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Translating Industry Experience into Classroom Practice among Maritime Vocational Teachers in Indonesia

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Abstract

Vocational teachers are expected to bring workplace knowledge into the classroom, yet little is known about how maritime teachers acquire, translate and are constrained in using it. This qualitative embedded single-case study examined how productive-subject teachers of the Nautika Kapal Niaga (merchant ship navigation) programme at one Indonesian maritime vocational high school applied industry experience in practical teaching and assessment. Situated learning theory framed the analysis, with boundary crossing as a supporting lens. Data came from semi-structured interviews with 18 purposively selected participants (four teachers, five students, four programme managers and five maritime practitioners), four lesson observations and eight document sets, analysed thematically with cross-source verification. Teachers acquired industry experience through different routes and translated it through reflection, selection and pedagogical adaptation rather than direct transfer. The experience appeared in relevant materials, procedure-based tasks, a strong safety orientation and performance-based assessment, although authenticity was adapted to school conditions. Facilities set the ceiling of authenticity, whereas teacher experience and practitioner networks determined how close practice came to it. Structured teacher placements and adequate practice facilities are needed to convert industry experience into student competence.

1 Introduction

The maritime industry is undergoing technological and operational change that is reshaping the competencies required of seafarers. A survey of firms in the Finnish maritime cluster found growing demand for competencies related to technology, automation, environmental regulation and transferable skills, suggesting a widening gap between current and anticipated requirements [1]. A recent review of maritime technical and vocational education names curriculum relevance, simulation-based and digital learning, instructor competence and industry–academic collaboration as reform priorities [2], and Indonesian faculty report that faculty readiness and curriculum alignment shape how new technologies can enter maritime programmes [3]. Maritime education must therefore prepare students not only to follow procedures but also to interpret operational information, respond to changing conditions and exercise professional judgement. Productive-subject teachers carry much of this work, because they link occupational knowledge to materials, practical tasks and assessment. Possessing industry experience does not, however, guarantee that teachers can translate it into structured learning: a systematic review of 54 articles found that vocational teachers' professional learning occurs through diverse formal and informal activities in academic, school and industry settings, with outcomes that vary across teachers and contexts [4]. The question is therefore how teachers acquire, interpret and translate industry experience into practices that can be taught and assessed, not merely whether they have it.

This issue is particularly relevant to Indonesia's maritime vocational education system, where programmes such as Nautika Kapal Niaga (NKN) prepare students for tasks associated with navigation, communication, shipboard procedures and safety. A policy document identified long-standing challenges, including the availability of teachers with maritime backgrounds, the recruitment of

professional seafarers as educators and the fit between learning and job demands [5]. Indonesian studies report that learning approaches still struggle to connect conceptual learning with authentic workplace experience [6] and that industry partnerships are essential for programme relevance [7], and school experience shapes how ready students feel for maritime work [8]. Elsewhere, maritime instructors regard practical field experience as a main source of legitimate teaching knowledge and rely on it more than on pedagogical research [9], and graduates of Turkish maritime vocational schools judged that sea-experienced educators could raise student motivation [10]. Yet programmes and partnerships do not establish how consistently workplace knowledge enters instruction or assessment. Some operational activities cannot be reproduced at school because of equipment, safety and access constraints, so teachers must decide which parts of workplace practice to keep, simplify or represent through scenarios, demonstrations and simulation.

Earlier research has examined maritime competence needs and vocational teachers' professional learning [1, 4], and action research in Norwegian vocational education showed that school–workplace collaboration can improve relevance [11]. These strands do not explain how teachers select workplace experiences, adapt them to students' levels, convert them into practical tasks or align those tasks with assessment in a maritime vocational school. This study addresses that gap through a qualitative case study of the NKN programme at one maritime vocational high school (Sekolah Menengah Kejuruan, SMK) in Central Java, Indonesia, and asks three research questions (RQs). RQ1: How do productive-subject NKN teachers acquire and apply industry experience in planning and implementing practical teaching? RQ2: How is that experience reflected in teaching materials, practical tasks and the assessment of student competence? RQ3: What factors support or hinder its application, particularly teacher competence, curriculum, industry partnerships and practice facilities?

2 Theoretical framework

Situated learning theory [12] is the main foundation. It views learning as a social process that takes place through participation in practice and professional communities and helps explain how teachers gain knowledge through maritime work, interaction with practitioners and experience of operational situations. Such knowledge cannot, however, be applied directly in school, so boundary crossing [13] serves as a supporting lens for examining how teachers bring, interpret and adjust workplace knowledge through identification, coordination, reflection and transformation, mediated by boundary objects (Fig. 1). Industry immersion is defined as teachers' direct and relevant involvement in the maritime work environment that offers opportunities to observe, perform, discuss or reflect on professional tasks related to the subject taught. It covers earlier professional experience as a seafarer and structured involvement during a teaching career, such as placements or teacher internships, which were distinguished in data collection and analysis; seminars, classroom training or certification without direct work involvement were not counted.

3 Materials and methods

3.1 Research design and participants

This study used a qualitative embedded single-case design to examine how productive-subject teachers' industry experience was translated into teaching and assessment in the NKN programme at one maritime vocational high school in Central Java. The case was bounded by one school, one study programme, the relevant teaching practices and a fieldwork period from April to July 2026. The four participating teachers were embedded analytical units, allowing systematic comparison of how differences in industry experience were reflected in lesson planning, practical tasks and assessment. Students, managers and practitioners, together with lesson observations and documents, supplied complementary evidence about the same processes and were not treated as separate cases; keeping units of analysis distinct from the participants and sources through which data are collected is central to embedded designs [14, 15]. A case study suits a contemporary educational process examined in its real-life context [15, 16], and recent methodological work stresses clear case boundaries and the combination of several sources of evidence [17]. The design did not seek causal effects on student learning. Each teacher's interview was analysed with the corresponding lesson observation and relevant documents; student, manager and practitioner accounts were attributed to a teacher's class only when class membership could be established from the records, and otherwise analysed at case level. Multi-perspective designs combining lecturers, cadets and maritime professionals are also used in other Indonesian maritime education studies [18].

Participants were selected by purposive sampling according to the relevance of their experience and involvement to the phenomenon studied, not for statistical representation. Eighteen participants were distributed fairly evenly across four groups (Table 1), in line with the notion of information power, which holds that sample adequacy depends on the study aim, participant specificity, use of theory, quality of dialogue and analysis strategy, not on numbers alone [19]. Teachers were the main source on how experience was gained, selected, adapted and used; students described how materials, tasks and assessment were experienced; managers supplied information on policy, curriculum, facilities and industry links; practitioners offered an external view of professional procedures. For teachers, the type, period, duration, tasks and relevance of experience were recorded, and seafaring work, placement and structured industry involvement were not treated as equivalent. All participants were over 16 years of age: teachers were 29–35 years old, students (Grade XI) 17–18, programme managers 42–47 and practitioners 37–52.

Table 1
Participants and selection criteria

Participant group	n	Label in text	Selection criteria
Productive-subject NKN teachers	4	Teacher 1–4	Teach productive subjects or practical learning in NKN; hold relevant maritime professional experience and/or industry involvement; form of experience verified and recorded separately.
NKN students	5	Student 1–5	Took part in the practical learning at the centre of the case; able to describe learning experiences, practical tasks and assessment.
Programme managers or school leaders	4	Manager 1–4	Directly involved in managing the NKN programme, curriculum development, practice arrangements, teacher development or industry partnerships.
Maritime industry practitioners	5	Practitioner 1–5	Relevant professional experience in navigation, ship operations, safety or mentoring of workers; able to comment on work competence.

NKN, Nautika Kapal Niaga

3.2 Data collection

Data were collected between April and July 2026 through semi-structured interviews, non-participant observation of practical lessons and document review. Interview guides were developed from the research questions and theoretical framework [20], reviewed by all researchers, checked by content experts and adapted to each participant group. Interviews lasted approximately 70–100 minutes, were held online or face to face, and were recorded with permission. They were transcribed in Indonesian and translated into English for reporting. One practical lesson was observed per teacher: a navigation and communication simulation, a safety demonstration with personal protective equipment (PPE) and checklists, an equipment inspection with report writing, and video-based simulation and role-play of work procedures. Eight document sets were examined (professional histories, lesson plans, worksheets and standard operating procedures (SOPs), rubrics, student practice journals, teacher development records, partnership documents and the facility inventory). Documents were compared with interview and observation evidence and not treated as sufficient proof of practice on their own [21].

3.3 Data analysis and trustworthiness

Data were analysed manually through hybrid deductive–inductive thematic analysis [22] within the embedded case design. Situated learning and boundary crossing sensitised the researchers to professional participation, the translation of workplace knowledge, boundary objects and contextual conditions, while the inductive component allowed unanticipated patterns to emerge. Analysis proceeded in five stages (Appendix 1): organising data by source; repeated reading and open coding; grouping codes into categories, subthemes and themes and checking them against divergent evidence; comparing evidence across sources and across the four teacher-level units; and interpreting the themes against the research questions, the programme context and the two lenses. The final structure

comprised three themes and 14 subthemes. Trustworthiness was supported by cross-source verification, a search for negative cases, member checking, and records of transcripts, coding notes, analytic memos and decisions that kept findings traceable. Reporting followed the Standards for Reporting Qualitative Research [23], and excerpts were translated from Indonesian by the authors. Participants gave written informed consent, were assigned research codes instead of personal identifiers, and attention was paid to power relations in educational research [24].

4 Results

The findings are organised in three themes (14 subthemes) drawn from 18 interviews, four lesson observations and eight document sets. Participants are labelled by role and number in the statements in Tables 3–5. The analytic structure of each theme, the cross-case comparison and the triangulation by subtheme are given in Online Resource 2 (Tables S1–S6).

4.1 Theme 1: acquisition and translation of industry experience

4.1.1 Routes of acquisition

The four teachers' industry experience differed in form and depth (Table 2). Teacher 1 had about four years' experience as an able seaman on a tugboat followed by a one-month placement at a shipping company, the experience closest to ship operations. Teacher 2 gained experience through industry visits, training and discussions with captains and training instructors. Teacher 3 combined a shipyard placement with involvement in the school's partnership with a shipping company, and Teacher 4 combined industry training with a short placement whose duration was, in the teacher's words, "indeed limited." Professional records matched these accounts, and the technical vocabulary, procedural references and work examples used in lessons differed in ways consistent with these backgrounds. All five practitioners judged direct exposure important for teachers, and managers reported that the school facilitates placements and visits, yet access was unequal, as Practitioner 3 cautioned. In situated-learning terms, Teacher 1 participated closest to the core of the maritime community of practice and the others peripherally, through placements, training and practitioner networks [12].

Table 2
Teachers' industry experience and its translation into teaching

Teacher	Main industry experience	Knowledge emphasised	Main boundary object	Main limitation
Teacher 1	About four years as an able seaman on a tugboat; one-month placement at a shipping company	Decision-making and crew communication as weather changes	Scenario script	Scenario richness depends on one teacher's seafaring biography
Teacher 2	Industry visits, training and discussions with captains and instructors	Safety standards: PPE, checklists, incident reporting	Checklist and SOP	Indirect experience needs continuing practitioner validation
Teacher 3	Shipyard placement; involvement in the school–company partnership	Documentation and inspection follow-up	Inspection report	Documentation emphasis may under-address operational judgement
Teacher 4	Industry training and a short placement at a shipping company	Decisions weighing vessel, weather and company procedure	Video and graded procedure sheet	Limited direct experience compensated by network; risk of outdated information

PPE, personal protective equipment; SOP, standard operating procedure. Teachers 1–4 are embedded analytical units within one school-level case, not four independent cases

4.1.2 Situated professional knowledge

What teachers learned from professional practice went beyond equipment mastery. Teacher 1 learned to decide when weather changes and crew communication has to be quick and clear; Teacher 3 learned that every job and inspection result must be recorded; Teacher 2 learned how safety standards are applied through PPE, checklists and incident reporting; and Teacher 4 learned that field decisions weigh vessel condition, weather and company procedure at the same time (Table 3). Practitioners regarded these competences as part of maritime work culture, and Practitioner 5 said that industry experience helps teachers explain why a procedure must be done, not only how. Lessons and teaching documents reflected this knowledge through examples of communication failure, weather, PPE use and inspection reporting, and through SOPs and checklists. The knowledge was situated, tied to decisions, procedures and documentation within work activity and not to facts detached from context [25].

4.1.3 Reflection and knowledge selection

Industry knowledge was not moved into the classroom whole. All four teachers reflected on and selected from their experience before teaching, using three filters: curriculum fit, learner level and safety. Teacher 4 graded content by year level, introducing procedures and basic safety in Grade X and adding operational decision-making in Grades XI and XII; Teacher 3 chose the experiences closest to students'

needs; Teacher 2 validated practitioner information against the curriculum and updated materials when industry practice changed; and Teacher 1 chose cases that fit students' ability. High-risk work situations were converted into simulations, cases and role-play, and teaching documents showed graded sequences, simplified procedures and performance criteria adjusted to student ability. This corresponds to the reflection mechanism in boundary crossing, in which the difference between two practices becomes material for deciding what to bring across [13].

4.1.4 Pedagogical adaptation

Selected experience was translated into learning activities and products. Teacher 1 turned seafaring episodes into role-based scenarios in which students act as navigator and operator and deal with fog or communication disruption; Teacher 3 had students write work reports like those of officers in industry; Teacher 4 used videos and simple simulations so that students could picture conditions on board before practising in the laboratory; and Teacher 2 asked students to draft a checklist before entering a work area. Four of the five students described checklists, inspection reports or work scenarios in their lessons, and one also mentioned role-play and video. These checklists, scenarios, jobsheets, SOPs and reports acted as boundary objects linking industry practice with school assessment, and producing them was a form of transformation, because they exist neither on board nor in a textbook (Fig. 2). Longer experience did not automatically produce richer translation: Teacher 2 argued that what matters is how teachers validate, select and translate experience, and Teacher 4 stayed in contact with practitioners so that information would not become outdated. Reflection, selection and translation occurred in all four cases, and the strength of translation was not fully determined by the length of direct experience.

Table 3
Participant statements for Theme 1: acquisition and translation of industry experience

Subtheme	Participant statement
Routes of acquisition	"Most of my industry experience came through industry visits, training, and discussions with captains and training instructors, not from a long period of work on board. Even so, the interaction with practitioners helped me a great deal in understanding how safety standards are really applied." (Teacher 2)
Situated professional knowledge	"That experience helped me understand the real workflow, especially the importance of documentation. In industry, every job has to be recorded, including the results of equipment inspections and their follow-up." (Teacher 3)
Reflection and knowledge selection	"After that, I reflect on the experience and sort the material according to the students' level. For Grade X, I focus on introducing procedures and basic safety; for Grades XI and XII, I add decision-making in operational conditions." (Teacher 4)
Pedagogical adaptation	"I reflected on the experience, chose cases that fit the students' ability, and then turned them into practice scenarios. For example, students play the role of navigator and operator who must deal with fog or communication disruption. […]" (Teacher 1)
Translation beyond duration	"For me, industry experience does not always have to be direct work; what matters is how teachers are able to validate, select, and translate it pedagogically." (Teacher 2)

4.2 Theme 2: integration of experience into instruction and assessment

4.2.1 Relevance of materials

All five students judged the material relevant to work on board. Student 1 said the teacher explained not only how to read the instruments but also what to do if fog or communication disruption occurs, and Student 2 said that students practise using PPE, checking equipment and reporting working conditions and do not only memorise rules. Managers shared this view (Table 4) and encouraged teachers to update materials using practitioner information, safety standard documents and industry visits (Manager 1). Lessons used work terms, procedures, operational problems and cases related to navigation, safety, communication and inspection, and learning objectives linked school competence to work skills.

4.2.2 Practical tasks that resemble work

Practical tasks resembled work on board. Student 3 described solving a scenario in which bad weather suddenly arrived, with checklists, PPE and reports like those of officers in the field, and Student 4 described deciding what to do when communication is disrupted. Practitioners set a higher bar: tasks should not stop at demonstration but include decision-making in scenarios (Practitioner 2) and resemble real work (Practitioner 1). Students worked in groups and produced checklists or reports as work evidence. Context and complexity were simplified for the school, so convergence was partial: tasks imitated the logic of work on board but not all its conditions.

4.2.3 Work and safety standards

Safety was the most consistent standard across sources. Students reported that the teacher always emphasises PPE use and procedures before entering the work area and treats safety as the main priority before speed. Practitioners said that safety must be part of all learning activities and that industry values students who work systematically, follow SOPs and report clearly, and Manager 4 expected technical competence to be assessed together with work attitude, including discipline, responsibility and safety. Lessons included PPE checks, opening safety instructions and teacher supervision, although supervision intensity varied with group size and the number of tools, and assessment indicators included procedural compliance and PPE use. Safety acted as a norm of the maritime community of practice and was kept in place when other aspects were simplified.

4.2.4 Assessment and feedback

Assessment was process-oriented and aimed at improvement. Students said that teachers assessed working steps, documentation and safety through observation during practice, work reports and oral questions, and gave feedback on procedural errors, the order of procedures and report neatness. A rubric covered process, safety, technical skill, documentation and work attitude, and practice records showed report revisions. Teachers corrected procedure during practice and gave closing guidance, but

the depth of feedback differed between sessions. Performance assessment is therefore present, whereas the quality of feedback is uneven across teachers.

4.2.5 Adjustment to school conditions

All five students mentioned limited facilities that restricted authenticity: tools were few, so students sometimes waited their turn (Student 4), and simulation facilities were incomplete, so some working conditions could only be described through video or role-play (Student 5). The school responded by using the laboratory in turns, using simulation media and working with industry for visits and placements (Manager 2), and tasks were adjusted to the tools available. These findings point to *adapted authenticity*: tasks replicate the logic of work on board (procedural accuracy, safety, communication, documentation and accountability) while risk, complexity, equipment and duration are adjusted to the school (Fig. 3). Managers and practitioners described this as a deliberate trade-off between closeness to work and student safety.

Table 4
Participant statements for Theme 2: integration into instruction and assessment

Subtheme	Participant statement
Relevance of materials	“We see that teachers who have industry experience tend to be better able to explain material contextually. They can connect navigation theory with real work situations, such as bad weather, communication disruption, or safety procedures.” (Manager 3)
Practical tasks	“[…] The practical tasks were authentic because we had to fill in checklists, use PPE, and write reports like officers in the field.” (Student 3)
Work and safety standards	“Safety standards must be part of all learning activities, not just a separate topic. In assessment, industry values students who work systematically, follow SOPs, and report their work clearly.” (Practitioner 2)
Assessment and feedback	“The teacher assesses not only the final result but also the working steps, the neatness of documentation, and safety. After practice, we received feedback on the parts that were still not right.” (Student 2)
Adjustment to school conditions	“The main obstacles are limited facilities and teachers’ administrative load. Because of that, the school makes adjustments, such as using the laboratory in turns, using simulation media, and working with industry for visits and placements.” (Manager 2)

4.3 Theme 3: facilitating and inhibiting conditions

4.3.1 Teacher competence

Teacher competence shaped the quality of integration and was unevenly distributed (Table 5). Practitioner 3 said that teachers who have worked on vessels are usually more confident in explaining real work situations, and Practitioner 5 added that NKN teachers need a firm grasp of maritime work culture, especially safety, discipline and responsibility. Teachers differed in the variety of work examples,

fluency of demonstration, quality of prompting questions, ability to give feedback and industry experience held. Access to experience and development therefore affects how deeply industry is integrated into teaching, and the ability to translate experience matters as much as the experience itself (Teacher 2).

4.3.2 Curriculum and school management

Curriculum and school management provided both a framework and limits. Manager 2 said that integrating industry experience is part of improving graduate relevance and that teachers are asked to align material with the needs of shipping companies, while Manager 4 named limited equipment, practice space and teachers' time as obstacles, to which the school responds with rotating schedules and partnership visits. Practitioners said the curriculum must be flexible enough to follow developments in technology and safety procedures (Practitioner 3) and needs periodic review (Practitioner 5). Rotating schedules sometimes limited each student's practice time. School management supported integration, but curriculum flexibility and practice time remained challenges.

4.3.3 School–industry partnerships

Practitioners welcomed partnerships with schools on the condition that they are clearly designed and not just short visits (Practitioner 4). Practitioner 3 proposed teacher placements, regular visits and technical discussions with practitioners. Each of the four teachers named placements, visits or practitioner networks as a route for updating knowledge, and managers described cooperation with companies. Partnership records included memoranda of understanding, visit schedules, speaker lists and activity reports, but administrative partnerships must be distinguished from those that influence lesson planning, and records alone could not make that distinction.

4.3.4 Facilities and resources

Limited facilities appeared in every informant group and were the main inhibiting condition. Student 1 said that school facilities are less complete than a real ship, Student 2 that tools are used in turns because there are few of them, and Manager 3 that not all ship equipment can be provided, so teachers must adjust their methods. Practice involved turn-taking, substitute tools and reliance on simulation or video, and the facility inventory recorded the number and condition of equipment. Facilities constrained the frequency, duration and authenticity of practice and, in that sense, set the upper limit of the authenticity teachers could reach.

4.3.5 Negotiating work and educational demands

Informants described learning as the outcome of negotiation between work and educational demands. Practitioner 5 pointed to the difference in work rhythm between school and industry; Practitioner 4 named busy vessel schedules as a frequent constraint while judging that good communication can overcome it; and Practitioner 3 called the alignment of company operational demands with school time the greatest challenge. Manager 4 said that authenticity must be adjusted to the capacity and resources of the school. Industry procedures were kept in their essential elements (safety, work sequence,

documentation) but simplified in risk, duration and tools. The five conditions did not work in isolation (Fig. 4): teacher competence and partnerships expanded what could be brought into the classroom, facilities and schedules limited how far, and school management negotiated between the two.

Table 5
Participant statements for Theme 3: facilitating and inhibiting conditions

Condition	Participant statement
Teacher competence	"Teacher competence strongly determines the quality of maritime vocational learning. Teachers who have worked on vessels are usually more confident explaining real work situations, including decision-making and handling emergencies. However, not all teachers have the same opportunity to gain industry experience." (Practitioner 3)
Curriculum and school management	"The obstacles we face are limited equipment, practice space, and teachers' time. Therefore, the school applies rotating schedules and uses industry partnerships for learning visits." (Manager 4)
School–industry partnerships	"We welcome partnerships with schools because they can help prepare more work-ready graduates. However, such partnerships need to be clearly designed, not just short visits. Teachers need direct experience of workflows, safety standards, and documentation in the company." (Practitioner 4)
Negotiating work and educational demands	"The main obstacle is the difference in work rhythm between school and industry. Companies have tight operational schedules, so collaboration requires planning, time agreements, and commitment from both sides." (Practitioner 5)
Facilities and resources	"[…] school facilities are not as complete as a real ship, so some simulations have to be done simply." (Student 1)

5 Discussion

Three connected findings emerged: industry knowledge was acquired through different routes and required reflection, selection and pedagogical adaptation; the translation was visible in relevant materials, procedure-oriented tasks, safety practices and performance assessment, with authenticity adjusted to school conditions; and integration depended on professional development, curriculum management, partnerships, facilities and the negotiation of educational and workplace demands.

5.1 Acquisition and pedagogical translation of industry experience

Teachers acquired occupational knowledge through direct seafaring work, short placements, visits, training and practitioner contact, yet the form and duration of experience did not by themselves determine how effectively it entered teaching. This is consistent with the review of Zhou et al. [4], which identified vocational teacher learning across industry, school and formal or informal settings, and with evidence that work placements develop teaching-related and occupational knowledge through several learning activities, including learning from others [26]. The central place of field experience also echoes

simulator-based maritime teaching, where instructors treat practical experience as a main source of legitimate knowledge [9]. Indirect experience is nevertheless not equivalent to sustained participation: teachers differed in the range of operational examples, the emphasis on procedures or decisions and the depth of feedback. A quantitative study of 345 vocational teachers found that transfer from work placement was associated with placement duration, personal capacity, content relevance, peer support and opportunities to apply learning [27], which casts doubt on the assumption that workplace exposure automatically changes teaching. The present case adds a view of translation in actual instructional materials and practice and suggests that shorter or indirect experience can be pedagogically useful when critically selected and adapted.

Situated learning and boundary crossing help to interpret these findings, but the contribution is empirical and the study does not claim to validate either theory. Checklists, SOPs, scenarios and rubrics mediated between workplace expectations and school activities, in a way that resembles the co-construction of learning environments across school and work described by Bouw et al. [28]. Reflection, central to how teachers selected experience, is likewise regarded as important for learning from simulation-based maritime safety training [29].

5.2 Integration into materials, practical tasks and assessment

Materials connected navigation, communication, inspection and safety with shipboard situations, tasks reproduced selected elements of occupational activity, and safety remained central even when the context was simplified. Occupational relevance thus came less from mentioning industry examples than from organising learning around procedures, decisions and documentation with recognisable functions at work. This agrees with action research identifying authentic vocational tasks, links between theory and practice and joint planning as principles for relevance [11], and with an Indonesian study in which a model integrating STEM learning with work-based learning improved maritime students' competency and job readiness [6], while post-internship cadet accounts credit an integrative curriculum with linking theory to practice [30]. Task-based, workplace-oriented designs in Indonesian maritime English teaching have likewise been reported to be positively perceived or to support communication outcomes [31–34], and training scenarios built from real situations are used in other maritime fields, such as cybersecurity protocols constructed from 34 real-life scenarios [35].

Simulation-based training and authentic assessment in maritime education have been traced across six decades [36], and this work supports using scenarios and simulation when direct workplace access is not feasible, without establishing that a simulated task equals the same task in a real maritime environment. The present findings show partial rather than complete authenticity: relevance lay in the link between lesson content and recognisable maritime situations, whereas authenticity was constrained by the resources and conditions of practice. Epistemic, spatial, temporal and social differences between learning settings shape how occupational practice can be represented educationally [37], so authenticity is best seen as negotiated and selective, not binary. Uneven feedback is not confined to schools: on-

board monitoring data show markedly different feedback frequencies across cadet performance profiles [38]. Because learning gains were not measured, the evidence supports conclusions about how occupational expectations were represented in tasks and assessment, not a causal claim that these practices improved competence or employability, in line with the varied outcomes reported by Zhou et al. [4].

5.3 Conditions supporting and constraining integration

The translation of industry experience was institutionally conditioned. Teacher competence and networks supported the updating of materials, curriculum arrangements and school management shaped the time available for practice, partnerships gave access to professional knowledge although an agreement alone did not show that it influenced lesson planning, limited equipment constrained the frequency, duration and realism of practice, and teachers and managers negotiated between occupational standards, readiness, safety, timetables and industry schedules. Comparable conditions are reported in Indonesian maritime vocational education: school leaders' roles in industry-based curricula, training infrastructure, teacher competence and company partnerships [39]; the importance of industry partnerships [7]; and faculty-reported barriers of infrastructure, cost, faculty readiness and curriculum alignment [3]. The practitioners' call for a flexible, periodically reviewed curriculum parallels arguments for aligning navigation curricula with industry development and collaboration [40, 41] and for curriculum reform with practical training opportunities [42], and skill-gap evidence from container-port technicians suggests that institutions need to identify employer-preferred skills [43].

The literature also cautions against assuming that placements or partnerships necessarily change classroom practice: transfer is associated with a combination of individual, programme and school-related factors [4, 27]. Access to industry is an opportunity for learning that does not ensure knowledge will be retained, adapted or used in instruction. The present case is consistent with this account: the influence of visits, placements and networks depended on teachers' capacity to select and adapt knowledge and on the time, resources and curricular space the school provided.

5.4 Limitations and future research

The study has four limitations. First, it is a single case at one school, with 18 participants and one observed lesson per teacher, so the findings are not statistically generalisable and are offered for analytic transfer to similar contexts. Second, it did not measure student learning outcomes; claims about student competence concern how experience is reflected in tasks and assessment, not its effects. Third, teachers' past experience was reconstructed from accounts and documents and not observed. Fourth, a single fieldwork period precluded examining change over time. Future studies could compare several schools, follow teachers before and after structured placements and combine process evidence with measures of student competence.

6 Conclusions and recommendations

This study examined how productive-subject teachers of the NKN programme at one Indonesian maritime vocational school applied industry experience in teaching and assessment. Teachers acquired industry experience through different routes, from about four years of seafaring work to short placements, visits, training and practitioner networks; none transferred it directly, and all four reflected on it, selected from it according to curriculum fit, learner level and safety, and transformed it into scenarios, checklists, reports and role-play. The experience was visible in relevant materials, procedure-based tasks, a consistent safety orientation and performance-based assessment, with authenticity adapted to school conditions and feedback of uneven depth. Teacher competence, curriculum management and partnerships facilitated integration unevenly, whereas limited facilities and the mismatch between industry and school schedules constrained it. Facilities set the upper limit of authenticity, while teacher experience and practitioner networks determined how close practice came to that limit. Industry experience becomes student competence only through deliberate translation.

Based on these findings, the following recommendations are proposed:

1. Provide structured teacher placements, regular visits and technical discussions with practitioners, as practitioners proposed, and widen access to direct industry experience.
2. Support translation through professional development focused on reflection, selection and pedagogical adaptation, not only on exposure to industry.
3. Invest in practice facilities and simulation media, because facilities set the ceiling of authenticity.
4. Link partnership activities to lesson planning so that agreements and visits demonstrably influence materials and tasks.
5. Strengthen the consistency of feedback in practical assessment, building on the existing process-oriented rubrics.

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Author contributions

Muhammad Nurtanto: Conceptualization; Methodology; Investigation; Formal analysis; Resources; Data Curation; Writing – Original Draft; Visualization; Supervision; Project administration. **Hamid Ramadhan Nur**: Conceptualization; Resources; Methodology; Writing – Original Draft. **Valiant Lukad Perdana Sutrisno**: Investigation; Resources; Visualization; Writing – Review & Editing. **Farid Mutohhari**: Conceptualization; Methodology; Validation; Formal analysis; Writing – Review & Editing. **Mustofa Abi Hamid**: Investigation; Data Curation; Validation; Writing – Review & Editing.

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Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical requirements and participant confidentiality.

Generative AI statement

The authors used the generative AI tool Claude (Anthropic; Claude Sonnet 5.5, medium reasoning effort) to assist with language refinement, clarity and readability, and with formatting the manuscript to the journal's guidelines. The authors are fully accountable for the work, including all edits, interpretations, conclusions and the correctness of the references.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Institute for Research and Community Service (Lembaga Penelitian dan Pengabdian kepada Masyarakat, LPPM), Universitas Negeri Jakarta (ethical clearance number 197/UN39.14/PT.01.05/III/2026, dated 17 March 2026). The study was conducted in accordance with the principles of the Declaration of Helsinki and the Research Ethics Guidelines of the committee. Participants were aged 29–35 years (teachers), 17–18 years (Grade XI students), 42–47 years (programme managers) and 37–52 years (maritime practitioners); none was under 16 years of age, so parental consent was not required. Freely given informed consent to participate was obtained from all participants before data collection. The purpose of the study, the procedures involved, the possible risks and benefits, the voluntary nature of participation and the use of the information collected were explained in the invitation to take part as an informant and explained again at the start of each interview. Informed consent was documented in writing. Participants were assigned research codes instead of personal identifiers.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing financial or non-financial interests related to this study.

Supplementary information

Interview guide (Appendix A), observation guide (Appendix B) and document review guide (Appendix C) used in the study. Stages of data analysis, analytic structure of the three themes, cross-case comparison of the four teachers and triangulation summary by subtheme (Appendix D).

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Figures

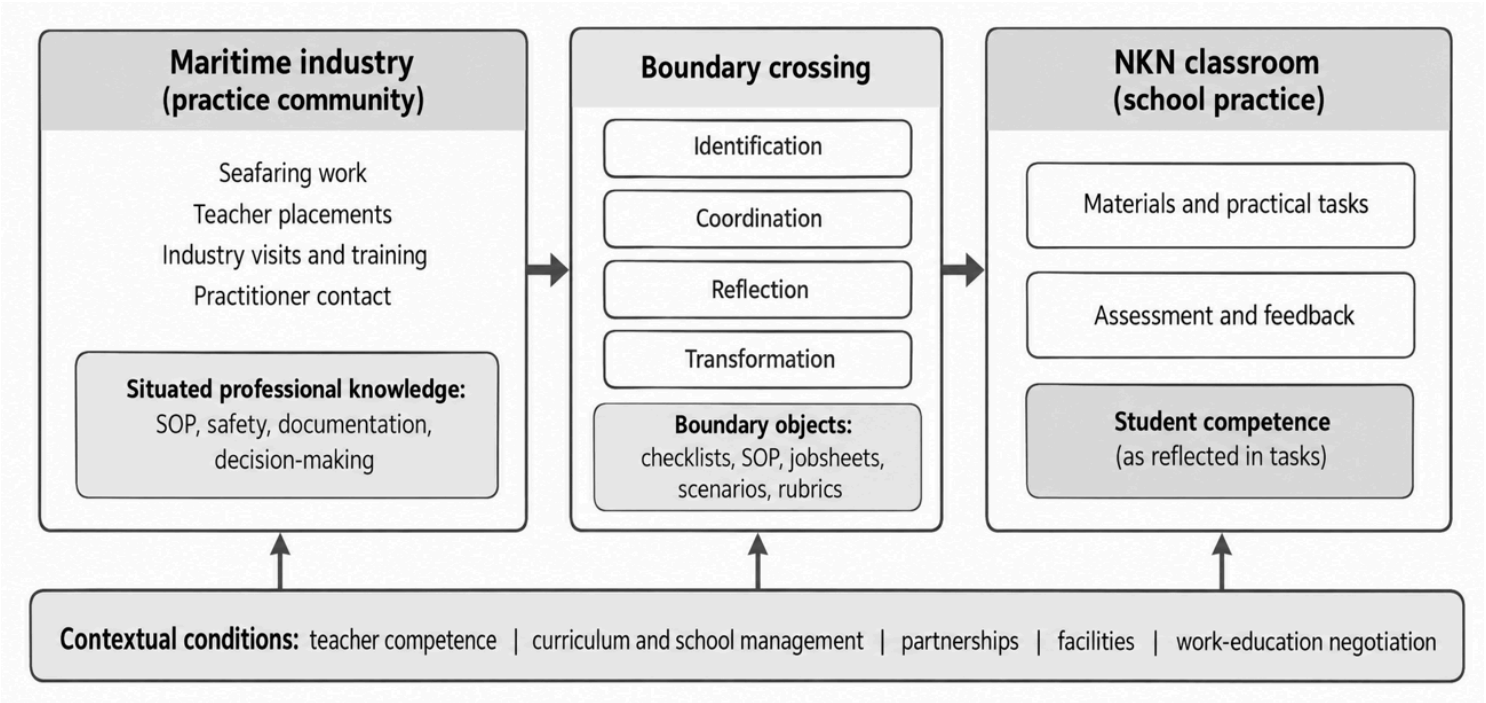


Figure 1

Conceptual framework: teachers' industry experience crosses the boundary between maritime practice and the NKN classroom through boundary-crossing mechanisms and boundary objects, under contextual conditions

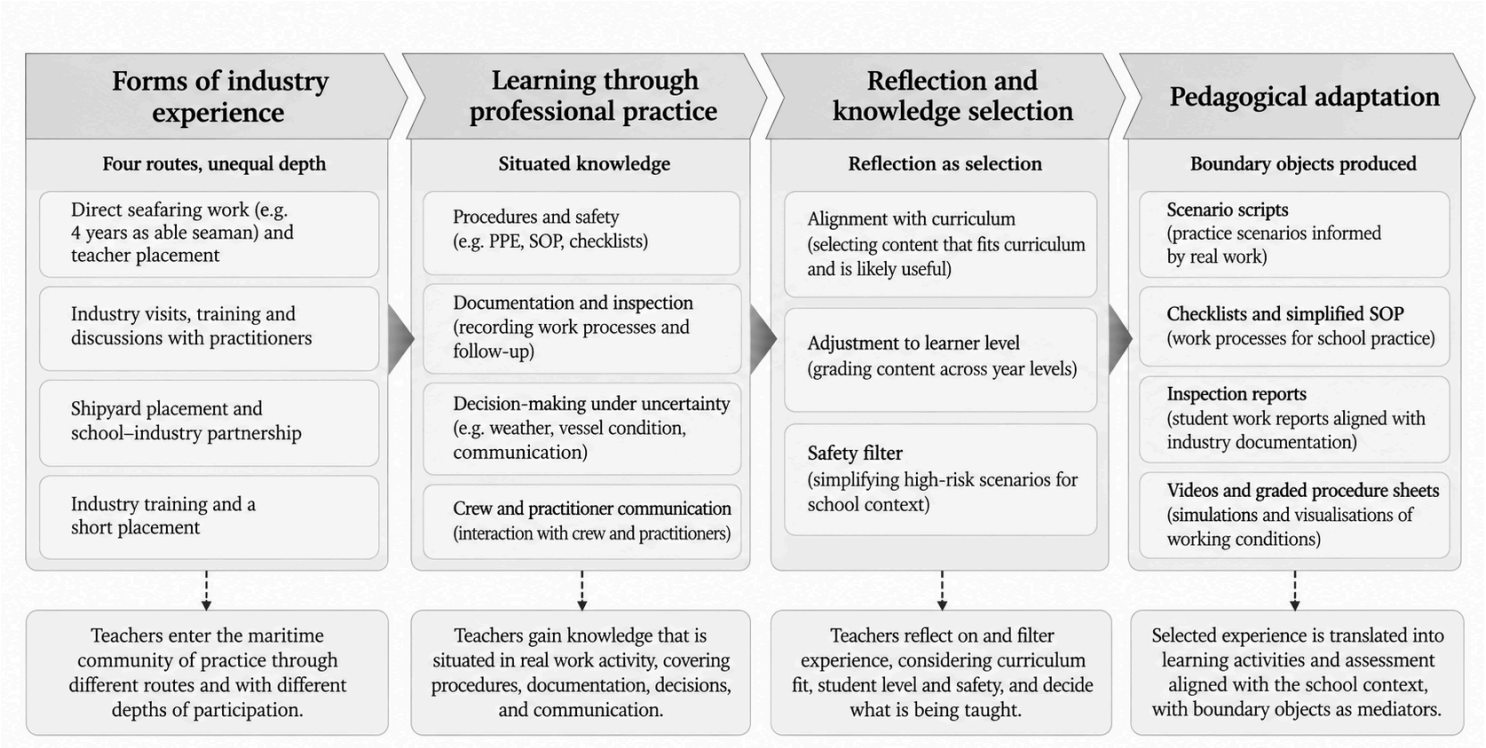


Figure 2

Translation pathway of industry experience into NKN instruction, with the experience profile and boundary objects of each teacher

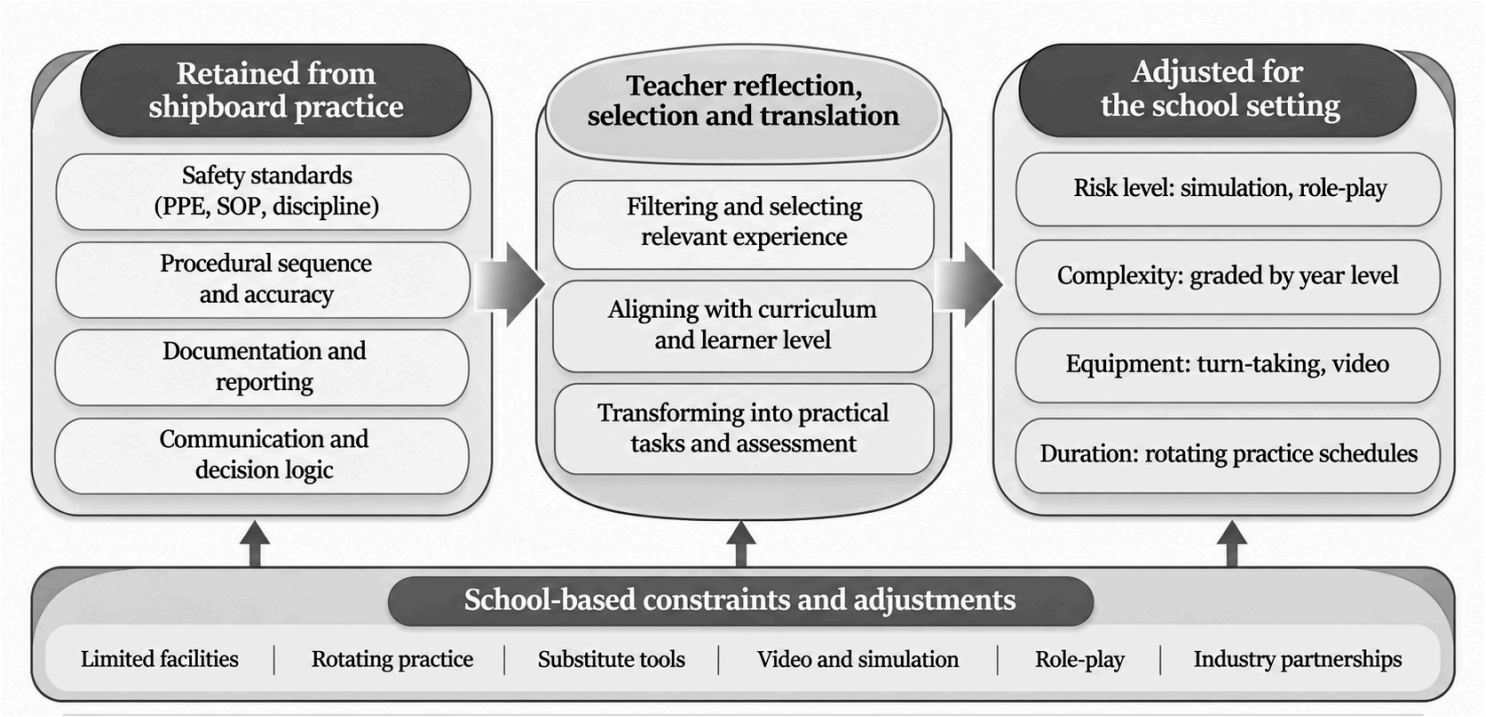


Figure 3

Adapted authenticity: what is retained from shipboard practice and what is adjusted for the school setting

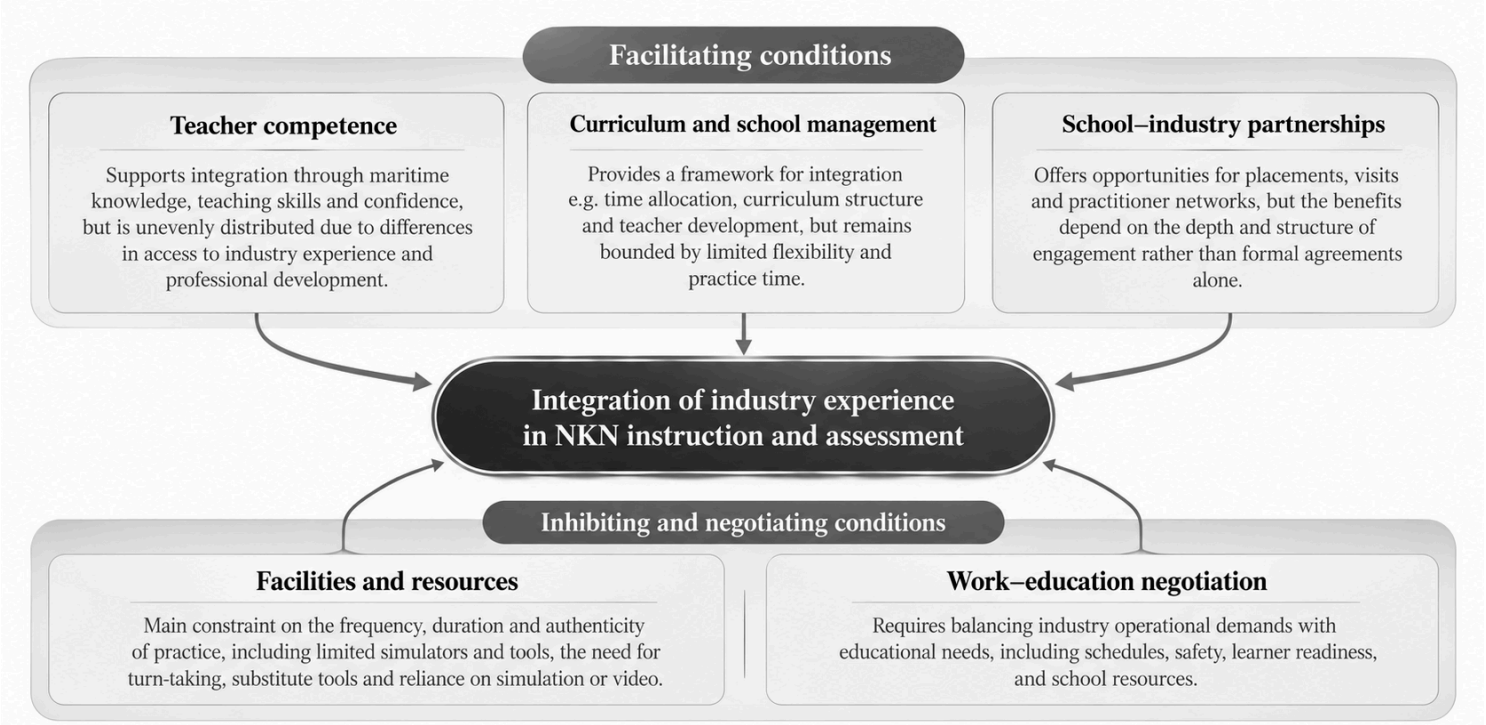


Figure 4

Conditions that facilitate and inhibit the integration of industry experience in NKN instruction

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