



Unpacking Physics Teachers' Perceptions of Assessment and the Challenges of Classroom Implementation: Insights from Bengkayang District, Indonesia

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Abstract: This study aims to analyze physics teachers' perceptions of assessment implementation in learning and to identify the challenges they face in state senior high schools in Bengkayang Subdistrict, Bengkayang Regency, West Kalimantan Province. A qualitative approach was employed through in-depth interviews and document analysis involving four physics teachers selected using purposive sampling. The data were analyzed using thematic analysis through the stages of data condensation, data display, and conclusion drawing and verification. The findings indicate that teachers have implemented various types of assessment, including diagnostic, formative, and summative assessments, through written tests, oral tests, quizzes, and practical activities. The findings also reveal a high level of teacher awareness regarding the importance of assessment in supporting student learning, as reflected in their efforts to integrate assessment throughout the learning process. However, limited instructional time and inadequate laboratory facilities remain the primary challenges to effective assessment implementation. To address these constraints, teachers adopted adaptive strategies, such as continuing assessment activities in subsequent class sessions and utilizing alternative learning media, including PhET Simulations. These findings suggest that the effectiveness of assessment implementation largely depends on teachers' ability to adapt to resource limitations while maintaining the quality of the assessment process.

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Introduction

Physics learning at the senior high school (SMA) level requires students not only to understand scientific concepts but also to be able to apply that knowledge in real-life contexts (Sari & Wulandari, 2022). To achieve optimal learning objectives, assessment becomes an essential component that cannot be separated from the learning process. Assessment in physics learning functions to measure the development of students' understanding and skills and serves as a basis for teachers in making subsequent instructional decisions (Rahayu, Wiyarsi, & Prasetyo, 2020).

Assessment in physics learning encompasses several functions, such as assessment of learning, assessment for learning, and assessment as learning. These three functions complement one another in providing a complete picture of students' achievement and learning needs (Dufresne & Gerace, 2004). Through assessment, teachers can determine students' initial knowledge, skills, and attitudes and adjust learning strategies to be more targeted (Balakrishnan, 2021).

However, assessment practices in the field still face various challenges. A number of studies have shown challenges in assessment practices carried out by physics teachers for



students. Sirait (2024) found that teachers had difficulty developing assessment instruments aligned with learning objectives and recommended the use of Evidence-Centered Design (ECD) and the Three-Dimensional Learning Protocol (3D-LAP) to improve assessment validity.

In addition, Agustina et al. (2021) found that although teachers had implemented various types of assessment for students, including project, performance, and portfolio assessment, many of these forms were not yet optimal due to time constraints, instrument planning issues, and differences in student ability. These findings confirm that teachers' perceptions of the types, forms, and obstacles of assessment strongly determine the success of its implementation.

Teachers' perceptions of assessment greatly influence how they design and carry out the assessment process in learning. Teachers with positive perceptions of assessment tend to be more creative and reflective in selecting and developing assessment instruments suited to students' characteristics and needs (Black & Wiliam, 2009). Teacher reflection on assessment practice is essential to improve the quality of assessment and ensure that it genuinely measures student competence. In addition, innovation and creativity in designing assessments can help accommodate students' diverse learning styles, making learning more effective and meaningful (Brookhart, 2011).

Although various studies have examined the implementation of assessment in physics learning, research that explores physics teachers' perceptions in depth remains limited, particularly in areas with specific geographical characteristics such as Bengkayang Subdistrict. Therefore, this study aims to answer the question of how physics teachers perceive the implementation of assessment in physics learning at state senior high schools in Bengkayang Subdistrict. The main focus of this study is on how teachers understand, respond to, and implement assessment in learning practice, as well as the factors that shape these perceptions, including experience, training, and the challenges faced (Putri & Rahmawati, 2023)

This study offers novelty by examining teacher perceptions in a local context that has not been widely studied, namely state senior high schools in Bengkayang Subdistrict. Unlike previous studies that have focused on the effectiveness of specific assessment design frameworks, such as Evidence-Centered Design (ECD) and the Three-Dimensional Learning Protocol (3D-LAP) (Sirait, 2024), this study fills that gap by offering a deeper, contextual portrait of teachers' psychological readiness and the systemic barriers they encounter when implementing assessment in an urban/sub-urban region, approached qualitatively so as to foreground teachers' own lived perceptions rather than the technical effectiveness of a particular assessment instrument. Accordingly, this study seeks to provide an in-depth understanding of teachers' viewpoints on the role and function of assessment. The results of this analysis can serve as a basis for developing more contextual training and policies to improve the quality of physics learning in schools (Lin & Luo, 2023; Klenowski & Wyatt-Smith, 2019).

Specifically, this study aims to (1) describe physics teachers' perceptions of the function and forms of assessment implemented in their classrooms, and (2) identify the challenges they face and the adaptive strategies they use to implement assessment under resource-limited conditions. This study is limited to the perspective of teachers as assessment practitioners, without evaluating student learning outcomes or developing new assessment instruments. Thus, this study is expected to contribute to understanding the dynamics of assessment implementation from the teachers' perspective and to offer practical



recommendations for improving the quality of physics assessment at the senior high school level.

Research Method

This study uses a descriptive qualitative approach to explore physics teachers' perceptions of assessment in physics learning at state senior high schools in Bengkayang Subdistrict, covering their understanding, implementation, and the factors that shape these perceptions (Rahayu, Wiyarsi, & Prasetyo, 2020).

The research subjects consisted of four physics teachers from state senior high schools in Bengkayang Subdistrict, Bengkayang Regency, West Kalimantan Province, selected through purposive sampling (Creswell & Poth, 2018), based on active teaching status in Bengkayang Subdistrict and variation in teaching experience (3–26 years), educational background, and Kurikulum Merdeka assessment certification status, so as to capture a broad range of perspectives on assessment practice. The informants' identities were disguised using initials (T1–T4) to protect their privacy in accordance with research ethics (Sugiyono, 2019). Data were collected through semi-structured in-depth interviews lasting 45–60 minutes per informant, using an interview guide that had been validated by experts. A summary of the informants' demographic characteristics is presented in Table 1.

Table 1. Demographic Characteristics of Informants

Informant Code	Gender	Teaching Experience (Years)	Educational Background	Certification Status
T1	Male	20	Physics Education (S1)	Certified
T2	Male	26	Engineering (S1)	Certified
T3	Male	10	Physics Education (S1)	Certified
T4	Male	3	Pure Physics / Natural Sciences (S1)	Not yet certified

The interview data were analyzed using Miles, Huberman, and Saldaña's (2019) thematic analysis technique: data condensation (verbatim transcription, coding, and categorization into three major themes the function, forms, and obstacles/solutions of assessment), data display (organizing coded data into tables and diagrams to reveal patterns), and conclusion drawing/verification (interpreting the displayed data against relevant theory). Data validity was maintained through source triangulation cross-checking interview results against assessment documents such as lesson plans and instruments and member checking with the informants.

This study began by developing a semi-structured interview guide containing questions about assessment implementation. Interviews were conducted with physics teachers as the main informants. In addition, the researcher also analyzed documents, such as lesson plans (RPP) and assessment instruments mentioned by informants during the interviews. The purpose of the document analysis was to strengthen the interview results and assess the alignment between assessment planning, implementation, and evaluation (Lestari, 2020). The document analysis process included collection, classification, content analysis, and data interpretation.

This method was used to obtain a comprehensive picture of assessment practices in physics learning, while also serving as a form of triangulation to increase data validity (Sugiyono, 2019). Next, data reduction was carried out to summarize and focus on information relevant to the research objectives (Rijali, 2018). The procedure included: (1) summarizing the data, including transcribing interviews and identifying relevant information;

(2) coding, grouping data based on similarity of meaning; and (3) theme searching, namely identifying patterns and grouping data into major themes.

The next stage was presenting the data in tabular form so that the information was systematically organized and easier to draw conclusions from (Creswell, 2018). Finally, conclusions were drawn through an ongoing process of verification and evaluation to ensure that the research results were valid and accountable (Huberman & Saldaña, 2019).

Results and Discussion

The results of this study were obtained through data collection techniques involving interviews and related documents from four physics teachers at state senior high schools in Bengkayang Subdistrict. Based on the interviews and document analysis conducted, three key points were identified: (1) the function of assessment, (2) the forms of assessment, and (3) the obstacles and solutions in implementing assessment. An overview of the research results can be seen in the figure below.

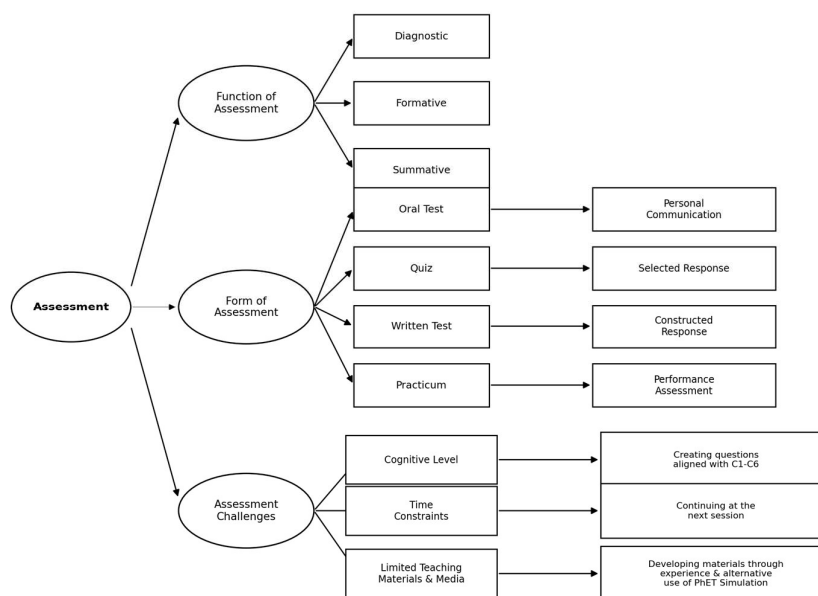


Figure 1. Functions, Forms, Obstacles, and Solutions in Teachers' Perceptions

Figure 1 above summarizes the research results obtained through interviews and document analysis with the four physics teachers. These findings form the basis for further discussion of the functions, forms, obstacles, and solutions in assessment implementation according to teachers' perceptions. The interview results with the four physics teachers show that diagnostic assessment has become an integral part of their lesson planning. All teachers stated that this assessment is conducted before core instruction begins, aiming to identify students' prior knowledge and map potential difficulties in understanding the material (Ardiansyah et al., 2023). Teacher G1 stated,

"Before new material, I give a pre-test to see how well the students already understand the topic I am about to teach."

a. Asesmen Diagnostik

Asesmen ini untuk mengetahui pengetahuan awal siswa tentang konten yang akan dipelajari:

No	Tujuan Pembelajaran	Asesmen Diagnostik	Jawaban	Skor
1.	Peserta didik dapat menjelaskan pengertian dan karakteristik gelombang bunyi	Perhatikan gambar berikut ini!  Ketika HP dalam mode getas, dapatkah terdengar oleh telinga kita? Dari peristiwa tersebut, menurut Anda apa itu gelombang bunyi?	Dari gambar yang diberikan, yaitu gambar HP tergetas, ketika HP berada dalam mode getas, suara atau bunyi tidak dapat terdengar oleh telinga kita secara langsung. Mode getas pada HP berarti bahwa HP menghasilkan gelombang mekanik yang merambat melalui perantara itu sendiri, menyebabkan getaran pada perantara tersebut. Gelombang bunyi adalah gelombang mekanik yang merambat melalui medium, seperti udara, air, atau benda padat. Gelombang bunyi dihasilkan ketika ada perubahan tekanan atau getaran pada medium tersebut. Ketika gelombang bunyi mencapai telinga kita, gelombang ini menyebabkan getaran pada gendang telinga dan diubah menjadi sinyal elektrik yang diteruskan ke otak melalui saraf pendengaran, yang kemudian kita interpretasikan sebagai suara. Dalam kasus HP dalam mode getas, meskipun ada getaran mekanik yang dihasilkan oleh HP, getaran tersebut tidak cukup kuat atau berfrekuensi rendah sehingga tidak dapat diteruskan oleh telinga kita sebagai suara. Sehingga meskipun HP bergetas, tidak ada suara yang dihasilkan atau terdengar oleh telinga kita, kecuali jika kita merambatkan	15

Figure 2. Implementation of Diagnostic Assessment on the Topic of Sound Waves

As shown in Figure 2, the diagnostic assessment document on the topic of Sound Waves displays a structure and syntax indicating a systematic assessment process. This practice shows that teachers do not merely implement assessment as a formality but use it as a reflective tool for designing adaptive learning strategies. This finding is consistent with Dwi Suprapti & Ridho (2024), who state that diagnostic assessment in the Merdeka Curriculum allows teachers to assess students' readiness through a systematic document structure, thereby supporting teachers' reflective steps in designing adaptive and relevant learning strategies. The four teachers' shared view that pre-test-style diagnostic assessment is an integral, non-negotiable step before instruction begins reflects the core demand of the Merdeka Curriculum for learning to start from students' actual readiness rather than a uniform starting point. This local practice also resonates with Black and Wiliam's (2009) Assessment for Learning (AfL) theory, in which eliciting evidence of learners' current understanding is treated as the entry point of a continuous feedback loop between teacher and student, rather than a one-off diagnostic exercise. Read together, G1's pre-test practice illustrates how a global AfL principle is being enacted, in an adapted and resource-conscious form, within a local Bengkayang classroom.

After understanding students' initial condition through diagnostic assessment, the next step taken by teachers is to implement formative assessment to continuously monitor learning progress. This takes various forms, such as question-and-answer sessions, discussions, and written assignments aimed at providing feedback to improve and enhance students' learning process (Anggraena et al., 2022). Teacher G2 stated,

"For formative assessment, I conduct it individually during the learning process, observing how well the students understand the material..."

2. Peserta didik hanya mampu menyebutkan 2 nama alat ukur, maka mendapatkan skor 15.	
3. Peserta didik hanya mampu menyebutkan 1 nama alat ukur, maka mendapatkan skor 10.	
4. Peserta didik belum mampu menyebutkan nama alat ukur, maka mendapatkan skor 5.	
SKOR TOTAL	100

ASESMEN FORMATIF

Asesmen ini berupa penilaian diri (refleksi dan umpan balik) serta keterampilan proses dalam melakukan percobaan dan menyelesaikan LKPD. Asesmen ini dilakukan saat pembelajaran sedang berlangsung hingga akhir pembelajaran.

I. PENILAIAN DIRI (REFLEKSI DAN UMPAN BALIK)

PERTANYAAN	JAWABAN
Apakah kamu sudah memahami tentang konsep pengukuran yang tepat?	
Dapatkah kamu menyebutkan macam-macam alat ukur beserta kekurangannya?	
Sudahkah kamu mengetahui arti pentingnya dilakukan pengukuran berulang?	
Menurutmu apa yang harus dibenahi dalam pembelajaran kita berikutnya?	

Figure 3. Formative Assessment Document Using a Student Worksheet (LKPD)

Figure 3 shows the student worksheet (LKPD) used as a formative assessment instrument, confirming that this assessment is carried out systematically and continuously. In line with research by Halimah & Nugroho (2021), the Student Worksheet (LKPD) is one of the effective instruments used to support formative assessment in competency-based learning. Meanwhile, according to the perceptions of the four teachers, summative assessment is conducted at the end of a unit, chapter, or semester. Its forms include daily tests, the End-of-Semester Assessment (PAS), and the End-of-Semester Examination (UAS) (Wulandari & Santoso, 2020). Teacher G4 stated,

“Meanwhile, summative assessment is carried out during the End-of-Semester Examination...”

c. Asesmen Sumatif

Sumatif akan dilakukan untuk mengetahui ketercapaian tujuan pembelajaran.

No	Tujuan Pembelajaran	Penyusunan	Penyusunan	Uraian	Skor
1.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	12

ASESMEN SUMATIF BARIAN

No	Tujuan Pembelajaran	Penyusunan	Penyusunan	Uraian	Skor
1.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	Penyusunan materi, penyusunan materi yang siap belahan, serta penyusunan materi yang siap belahan.	12

Figure 4. Sound Waves Test Item – Summative Assessment

Evidence in the form of an end-of-semester exam item on the topic of sound waves (Figure 4) shows that summative assessment is designed to comprehensively evaluate competency mastery. This view is also reinforced by Wulandari & Santoso (2020), who emphasize the function of summative assessment in comprehensively evaluating students' learning achievement.

In implementing these three functions of assessment, it was found that physics teachers at state senior high schools in Bengkayang apply a variety of assessment forms based on the theoretical framework of Stiggins (2005), which divides assessment forms into four categories: (1) *selected response*, (2) *constructed response*, (3) *performance assessment*, and (4) *personal communication*. These four categories are applied adaptively according to the characteristics of the material and learning objectives (Sari & Sujito, 2023). The personal communication form is implemented through oral tests used to explore both initial and in-depth understanding, particularly for conceptual topics. Teacher G1 stated,

“For conceptual material such as the theory of relativity, I mostly use oral tests...”

Apersepsi	
6.	Guru memberikan pertanyaan dengan mengaitkan materi sebelumnya dengan materi yang akan diajarkan pada pertemuan sebelumnya

9 | Modul Ajar Gelombang Bunyi

Motivasi	
7.	Guru menggali pengetahuan dasar peserta didik mengenai gerak lurus pertanyaannya “Bagaimana suara yang terdengar di telinga kita ketika sirine ambulans yang sedang bergerak mendekati kita dan menjauhi kita?”

Figure 5. Implementation of Oral Assessment



An excerpt from the teaching module showing an apperception activity based on oral assessment (Figure 5) supports the fact that oral assessment has been incorporated into lesson planning. This is consistent with the findings of Black & Wiliam (2018), which show that oral assessment is effective in developing students' scientific communication skills. In addition, quizzes are also a form of assessment frequently used to review students' understanding outside the classroom (Sari & Wulandari, 2022). The *selected response* form is implemented through quizzes in the form of multiple-choice questions administered online using the Quizizz platform. Teacher G3 stated,

"I use quizzes, and the students complete them at home."

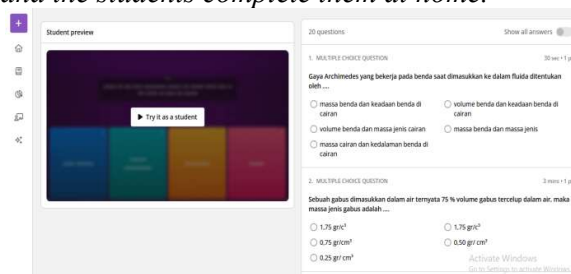


Figure 6. Quiz Question – Archimedes' Principle

The quiz question on Archimedes' Principle (Figure 6) shows that this assessment is used as independent practice. Research by Sari and Saputra (2018) states that quizzes can improve material retention. In addition, to measure in-depth conceptual understanding, physics teachers also rely on written tests as an evaluation instrument, particularly for material that involves calculations and in-depth analysis, applying the constructed response format, in which students independently compose answers in the form of short answers or essays (Dharmawati et al., 2016). Teacher G1 stated,

"For material that involves calculations, I mostly use written tests."

Permasalahan:

"Seorang peserta, Budi, sedang mempersiapkan diri untuk mengikuti tantangan tersebut. Berat badan Budi dan sepedanya adalah 80 kg, dan ia dapat mencapai kecepatan maksimum 10 m/s di lintasan lurus. Bantalan yang digunakan memiliki kemampuan untuk memberikan gaya sebesar 400 N. Budi ingin tahu berapa lama waktu yang diperlukan untuk menghentikan sepeda setelah menabrak bantalan tersebut. Bagaimana Budi dapat menghentikan sepedanya dalam waktu sesingkat mungkin setelah menabrak bantalan?"

Jawab:

Activate

Figure 7. Written Test Assessment (Impulse and Momentum)

The teaching module on the topic of Impulse and Momentum (Figure 7) shows a numerical fill-in question format. Written tests are the evaluation method most frequently used to measure students' cognitive knowledge. These tests may take the form of multiple-choice, essay, or short-answer questions that measure conceptual understanding in a systematic and structured way (Arikunto, 2012)

Furthermore, to complement the assessment of cognitive aspects through written tests, teachers also use performance-based assessment through project assignments and practicums to measure students' scientific process skills. This is particularly applied to material requiring mastery of measurement techniques and optical concepts, allowing teachers to assess students' ability to apply concepts practically and to develop scientific skills comprehensively (Dewi, Arsyad, & Khaeruddin, 2019), as stated by Teacher G4,



“For material that requires practical skills such as measurement, I use performance assessment through practicums.”



Figure 8. Practicum Video – Optics Topic (Mirrors)

Video documentation of students' practicum work (Figure 8) shows students' active involvement in the experiment. This form of assessment is relevant for measuring the practical application of knowledge in real-life contexts (Kurniawan & Putra, 2020). Performance assessment is highly compatible with project-based learning approaches that emphasize 21st-century skills.

In practice, the implementation of these various forms of assessment does not always run smoothly. Physics teachers face several obstacles that affect the effectiveness of assessment implementation. The most dominant obstacle is limited time, especially in implementing formative assessment, which requires active involvement throughout the learning process (Sari & Wulandari, 2022). Teacher G3 stated, “If the allocated time is not enough..., I usually give extra time or ask students to complete it as homework.”

This solution is also applied by other teachers, such as postponing the assessment or shifting it to homework. This is consistent with the Ministry of Education, Culture, Research, and Technology (2022), which shows that time constraints are a major inhibiting factor in the optimal implementation of formative assessment, resulting in less-than-maximal quality of feedback and reflection on assessment results. Another obstacle that arises is limited resources. In addition, limited equipment and teaching materials in the physics laboratory significantly affect the effectiveness of practicums, making teacher creativity in designing simple practicums an important solution for overcoming this obstacle (Hidayat & Sari, 2021). Teacher G3 stated that when equipment is unavailable, they use alternatives such as digital simulations or simple tools. They stated,

“I have to be creative by using digital simulations such as PhET or designing simple practicums...”

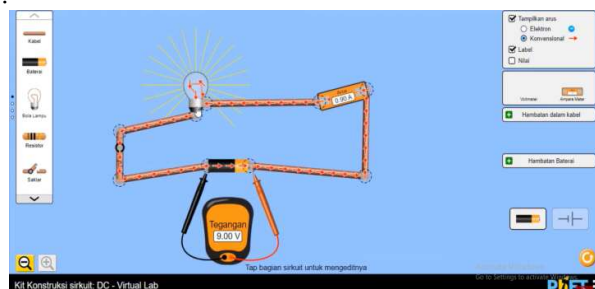


Figure 9. Alternative Use of the PhET Virtual Lab Simulation

Teachers also provided evidence of using a virtual laboratory with a PhET simulation on the topic of Ohm's Law (Figure 9). According to Putri and Hidayat (2022), digital



simulations such as PhET are an effective virtual practicum solution for supporting interactive learning and making the visualization of physics concepts more concrete. Overall, the obstacles faced did not prevent teachers from implementing assessment. Instead, they demonstrated adaptive and reflective efforts to continue implementing assessment optimally, whether in the form of oral, written, or performance-based assessment (Halimah & Nugroho, 2021).

Conceptually, this study extends Black and Wiliam's (2009) Assessment for Learning framework by showing how its core principles are adapted by teachers under real resource constraints in a sub-urban Indonesian setting, rather than under the ideal conditions typically assumed in the theoretical literature. Diagnostic, formative, and summative assessment appear here not as discrete, sequential procedures but as a continuously adapted cycle in which teachers reallocate time, substitute media (e.g., PhET simulations), and improvise instruments in response to constraints. Assessment theory in physics education thus needs to more explicitly account for teacher agency and resourcefulness as a mediating factor between assessment design and implementation.

Practically, the informants' profiles (Table 1) show variation in teaching experience (3–26 years), educational background, and certification status, with one of the four teachers not yet certified. This suggests that adaptive assessment capacity may not be evenly distributed among physics teachers, pointing to a practical need for peer mentoring between less-experienced and veteran teachers and for targeted Kurikulum Merdeka assessment training for as-yet-uncertified teachers.

Conclusion

This study confirms that the perceptions and understanding of physics teachers at state senior high schools in Bengkayang Subdistrict regarding the role and function of assessment are reflected in the implementation of diagnostic, formative, and summative assessment through various forms of assessment, namely personal communication, *selected response*, *constructed response* and *performance assessment*, covering cognitive, skill, and attitude aspects. In its implementation, teachers face obstacles in developing instruments based on the revised Bloom's Taxonomy and limited learning facilities; however, teachers demonstrate adaptive capacity through innovation and the use of alternative resources. These findings therefore provide an empirical basis for developing more contextual assessment training and policies that are responsive to local needs.

Recommendation

Based on the research results, several follow-up recommendations are proposed. Physics teachers are encouraged to continue developing low-cost alternatives to formal laboratory practicums (e.g., PhET simulations, simplified demonstrations) and to share these practices through peer mentoring, particularly with less-experienced or as-yet-uncertified colleagues. School principals are encouraged to allocate dedicated time for formative assessment and to facilitate access to digital tools for virtual laboratory simulations, so that time and facility constraints do not fall solely on individual teachers. The Education Office is encouraged to prioritize Kurikulum Merdeka assessment training and certification for teachers who have not yet received them, and to address the uneven distribution of laboratory facilities across geographically dispersed subdistricts such as Bengkayang. Finally, future researchers are encouraged to involve the Education Office or school supervisors to obtain



more comprehensive access to assessment documents, and to consider a larger or more geographically varied sample.

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