learning area is Cargo Handling. This area is relevant to cargo handling competencies. It needs to be strengthened through practical learning, an introduction to equipment, work procedures, and an understanding of cargo handling risks.

5. Documentation and Customs

The identified learning areas are Port Documentation as well as Export-Import and Customs. These areas are relevant to documentation and customs competencies. Learning can be strengthened through case studies of documents and CIQP coordination flows.

6. Digitalization and Information Systems

The identified learning area is Information Systems and Digital Port. The alignment of this area still needs to be verified based on the actual material in the RPS. Exercises on data flows, the use of relevant information systems, and simple operational data analysis are recommended.

7. Safety and Security

The identified learning areas are K3, HSSE, and Port Security. These areas are relevant to safety and security competencies. Strengthening can be done through simulations of hazard identification, risk assessment, restricted area security, and emergency response.

8. Communication and Leadership

The identified learning areas are Maritime English, Leadership, and Professional Communication. These areas are relevant to communication and leadership competencies.

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Learning needs to include practice in workplace communication, reporting, correspondence, and cross-functional coordination.

However, because the available RPS documents are still partial, this study cannot yet confirm the depth of the material, the number of practice hours, the assessment methods, or the learning outcomes of each course. Therefore, this mapping is a preliminary mapping of learning areas, not a final assessment of the entire curriculum.

Identification of Areas That Need Strengthening

First, learning in terminal operations needs to be strengthened through case studies that describe the processes of vehicle and container terminals in sequence, starting from arrival planning, receipt of goods or vehicles, placement in the stacking area, and loading and unloading activities, through to delivery and documentation. This learning can be supplemented with process flow diagrams, simple simulations, and field visits or observations where possible.

Second, digital competencies need to be translated into applied skills. Mastery of information system concepts should be complemented by an understanding of operational data flows, recording of cargo status, information exchange between parties, the use of relevant applications or systems, and the ability to read and present simple data. Studies on maritime logistics competencies and digitalization show that technological change requires a combination of professional skills and adaptability (Li et al., 2023; Theotokas et al., 2024; Zeng et al., 2025).

Third, learning in documentation and customs needs to use examples of document flows adjusted to the applicable regulations. Students need to understand the relationship between vessel documents, cargo documents, terminal services, export-import processes, and coordination with the relevant agencies. Sample documents used in learning must contain simulated data labeled as exercises, not actual transaction documents.

Fourth, safety and security aspects need to be integrated into every relevant practical course. Terminal operations involve the movement of vehicles, heavy equipment, cargo, personnel, and vessels, so hazard recognition, safe work procedures, incident reporting, and security awareness need to be part of the learning outcomes.

Fifth, Maritime English and professional communication need to be developed through assignments that are close to the work context, such as writing operational emails, reading work instructions, preparing short reports, conducting radio or service communication within the scope of learning, and delivering safety information.

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Curriculum Development Recommendations

Based on the preliminary mapping, curriculum development can be carried out through the following steps.

1. Curriculum Validation

Complete and review the entire curriculum structure, RPS, graduate learning outcomes (CPL), course learning outcomes (CPMK), study materials, practical methods, and assessments. This can be implemented through an internal document audit for each course and the preparation of a matrix linking CPL, CPMK, materials, and assessments.

2. Industry Involvement

Establish a mechanism for periodic input from terminal operators, logistics companies, shipping companies, government agencies, and related associations. Implementation can take the form of curriculum discussion forums, the formation of an advisory board, practitioner lectures, and validation of the competency map.

3. Process-Based Practice

Develop learning based on terminal operation and logistics flows. This can be implemented through case studies of vehicle and container terminals, yard simulations, document flows, and operations planning.

4. Strengthening Digital Competencies

Incorporate data literacy and information systems in the context of port operations. Implementation can take the form of spreadsheet exercises, simple data visualization, information flow simulations, and digital port case studies.

5. Safety and Security

Integrate K3/HSSE and port security into both theoretical and practical learning. Implementation can take the form of simple risk assessments, toolbox meetings, hazard identification, and emergency response simulations.

6. Work Experience

Strengthen internships, observations, projects, and learning with practitioners. This can be implemented through structured internship placements, competency logbooks, and assessment by industry supervisors.

7. Periodic Evaluation

Review the curriculum periodically in line with changes in port processes and technology. Evaluation can be carried out annually with documentation of changes, industry input, and follow-up improvements.

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Implications for Vocational Education in the Patimban Area

The proximity of the educational institution to the port area provides opportunities to develop contextual learning. However, geographical proximity alone does not automatically guarantee curriculum alignment. Alignment needs to be built through structured communication with industry, updating of teaching materials, practical experience, and evaluation of learning outcomes. Collaboration can be realized through practitioner lectures, guided visits, case studies, internships, problem-solving projects, and the joint formulation of competency input.

For Akademi Teknologi Maritim Patimban, the results of this preliminary mapping can be used as a basis for reviewing the linkage between courses and relevant competencies. The next steps are to complete the RPS documents, examine the alignment of CPL and CPMK, and seek validation from industry stakeholders. Through this process, the curriculum can be developed gradually based on documentary evidence and stakeholder input, not merely on assumptions.

Limitations of the Study

The main limitations of this study are that not all curriculum documents and RPS were available for analysis and that no primary data were collected from industry. Therefore, the study cannot quantitatively conclude the level of curriculum alignment, cannot measure the magnitude of graduates' competency gaps, and cannot determine the number of workers needed or project workforce demand for Patimban Port. The mapping results should be understood as a preliminary analysis based on documents and literature. Further research is recommended to involve terminal operators, logistics companies, shipping companies, relevant agencies, lecturers, students, alumni, and graduate users through interviews, focus group discussions, or separately designed surveys.

CONCLUSION

This study developed a preliminary analysis of the alignment of the Port Management and Maritime Logistics vocational education curriculum with the competency domains relevant to the industrial ecosystem of Patimban Port. Based on policy documents, official publications on port characteristics, scientific literature, and the learning areas identified in the initial documents, the relevant competencies include port management and services, vehicle and container terminal operations, maritime logistics and supply chain, cargo handling,

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documentation and customs, digitalization and information systems, safety and security, and professional communication.

The learning areas that have been identified show conceptual relevance to these competency domains. Nevertheless, because the available curriculum and RPS documents are incomplete, this study cannot yet state that all competencies have been adequately covered. Aspects that require attention include deeper practice in terminal operations, integration of information systems and data literacy, case-based learning in documentation and customs, the application of K3/HSSE and port security, and professional communication and Maritime English.

This study did not use questionnaires and does not present statistical testing. Therefore, its conclusions are descriptive and based on document review, not empirical evidence of causal relationships or the level of workforce demand. To obtain a more accurate picture, further research needs to complete the review of all RPS and validate the competencies together with industry.

It is recommended that Akademi Teknologi Maritim Patimban evaluate its curriculum periodically, build a communication forum with port stakeholders, expand practical learning and internships, and develop teaching materials based on the operational processes of Patimban Port. Through these steps, the curriculum is expected to become increasingly adaptive to changing competency requirements in the field of ports and maritime logistics.

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