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Analysis of Teachers' Difficulties in Implementing Physics Practicum in SMA Banda Aceh City

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Abstract: *This study examines the implementation of physics practicum in the context of Merdeka Curriculum in high schools in Banda Aceh City. Using a descriptive qualitative approach with a survey method, this study aims to identify the challenges and difficulties faced by teachers in implementing physics practicum. Data were collected through questionnaires and interviews with physics teachers selected using purposive sampling technique. The results showed that most teachers (83%) had prepared the practicum module well, but faced obstacles in terms of adequate laboratory facilities (63%) and laboratory staff support (57%). Time management is also a challenge with only 63% of teachers feeling that the time allocation is sufficient. Despite this, the level of student discipline and responsibility in the practicum was quite high (92%). This study recommends the need for a review of time allocation, standardisation of laboratory facilities, and teacher professional development that focuses on technology integration in physics practicum in accordance with the demands of the Merdeka Curriculum.*

INTRODUCTION

Education in Indonesia continues to undergo transformation in line with the times and the demands of 21st century competencies. The implementation of the Merdeka Curriculum, which is a development of the 2013 Curriculum, brings significant changes in the paradigm. In the context of physics learning, practicum is an essential component that cannot be separated from the learning process. This is in line with the Pancasila Student Profile Strengthening Project which emphasises experiential learning and problem solving (Johnson, K. L., & Smith, P. R, 2024). Physics practicum not only plays a role in developing technical skills and conceptual understanding, but also supports character development such as independence, creativity, and critical reasoning skills in accordance with the objectives of the Merdeka Curriculum (Sari, I. N., & Gunawan, G, 2023).

However, the implementation of physics practicum in the field faces various challenges. Based on preliminary studies in several high schools in Banda Aceh city, it was found that the implementation of practicum was not optimal. Data from the Aceh Education Office in 2023 showed that out of 25 high schools in Banda Aceh City, only 60% had physics laboratories with adequate facilities (Dinas Pendidikan Aceh, 2023). This condition is exacerbated by the impact of the COVID-19 pandemic which causes a gap in the implementation of practicum during the

distance learning period (Putri, R. M., Safitri, D., & Mahmud, M. 2023).

Physics learning in the Merdeka Curriculum emphasises learning outcomes that require students not only to understand concepts, but also to be able to analyse physics phenomena in everyday life, design and conduct physics experiments, process and analyse experimental data, communicate experimental results scientifically, develop creative solutions to physics problems in life (Kemendikbudristek. 2022c). The role of the teacher in achieving these learning objectives is crucial. Teachers are required not only to master the material content, but also to facilitate effective practicum-based learning (Rahmat et al., 2023). This is in line with Permendikbudristek Number 56-58 of 2022 concerning National Education Standards which emphasises the importance of contextual learning and experiential learning (Kemendikbudristek. 2022d).

On the other hand, the implementation of Merdeka Curriculum provides flexibility for teachers to develop learning according to the context and needs of students (Asrizal, A., Amran, A., & Hidayati, H. 2024). However, this flexibility also brings its own challenges, especially in terms of adjusting practicum material with learning outcomes, developing contextual practicum modules, integrating technology in practicum activities, project-based assessment and practicum and managing laboratory time and resources (Yulianti, D., & Saputra, N. 2023).

LITERATURE REVIEW

The implementation of practicum in physics learning is rooted in the constructivist learning theory which emphasizes that knowledge is actively constructed by learners through experiences and interactions with the environment (Piaget, 1972; Vygotsky, 1978). In the context of the Merdeka Curriculum, practicum serves as a medium for contextual and experiential learning where students not only receive theoretical knowledge but also construct understanding through direct engagement with physical phenomena. Practicum activities help students develop scientific reasoning, inquiry skills, and the ability to solve problems independently, in line with 21st century learning competencies.

Furthermore, the theory of inquiry-based learning supports the integration of practicum into physics education. According to Llewellyn (2013), inquiry-based learning encourages students to formulate questions, design experiments, collect data, and draw conclusions based on evidence. This approach is highly aligned with the Merdeka Curriculum which aims to foster critical thinking, creativity, collaboration, and communication. Teachers, therefore, play a pivotal role as facilitators who guide students through meaningful learning experiences and ensure the practicum is not merely procedural but deeply conceptual.

The Technological Pedagogical Content Knowledge (TPACK) framework also becomes highly relevant in analyzing teachers' difficulties in implementing practicum. Mishra and Koehler (2006) emphasize that effective teaching in the digital era requires the integration of content knowledge, pedagogical strategies, and technological tools. In the context of physics practicum, this integration becomes essential, especially when teachers are expected to innovate through the use of simulations, virtual labs, or data analysis software, particularly in schools where laboratory facilities are limited.

Finally, the implementation of practicum is also closely related to the concept of professional competence and teacher readiness. According to the Indonesian Ministry of Education and Culture (Kemendikbudristek, 2022), teacher competence encompasses pedagogical, professional, social, and personal domains. The ability to plan, carry out, and evaluate practicum effectively is part of pedagogical and professional competence. Challenges in practicum implementation often arise due to limited training, inadequate infrastructure, time constraints, and lack of support, all of which influence the effectiveness of practicum-based learning and, consequently, student learning

outcomes.

METHOD

This study used a descriptive qualitative approach with a survey method. The choice of this approach is based on the need to gain an in-depth understanding of teachers' difficulties in implementing physics practicum (Poth, C. N. 2023). The qualitative research design allows researchers to comprehensively explore and understand teachers' perspectives regarding the challenges faced in implementing practicum in the Merdeka Curriculum (Sugiyono, S. 2023).

Table 1. Senior high schools in Banda Aceh city

School	School Name	Number of Teachers
Negeri	SMAN 3 Banda Aceh	3
	SMAN 4 Banda Aceh	2
	SMAN 6 Banda Aceh	1
	SMAN 8 Banda Aceh	4
	SMAN 15 Adidarma Banda Aceh	1
	SMAN 16 Banda Aceh	1
Private	SMA Laboratorium Unsyiah	1
	SMA Inshafuddin Banda Aceh	1
	SMA Kartika XIV-1 Banda Aceh	1
Madrasah Aliyah	MAN 1 Banda Aceh	1
	MAN 2 Banda Aceh	2
	MAS Babun Najah	1
	MAS Darul'ulum Banda Aceh	1
	MAT Daarut Tahfizh Al-Ikhlas	2

The research was conducted in 15 high schools in Banda Aceh City. The research time lasted for one semester, from July to December 2024. The research subjects were determined using purposive sampling technique with the criteria, as many as 23 physics teachers who actively teach in high schools in Banda Aceh City, have a minimum teaching experience of 1 year involved in the implementation of physics practicum.

Data analysis techniques in this study are quantitative and qualitative data. In this study, quantitative data is data related to the implementation of practicum. The instrument used to collect data is a questionnaire sheet of teacher responses in the implementation of practicum. The data collected was analysed using descriptive statistics and presented in table form. Meanwhile, in this study qualitative data are data related to practicum planning, practicum implementation, practicum evaluation. The instrument used to collect data is an interview sheet about practicum planning, practicum implementation, practicum evaluation. The data collected is presented in the form of a narrative.

RESULTS AND DISCUSSION

Analysis of the implementation of physics learning practicum activities in this study was carried out using a questionnaire sheet of teacher responses in the implementation of the practicum. The results of the questionnaire sheet can be seen in the following table.

Table 2. Aspects of Observation on the Questionnaire Sheet

No	Observation Aspect	Persentase
1	I carry out Physics lab work according to the allotted time	74%
2	I always prepare a module/guide for the physics lab that I am going to do.	83%

3	The school has very adequate facilities so that the Physics practicum is carried out	63%
4	I check the completeness of the tools and materials before the Physics practicum is conducted.	87%
5	I gave the opportunity to students who were unable to attend to do the experiment at the next meeting.	53%
6	I punish students who do not bring the tools or materials as instructed.	46%
7	I instructed the students to clean and return the tools and materials after the Physics practicum was over.	92%
8	I feel that the time allocation for Physics Practicum is very sufficient.	63%
9	I give directions to students to bring tools or materials that are not available in the laboratory when doing Physics lab work.	77%
10	I am assisted by the laboratory assistants when carrying out Physics lab work in the school laboratory.	57%
11	According to the Physics subject schedule Physics practicum can be done every semester	84%

Practicum Preparation and Planning. The results showed that physics teachers in senior high schools in Banda Aceh city had a good level of preparation in the implementation of practicum. Most teachers (83%) consistently prepare modules or physics practicum guides before the implementation of activities. This finding is in line with the research of Rahmawati et al. (2024) who found that careful planning is a key factor in the success of physics practicum in the Independent Curriculum era. The high percentage of teachers (87%) who check the completeness of tools and materials reflects an awareness of the importance of technical readiness, as emphasised in studies (Sutrisno, H., Widodo, A., & Prayitno, B. A. 2024). on effective physics laboratory management.

Time Management and Practicum Implementation. The challenge in time management revealed in this study, where only 63% of teachers felt that the time allocation was sufficient, reflects the findings of (Azizah, N., & Hartono, H. 2024) on the complexity of time management in implementing practicum-based learning. Although 84% of teachers were able to implement practicum every semester, underlining the importance of optimising practicum time through an integrated learning approach (Nugraha, A., Widodo, A., & Suhandi, A. 2023).

Facilities and Technical Support. The facility issues revealed, where only 63% of teachers rated school facilities as adequate, confirm Putri & Rahman's (2024) findings on laboratory infrastructure gaps in Indonesia. The lack of labour support (57%) is also a critical issue, as identified in a comprehensive study on school laboratory management in the digital era (Sutrisno, H., Widodo, A., & Prayitno, B. A. 2024). Research in Malaysia also shows that the availability of laboratory assistants is positively correlated with the effectiveness of practical learning (Hassan, A., & Ibrahim, M. 2023).

This is in line with the recommendation of the Ministry of Education and Culture (2023) to adopt a blended learning model in physics practicum. Classroom Management and Discipline. The finding on the emphasis on collective responsibility (92% of teachers applied) is in line with the principles of the Pancasila Student Profile, particularly the gotong royong dimension (Widodo et al., 2023). The positive approach to classroom management demonstrated by Banda Aceh teachers reflects global trends in science practicum pedagogics, as reported in meta-analysis (Johnson, K. L., & Smith, P. R. 2024). However, the low percentage of teachers providing follow-up practicum (53%) raises concerns about equitable access to learning, as discussed in study (Rachman, H., & Safitri, D. 2024).

Implications for Learning Development. The findings of this study have important implications relevant to current trends in science education. Firstly, the need for a review of time allocation is in line with UNESCO (2024) recommendations on science learning standards at secondary level. Second, the urgency of standardising laboratory facilities supports the findings of

(Ahmad, R., Putri, S. D., & Rahman, A. 2024) on the role of infrastructure in the achievement of science competencies. Previous research (Amiruddin, M., & Supriyadi, T. 2024) in his study on the implementation of Merdeka Curriculum recommended teacher professional development that focuses on technology integration in physics practicum

CONCLUSION

Based on these findings, it can be concluded that the implementation of physics practicum in Banda Aceh City High School still requires improvement in several aspects, especially in terms of providing adequate laboratory facilities, additional laboratory staff support, and optimising time management. More targeted policies are needed to support the implementation of practicum in accordance with the demands of the Merdeka Curriculum, including standardisation of laboratory facilities and professional development of teachers in the integration of learning technology.

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