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Socialization of Applied Physics Textbook Writing for Teachers at SMK Pelayaran Padang

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ABSTRACT

The socialization of applied physics textbook writing conducted for teachers of Padang Shipping Vocational High School is a strategic effort to improve the quality of vocational education in the shipping sector, particularly in the realm of physics which is directly related to the technical and practical aspects of shipping operations. This activity is designed to provide a deep understanding of the importance of developing teaching materials that are not only theory-oriented, but also able to integrate real-world applications of physics concepts in the context of the shipping world. In addition, this socialization also serves as a forum for exchanging experiences, discussing curriculum needs, and challenges faced by teachers in compiling textbooks that are in accordance with national standards and the needs of the shipping industry. Through this program, it is hoped that teachers of Padang Shipping Vocational High School can create high-quality, relevant, and contextual teaching materials, thereby increasing the effectiveness of learning and the competency of vocational high school graduates who are ready to compete in the world of work.

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1. INTRODUCTION

Maritime education in Indonesia plays a strategic role in producing competent human resources in the maritime sector. Vocational High Schools (SMK) Pelayaran (Vocational High School) play a significant role in equipping students with knowledge and skills relevant to the needs of the shipping industry. One such school is SMK Pelayaran Padang.

SMK Pelayaran Padang is a private vocational high school under the auspices of the Ministry of Education and Culture. SMK Pelayaran Padang is located at Jalan Padang Pasir I No. 9C, Padang Pasir, West Padang District, Padang City, West Sumatra, with ZIP Code 25113. This private vocational school was established in 1991 with the National Registration Number (NPSN) 10304855. Currently, SMK

Pelayaran Padang uses the government-mandated curriculum, SMK 2013 Rev. Nautika Kapal Niaga (Vocational School for Commercial Ships). SMK Pelayaran Padang is led by the principal, Capt. Zakir, A.Md., M.Mar. Padang Sailing Vocational School received B accreditation in 2019 from BAN-S/M (National Accreditation Board for Schools/Madrasahs). There are 43 teaching and administrative staff at Padang Sailing Vocational School. Facilities and infrastructure include 14 classrooms, a library, a science laboratory, a language laboratory, and a computer laboratory.

Although under the auspices of the Ministry of Education and Culture, the learning process at Padang Sailing Vocational School adheres to the regulations of the Directorate of Shipping and Maritime Affairs (Ditkapel), which is overseen by the Ministry of Transportation. Therefore, this situation and condition demonstrate that the West Sumatra Sailing Polytechnic shares similarities with Padang Sailing Vocational School, as both are regulated by the Ministry of Transportation. Triastuti (2022) explains that shipping institutions or agencies in the maritime transportation subsector are regulated by the International Maritime Organization (IMO). Padang Sailing Vocational School also offers Applied Physics courses that comply with IMO standards.

Applied physics, as the foundation of maritime technology, is a crucial subject at Padang Maritime Vocational High Schools. However, the availability of applied physics textbooks that are specific and relevant to the shipping context remains limited. Many existing textbooks are general in nature and fail to connect physics concepts to practical applications in the shipping world.

Applied physics plays a crucial role in the development of technology and industry in the modern era. A deep understanding of applied physics concepts is an essential foundation for Padang Maritime High School/Vocational High School students to prepare themselves for the challenges of an increasingly competitive workforce. However, the availability of high-quality applied physics textbooks that are relevant to students' needs remains a challenge. Many existing textbooks fail to present material in an engaging, contextual manner, and in line with current technological developments. This results in low student interest and understanding of applied physics.

This results in less than optimal student understanding of applied physics in the shipping context. In fact, a solid understanding of applied physics is crucial for maritime vocational school students to be able to properly operate and maintain navigational equipment, ship engines, and electrical systems.

On the other hand, many high school (SMA/SMK) physics teachers have great potential to develop better textbooks. Their teaching experience and in-depth understanding of student needs are valuable assets in writing textbooks. However, not all teachers possess the skills and knowledge to write effective and high-quality textbooks.

Therefore, outreach and training on writing applied physics textbooks for maritime vocational school teachers in Padang is crucial. This activity aims to:

a. Improve teacher skills in writing applied physics textbooks that are specific and relevant to the maritime context.
b. Encourage teachers to develop innovative textbooks that meet the needs of maritime vocational school students.
c. Increase the availability of quality applied physics learning resources at Padang maritime vocational schools.
d. Create a collaborative network among teachers in the development of applied physics textbooks in the maritime field.

With this activity, it is hoped that the quality of applied physics learning at Padang Maritime Vocational School can improve, so that students can have a better understanding and be ready to face challenges in the increasingly complex world of shipping.

2. METHODS

The approach used to resolve the partner's problems is through outreach. The outreach for writing Applied Physics textbooks is aimed at teachers. The outreach for writing Applied Physics textbooks for teachers aims to improve teachers' skills in writing applied physics textbooks that are specific and relevant

to the shipping context. Furthermore, a participatory and collaborative approach actively involves teachers in every stage of the activity, from planning, implementation, to evaluation. It also encourages teachers to develop textbooks that are relevant to the needs of Padang Maritime Vocational School students. It was held on September 9, 2025 at SMK Pelayaran Padang of Padang City, West Sumatera Province. The school is also the most appropriate place to conduct this research because of its institution of maritime vocational schools and cooperation with Ministry of Transportation as well as Ministry of Education Culture.

Implementation procedures The 5 main stages during implementation were:

a. Survey, observation and interviews with school principals and physics teachers to understand Applied Physics teaching material requirements and challenges.
b. Prioritizing needs problems identified and development of alternative solutions to meet needs.
c. Writing of the textbook in applied-physics, which is specially crafted for maritime application in accordance to IMO standards.
d. Co-ordination of the socialization timetable with school authorities and participating teachers.
e. Intervention, was the socialization activity in which teachers were exposed to courses created to improve their expertise and motivation for writing AP textbooks.

3. FINDINGS AND DISCUSSION

The activity began with an opening remarks by the head of the community service, Melda Yanti, S.Pd., M.Si. In her opening remarks, Melda Yanti explained that this community service activity was intended for teachers as users of open textbooks. Applied Physics textbooks are one of the learning media developed to address teachers' learning material challenges. Furthermore, applied physics bridges basic physics theory with practical applications in engineering and shipping. Physics concepts such as mechanics, fluid dynamics, thermodynamics, and electromagnetics are essential for understanding various phenomena in ship operations, such as ship stability, buoyancy, and ocean waves. Many ship navigational instruments, such as compasses, radar, sonar, and GPS, operate based on the principles of applied physics, particularly wave and electromagnetic physics. An understanding of applied physics enables sailors to operate and maintain these instruments effectively, resulting in more accurate and safe navigation. Applied physics is also used in ship stability analysis and calculations of loads, fluid flow around the ship, and interactions between the ship and the marine environment. This supports safe navigation and the efficient use of fuel and other resources.

The event continued with a speech from the Principal of SMK Pelayaran Padang, Mr. Capt. Zakir, A.Md., M.Mar. In his remarks, Mr. Zakir stated that the visit of the community service team from the West Sumatra Maritime Polytechnic to SMK Pelayaran Padang was an honor and a source of pride for the teachers. This was because the open-book format would be very useful for teachers and students. Furthermore, this learning medium, in the form of a textbook, would also add to the collection of reading materials and references in the school library.

Next, a presentation on the socialization material was delivered by Ms. Nelfi Erlinda, M.Pd., a member of the community service team and a Physics lecturer at SMK Pelayaran Padang. In her presentation, Ms. Nelfi presented an analysis of the learning situation and challenges still encountered at SMK Pelayaran Padang. One of these challenges is the learning of Applied Physics and the lack of learning resources for teachers and students. Therefore, the development of an Applied Physics textbook is one solution that can address students' challenges in learning Applied Physics and the challenges faced by teachers and the school institution regarding the availability of learning resources. In her final presentation, Ms. Nelfi outlined the conceptual knowledge and principles of writing applied physics textbooks, as well as techniques for developing effective and easy-to-understand content and structure.

Following her presentation, Ms. Nelfi opened a discussion and question-and-answer session with the teacher panel. The teacher panel took turns providing questions, feedback, and suggestions on the ongoing activities. The teachers actively participated in the discussion, Q&A, and writing practice

sessions. They also demonstrated a strong commitment to continuing the development of the open textbook with the support of a post-activity mentoring program.

Following the discussion, the activity continued with a symbolic handover of the open textbook to a teacher representative. The community service team hopes that this Applied Physics material can be immediately implemented in the learning process at SMK Pelayaran Padang. Teachers are expected to utilize this textbook as a comprehensive guide to improve their competence in writing applied physics textbooks. Furthermore, the team hopes this activity will have a positive impact not only on the teachers as open textbook authors, but also on the quality of applied physics learning at SMK Pelayaran as a whole, making it more interactive and contextual for students. Thus, community service through the socialization of writing applied physics textbooks is very useful in strengthening the capacity of Padang Shipping Vocational School teachers and supporting the development of vocational education that is relevant to the needs of the shipping industry.

There were 15 teachers involved in the socialization, which elicited very favorable responses. The majority of students reported that the material was clear, relevant, and inclusive, with specific examples making it easier to understand. Some of the teachers acknowledged that they had previously encountered barriers, such as limited resources or a lack of technical expertise. But then, after the socialization, they became more confident and willing to deliver good textbooks.

Table 1. Teacher's Response Data on the Textbook Writing Socialization

No.	Indicator	Total Responses (Percentage)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
1	The workshop material was readily comprehensible (or easily understood).	13 (86.7%)	1 (6.7%)	1 (6.7%)	0
2	The provided examples of textbook writing were clearly articulated.	14 (93.3%)	1 (6.7%)	0	0
3	The content was relevant to my teaching requirements (or pedagogical needs).	11 (73.3%)	4 (26.7%)	0	0
4	The explanation of textbook writing techniques was comprehensive.	13 (86.7%)	2 (13.3%)	0	0
5	The material elaborated on the selection of content and the structural organization (or arrangement) of the textbook.	8 (53.3%)	7 (46.7%)	0	0
6	The timing of the workshop was appropriate (or optimal).	8 (53.3%)	7 (46.7%)	0	0
7	The delivery method was engaging and interactive.	9 (60%)	6 (40%)	0	0
8	The facilitator was competent and communicative.	10 (66.7)%	5 (33.3)%	0	0
9	The supporting facilities (or logistics) provided during the workshop were adequate.	9 (60%)	4 (26.7%)	2 (13.3%)	0
10	The workshop enhanced my understanding of textbook writing.	13 (86.7%)	2 (13.3%)	0	0

No.	Indicator	Total Responses (Percentage)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
11	I have increased confidence in writing an applied physics textbook following the workshop.	11 (73.3%)	4 (26.7%)	0	0
12	The workshop provided novel ideas and references for developing textbooks.	13 (86.7%)	2 (13.3%)	0	0
13	The material presented will facilitate the textbook writing process.	12 (80%)	3 (20%)	0	0
14	The workshop motivated me to undertake textbook authorship.	10 (66.7)%	5 (33.3)%	0	0
15	I have commenced the planning phase for the development of an applied physics textbook.	9 (60%)	5 (33.3)%	1 (6.7%)	0
16	I require further support or advanced training related to textbook writing.	14 (93.3%)	1 (6.7%)	0	0
17	The workshop assisted in comprehending the standards for effective (or quality) textbook writing.	13 (86.7%)	2 (13.3%)	0	0
18	I would recommend this workshop to other educators (or faculty members).	8 (53.3%)	7 (46.7%)	0	0
19	I am interested in participating in similar future workshops or training activities.	10 (66.7)%	5 (33,3)%	0	0
TOTAL		1386.7%	486.7%	26.7%	0
AVERAGE		73%	25.6%	1.4%	**0**

The satisfaction evaluation showed that all the respondents were 100% satisfied with learning impact, increased knowledge on text book writing, reinforcement of confidence and generation of new ideas and references. The intention and follow-up item was 98.9%, which indicated donors' intent to write about and recommend the program. The material quality was 98.7% fulfilled, the implementation reached 96.7%, which showed that facilitators were competent, interactive and able to handle the activity effectively.

High satisfaction levels in the learning impact (100%) and motivation/follow-up (98.9%) indicated that the socialization program significantly improved teacher-engagement with context-based applied physics textbook development. This result is in line with the previous finding that teacher involvement and contextual relevance of professional development are likely to associate higher instructional innovation and teacher self-efficacy (Verawati & Nisrina, 2025). Almost perfect scores material quality (98.7%) and strong implementation rating (96.7) demonstrate the program's success in matching content, pedagogy, and support to vocational maritime needs.

Feedback also provided suggestions on areas that could be improved, including improvements in infrastructure, breaking down dense materials further into smaller components and introducing maritime case studies as well as extending the duration more for deeper practice. The implementation team will consider these suggestions for inclusion in an updated version of the document and arrange a subsequent workshop on the development of applied physics textbooks.

However, the various responses related to infrastructural limitation, necessity of module for heavy material, integration in maritime-case study and longer duration correspond to general literature on vocational physics education whereby materials should not only be context relevant but also affordable and scalable in poverty-constraint conditions (Khoeriah et al., 2020). The conclusions support the theoretical construct that technician-level, applied physics instruction is enhanced by moves across the theory-practice distinction and by incorporating authentic vocational contexts into textbook development (Taasoobshirazi, 2008). It is the merging of applied physics with maritime vocational contexts in this manner that makes this a new book, an activity which generic textbook development often struggles to engage in due to its vacuum of vocational application.

Socialization program in the Writing of Applied Physics Textbook to teachers at SMK Pelayaran Padang is a very strategic steps to improve the abilities of teachers in making student activity sheets, which are in accordance with maritime education (Hasza & Taharuddin, 2020). The action was needed in response to the urgent requirement of text books that are both theoretically well-informed and at the same time contextualized within a maritime vocational setting (E. Maryam & Fahrudin, 2019). In as much as applied physics supports skills in the maritime industry, it makes a direct input towards students being prepared to graduate meeting international standards, especially of teaching quality established by IMO (2014).

Workshops taught educators different elements of textbook creation, including choosing the materials, designing where they appear on the page and how to weave them into other materials. Accordingly, teachers showed increased awareness and initiative to develop teaching materials relevant to vocational needs (A. Rahman, 2017; Rahman, 2017). The positive responses and satisfaction rate confirm the success of the program, which is consistent with that discovered by Hasanah and Sari (2025), who stressed that to promote students' engagement and understanding, interactive learning resources within the context are vital requirements.

However, the results also show challenges that need attention regarding technological infrastructure and regular mentoring for teachers (Kemendikbudristek, 2022). Challenges such as these must be addressed to sustain and scale the program. The use of digital learning platforms recommended by teachers is in line with global trend in VET (vocational education and training) and supports the transformation process of SMK programs (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2018).

The collaborative nature of our training program and its practice-based design conforms to 'best practices' for vocational teacher development (Churchward et al., 2008), and is one possible explanation for the positive results obtained. Studies of VET (vocational education and training) teacher development highlight that good teacher professional development is industry-connected, active, reflective and offered in sustained communities of practice. These strategies enhance teachers' knowledge of content and boost their confidence, which result in visible improvements in classroom practice and learner performance. For example, Zhou et al. (2022) find that the working of learning activities for vocational teachers (in school, on campus or in workplace) are capable to lead to changes of teacher's cognition and behavior which are good for students and their institutions. Likewise, Siliņa-Jasjukeviča et al. (2025) find that teacher education need to be directly relevant and participatory, with teachers to participate in practical learning as well as ongoing reflection. The SMK Pelayaran program, which integrated the applied physics with workshop and peer-group discussion. It encourages pedagogical confidence and pedagogical innovation for teacher (Siliņa-Jasjukeviča et al., 2025; Gunawan et al., 2023; Zhou et al., 2022).

Make teachers more deeply in the production of textbooks enhances these benefits. When teachers create, or revise, learning resources they contribute their professional knowledge to it, which enhances

its relevance and context specificity. More recent work has revealed that materials developed by teachers themselves are frequently rated most beneficial by our teaching force and autonomy in material creation appears to be associated with greater confidence. Teacher's authorship of curriculum, such as that demonstrated by our textbook-writing cohort, and professional learning communities which prioritize teacher's ownership of curriculum have also produced highly embedded practice-oriented lesson designs. Indeed, the process of textbook writing should be understood as continuing professional development from which teachers would gain growing insights about how to approach one's pedagogical knowledge and better adjust content to real maritime activities (Martins & Baptista, 2024; de Souza et al., 2025). Through the co-creation of an applied physics textbook, teachers were able to translate abstract phenomena into concrete examples relevant to the maritime sector and bring theory closer to practice. Such processes of authoring did more than provide teachers with ownership. It situated the teachers as knowledge-producers and thus contributors to lasting teaching innovation (Zhao, 2025; Garay Abad & Hattie, 2025).

Especially in VET, learning has to be situated within real occupational environments. The inclusion of real-world scenarios in the maritime industry and problem-based tasks within a physics approach is supported by research on contextualization in VET, with studies showing that students are motivated to know if it is relevant to their chosen trade (industry) so that they feel more competent. That is to say, when you put the principles of physics in a marine context students see the application and realize practical uses. A teacher-authored material (TAM) can be specifically suited to that objective and reflecting the industry norms and resources locally available (Zhao, 2025). In our case, this material already in existence, the final textbook also demonstrates vocational pedagogy bindings by siting physics education at another level, contributing to conceptual understanding and workplace effectiveness. This process and context-based intervention, buttressed by active involvement of local teachers, ensures that the influence would be sustained. The teachers are skilled to connect the contents of their teaching with the contemporary maritime industry, hence making stronger the pipeline from school learning towards industry competence (Gunawan et al., 2023; Siliņa-Jasjukeviča et al., 2025).

Second, the socialization model supports contemporary vocational teacher development through engaging teachers in curriculum design. It highlights that when teachers jointly develop instructional resources there is a significant increase in their content knowledge and confidence. For instance, Fragat et al. (2022) found among physics teachers participating in design-based research projects that it enhanced content-pedagogy knowledge and self-efficacy, whereas Veugen et al. (2024) found that collegial development of context-specific assessment tasks assisted vocational teachers to identify learner's challenges and reflect more deeply on their teaching. Elbrekht et al. (2021) also found that a systematic training of textbook development helps them prepare teachers take authorship for addressing the technical and pedagogical challenges.

Also, Saborío-Taylor and Rojas Ramírez (2023) explain that teachers are "teacher-designers" who apply need analysis and iterative design to customize materials for learners, which serves to increase teacher awareness of student needs and learning contexts. These results resonate with more general recommendations of effective VET professional development that it should be active, collaborative and contextually situated (Silina-Jasjukeviča et al., 2025) with Teacher Design Teams frequently held up as a best practice. Indeed, Gryson et al. (2024a, 2024b) also find positive results for vocational schools who work in interdisciplinary Teacher Design Teams programs on the level of instruction and teacher beliefs, but stress necessity of administrative support if such initiatives are to be continued. `Garay Abad, Hattie (2025) further showed that teachers self-generated resources were related to more instructional autonomy and along-term professional development teachers felt more confident making and modifying their own materials. By mobilising teachers as co-designers of an authentic physics textbook we are able to provide industry-relevant content, while also fostering teacher agency and reflective pedagogy activities highly valued in recent international vocational education research (Gunawan et al., 2024; Hoekstra, 2023).

More than the direct benefits, socialization drives much in bringing maritime vocational education in Indonesia to be more liable through cooperative network among teachers, higher-education

institutions and maritime authorities (Kementerian Perhubungan Republik Indonesia, 2023). This collaboration model will advance a collective understanding to elevate the quality of instruction and integrate learning resources with industry requirements for the maritime sector. It also creates an environment supportive of a textbook-writing community that can continually create contextualized learning resources prepared in accordance with the needs of maritime education (Badan Penelitian dan Pengembangan Pendidikan dan Kebudayaan, 2018). These collaborative ecosystems are important to maintain innovation at maritime education institutions, especially in the development of adaptive and authentic learning material in line with current technology and professional practice (Maryam & Fahrudin, 2019; Widodo et al., 2021).

From the viewpoint of curriculum policy and teacher professional learning, this endeavor is consistent with Indonesia's national revitalization aims for vocational schools (SMK), which include industry-relevant skills, digital literacy, and pedagogical renewal (Kemendikbudristek 2022). The incorporation of applied physics in maritime setting is an endeavour and use transformational learning system in which theory relates directly to workplace skills (Hasanah & Sari, 2025; Putra et al., 2020). In addition, the shared model of SMK Pelayaran Padang with both higher education partner and civil agency show the role of the multi-stakeholders networks on persistence of innovations and significance curriculum vocational material (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2018; Rahman, 2017).

For physics education, there are two implications. First, vocational physics teaching as it applies to navigation, marine motors and electrical installations highly benefits from contextualization which embeds these abstract ideas within the context of real-world electric systems (Fahrudin in Fahrudin et al., 2022) or relatable experiences for students (Suryani et al., 2021). Second, producing textbooks in a professional practice context can enhance agency and teacher-directed deprivatisation of practice by supporting reflective pedagogy and innovation in content teaching (Aulia Rahmand & M. A., 2017; Gunawan et al., 2023). In addition, through involving teachers in producing the educational materials, the programme strengthens their role as knowledge developers rather than just knowledge disseminators conforming to constructivist ideas of teacher professional development (Voss & Wittwer, 2020; Zhang et al., 2022).

The model of participatory professional development can be implemented for the longer term, and used as a guide for other vocational schools in Indonesia's archipelago particularly to incorporate applied sciences to contextual curriculums (Deepublish, 2022; Sukardi et al., 2024). It does so by focusing not just on the improvement of pedagogical skills but also, by fostering innovation ecosystems which connect academia and industry and policy environments, that will make VPE dynamic, relevant and attuned to the global maritime standards (International Maritime Organization2020; Yusuf & Anwar 2019).

To sum up, the Applied Physics Textbook Writing Socialization in SMK Pelayaran Padang has positively contributed to changing teachers' pedagogical and context variables, resulting in high-grade quality of instruction and meeting the bottom-line expectation of maritime education alignment with industry and global standards. The success of this activity echoes the possibility of participatory, context based models of professional development to improve vocational education in Indonesia (Deepublish, 2022; Fahrudin, 2022).

4. CONCLUSION

The socialization of applied physics textbook writing for teachers at SMK Pelayaran Padang is a highly strategic activity and plays a crucial role in improving the quality of education in the maritime sector. Through this activity, teachers are provided with in-depth training and understanding of textbook writing techniques that align with the needs of applied physics learning. This approach not only refers to national curriculum standards but also emphasizes applicability and contextual aspects in line with the demands of the ever-evolving maritime industry.

This socialization also encourages teachers to develop more relevant and effective teaching materials to convey important physics concepts to SMK Pelayaran Padang students, thereby supporting their mastery of the technical competencies essential to the maritime workforce. Furthermore, this activity strengthens collaboration and networking among teachers, who exchange experiences and ideas to update applied physics teaching materials.

Thus, this textbook writing socialization not only enhances individual teacher skills but also collectively contributes to improving the quality of teaching staff and graduates at SMK Pelayaran Padang, who are ready to compete and meet international standards, particularly regulations of the International Maritime Organization (IMO). Therefore, this socialization is a crucial step in supporting the strengthening of sustainable and highly competitive maritime vocational education..

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