International Journal of Community Care of Humanity (IJCCH)
Vol 4, No. 4, April 2026 , pp. 78-93

STRENGTHENING CONTEXT-BASED HOTS ASSESSMENT IN SCIENCE LEARNING UNDER THE MERDEKA CURRICULUM

Evita Anggereini[1],Afreni Hamidah[1], Harlis[1], Upik Yelianti[1], Retni S Budiarti[1], Ria Inriyana[2], Suryani[3], Maya Lestari[4], Leni Maszura[4]

[1] Department of Mathematics and Natural Sciences Education, Faculty of Teacher Training and Education, University of Jambi
Jalan Jambi-Muara Bulian KM. 15, Mendalo Indah, Kecamatan Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi - Indonesia
[2]Universitas Pendidikan Indonesia, Jawa Barat - Indonesia
[3]Universitas Adzkia, Sumatra Barat - Indonesia
[4]Universitas Malikussaleh, Aceh - Indonesia

*Corresponding Author: evita.anggereini@unja.ac.id

Article history:

Received: April 2026
Revised: April 2026
Accepted: April 2026

ABSTRACT This study explores the implementation of contextual higher-order thinking skills assessment in science learning within the Merdeka Curriculum and aims to strengthen teachers' competence in designing and applying authentic assessments. The work was conducted through a community empowerment program involving science teachers from Muaro Jambi, who participated in a series of workshops, training sessions, and guided practice on assessment design. Using questionnaires, interviews, and analysis of teachers' assessment practices, the study identified key challenges across all stages of assessment, including planning, implementation, reporting, reflection, and the integration of digital tools. The results show that teachers still face difficulties in understanding project-based assessment, formulating higher-order thinking questions, managing time, and facilitating students with low literacy and limited digital readiness. The workshop program successfully improved teachers' knowledge of assessment concepts, strengthened their ability to develop contextual higher-order thinking questions, and increased their confidence in applying diagnostic, formative, and project assessments. Teachers also reported greater awareness of the importance of reflection, feedback, and the use of assessment results to improve learning. The study concludes that continuous professional development, technical guidance, and adequate school support are essential to optimize assessment implementation in the Merdeka Curriculum. It is recommended that future programs include more targeted training, extended mentoring, and improved digital infrastructure to ensure that teachers can design and implement high-quality assessments that promote deeper scientific understanding and meaningful learning.

KEYWORDS: *Assessment; Contextual Learning; Higher-Order Thinking Skills; Merdeka Curriculum; Science Education.*

1. INTRODUCTION

The Merdeka Curriculum is described as an evaluative refinement of the 2013 Curriculum. The Ministry of Education and Culture states that the Merdeka Curriculum provides diverse intracurricular learning, enabling learning content to be optimized so that students have sufficient time to deepen concepts and strengthen skills. Teachers are free to choose various teaching resources to tailor instruction to students' needs and interests(Makrif et al., 2023; Muzharifah et al., 2023; Suwandi et al., 2023). Projects designed to strengthen the Pancasila Student Profile are developed based on government-determined themes (Khasanah & Muthali'in, 2023; Simarmata et al., 2022). These projects are not directed toward achieving specific learning objectives and therefore are not bound to subject-matter content.

To improve the quality of learning outcomes, teachers must consider all aspects related to the learning process, including the assessment of student learning outcomes. When assessment is implemented effectively and validly, the resulting outputs will be of high quality (Hasanah et al., 2020; Rini et al., 2023; Zakirman et al., 2023). However, in reality, most teachers have not yet implemented learning assessment optimally. This is due to teachers' limited ability to utilize the *Merdeka Mengajar* platform and leverage technology to study and understand the Merdeka Curriculum (Sobri et al., 2023; Susanti et al., 2023). Survey results among biology teachers indicate that assessment-related challenges arise due to the lack of socialization and training provided to teachers. Such socialization efforts are limited, often only conducted in selected schools or Sekolah Penggerak, resulting in teachers having insufficient literacy, references, and knowledge regarding Merdeka Curriculum assessments.

There are three types of assessment in the Merdeka Curriculum: diagnostic, formative, and summative assessments (Darwin et al., 2023; Marfuah et al., 2023; Purwanto, 2024). **Diagnostic assessment** is conducted specifically to identify students' competencies, strengths, and weaknesses, allowing instruction to be designed according to their needs and conditions(Budiono & Hatip, 2023; Firmanzah & Sudibyo, 2021; Tanggur, 2023). Diagnostic assessment helps identify students' strengths and weaknesses (Junaidah et al., 2023). Once teachers understand the sources of students' difficulties, they can design appropriate instruments for subsequent lessons. In practice, diagnostic assessment may take the form of written or oral tests, observation sheets, interview guides, or homework tasks, and can be interpreted as an activity of interpreting measurement data (Firmanzah & Sudibyo, 2021). In planning and implementing formative and summative assessments, a growth mindset is needed so that students develop the awareness that the process of achieving learning goals is more important than merely the final result. Based on their functions, assessments consist of assessment *as learning*, assessment *for learning*, and assessment *of learning* (Faujiah et al., 2024).

Assessment or evaluation in the Merdeka Curriculum is also a crucial aspect of its implementation in schools. Learning evaluation in the Merdeka Curriculum emphasizes the assessment of learning processes (Ardianti & Amalia, 2022). The Ministry of Education, Culture, Research, and Technology explains that learning evaluation in this curriculum consists of diagnostic, formative, and summative aspects.

Formative assessment aims to monitor and improve the learning process and evaluate the attainment of learning objectives (Berliana & Atikah, 2024; Paramansyah et al., 2023). It is used to identify students' learning needs, obstacles, and difficulties, as well as to gather information on their progress. This information serves as feedback for both students and teachers (Hasmawati & Muktamar, 2023). Summative assessment at the primary and secondary education levels aims to measure students' attainment of learning objectives or CP (learning competencies) as the basis for determining grade promotion or graduation. Students' learning outcomes are evaluated by comparing their performance with predetermined achievement criteria (Purwanto, 2024).

Therefore, socialization efforts are needed through community service activities (PKM) related to the **Development of Digital Assessments for Project-Based Learning and Projects Strengthening the Pancasila Student Profile in the Merdeka Curriculum for Junior High Schools**, specifically for the MGMP Cluster 1 Science Teachers in Muaro Jambi District.

Based on observations and interviews conducted with biology teachers—particularly members of MGMP Cluster 1 Science Teachers in Muaro Jambi—teachers reported difficulties adapting to the implementation of the Merdeka Curriculum due to inadequate facilities and technology that hinder effective and efficient instructional activities. The implementation of the Merdeka Curriculum inevitably brings significant changes for teachers and school personnel in terms of instructional administration, learning strategies and approaches, teaching methods, and even learning assessment processes. Challenges include limited literacy, reference materials, digital access, teacher competencies, and time management. Given these conditions, the recommended solution for improving teachers' knowledge and skills in developing digital assessments is to conduct a workshop. The goal is to enhance teachers' capacity to design and develop digital assessments.

This community service activity aims to (1) increase teachers' knowledge in designing digital assessments for project-based learning and Pancasila Student Profile strengthening projects; (2) improve teachers' skills in designing such assessments; and (3) support teachers in applying digital assessments within these learning contexts. The activity provides significant benefits by helping teachers develop assessments through enhanced knowledge and skills in designing digital assessments for project-based instruction. With improved competence, teachers can optimize digital

tools to conduct daily assessments, midterm exams, final-term exams, and school examinations. It is expected that teachers' abilities will continue to improve and develop over time.

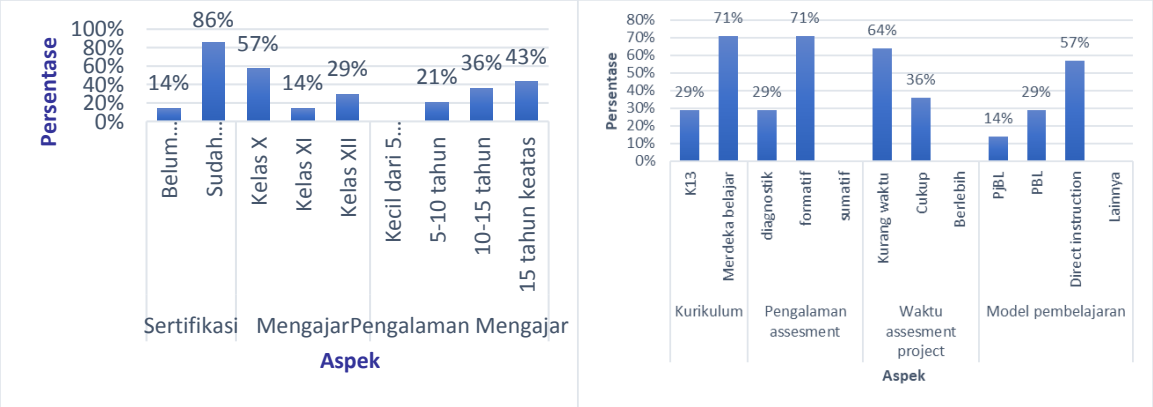
2. METHOD

The participants of this workshop were biology teachers from public junior and senior high schools (SMPN and SMAN IPA) in Muaro Jambi Regency. The resource persons consisted of expert lecturers from Jambi University who provided the teachers with knowledge and skills in designing online assessments based on the topics assigned to them. The community service program was conducted at SMP Negeri 6, MGMP Cluster 1 Science, Muaro Jambi Regency. The activity was carried out over a period of two months, starting from the planning stage to the production of the digital assessment products. Each design was evaluated and revised to obtain improved outcomes.

This activity took the form of a training workshop involving biology teachers who are members of the MGMP at SMP Negeri 6, MGMP Cluster 1 Science, Muaro Jambi Regency. The teachers were provided with knowledge about the Merdeka Curriculum, the 21st-century learning paradigm, and the importance of assessment in the learning process. Thus, the method of this activity consisted of three components: theoretical orientation and conceptual briefing, practice in designing assessments, and development of digital-based assessment items.

3. RESULT AND DISCUSSION

This results section presents the key findings related to the implementation of contextual-based HOTS assessment strengthening in science learning under the Merdeka Curriculum by the MGMP Science teachers in Muaro Jambi Regency. The data were collected through questionnaires, graphical analysis, and summaries of teachers' responses across various aspects of the assessment process, including planning, implementation, scoring, reflection, and technology integration. Graph 1 and Graph 2 illustrate the teacher profiles, while Tables 1 through 8 contain teachers' problems, challenges, and suggestions regarding the implementation of HOTS-based assessment in the Merdeka Curriculum. These findings serve as a foundation for understanding the actual conditions in the field and for determining strategic steps to strengthen the competency of MGMP teachers in developing and applying assessments that align with the demands of the Merdeka Curriculum.



Graph 1. Percentage of MGMP Teacher Data Cluster 1 Science

Based on the questionnaire results regarding the experiences of MGMP Science teachers in Muaro Jambi Regency, 86% of the teachers reported that they were certified, while 14% were not yet certified. The data also show that 21% of teachers have 5–10 years of teaching experience, 36% have 10–15 years of experience, and 43% have more than 15 years of teaching experience. Teaching experience is an essential factor influencing teachers' performance in carrying out their instructional duties (Wiranti, 2021). It also serves as an important foundation that supports teachers in maximizing their abilities during the learning process in the classroom (Rizal & Kurniasari, 2023). A teacher's teaching experience can be viewed from the length of time they have been teaching (Rahmawati et al., 2021).

The data further indicate that 57% of MGMP Cluster 1 Science teachers in Muaro Jambi Regency teach Grade X, 14% teach Grade XI, and 29% teach Grade XII. Regarding curriculum implementation, 29% of the teachers work in schools that still use the 2013 Curriculum (K13). This curriculum is implemented in four schools: SMPN 7 Muaro Jambi, SMPN 17 Muaro Jambi, SMPN 47 Muaro Jambi, and SMPN 30 Muaro Jambi. Meanwhile, 71% of the teachers teach at schools implementing the Merdeka Curriculum, namely SMPN 7 Muaro Jambi, SMPN 15 Muaro Jambi, SMPN 1 Muaro Jambi, SMPN 11 Muaro Jambi, SMPN Satu Atap Danau Sarang Elang, SMPN 6 Muaro Jambi, SMPN 18 Muaro Jambi, and SMPN 30 Muaro Jambi. Two schools—SMPN 7 Muaro Jambi and SMPN 30 Muaro Jambi—implement both curricula simultaneously.

With regard to instructional models applied by MGMP Cluster 1 Science teachers, 14% use the Project-Based Learning (PjBL) model, 29% use the Problem-Based Learning (PBL) model, and 57% use the direct instruction model. These findings indicate that many teachers still rely on direct teaching, while relatively few have implemented project-based or problem-based learning models.

In terms of assessment practices, 29% of MGMP Cluster 1 Science teachers reported using diagnostic assessments, while 71% use formative assessments. Diagnostic assessment is a component of the Merdeka Curriculum aimed at identifying students' characteristics, competencies, strengths,

weaknesses, and learning profiles, allowing instruction to be designed according to students' needs and abilities (Hendayani et al., 2023; Maut, 2022). Formative assessment aims to monitor and improve the learning process as well as evaluate students' achievement of learning objectives (Aulia et al., 2024; Putri & Zakir, 2023). Regarding the implementation of project-based assessments in schools, 64% of MGMP Cluster 1 Science teachers in Muaro Jambi reported insufficient time availability, while 36% considered the available time adequate. Limited time has become a significant challenge in conducting assessments for project-based learning within the Merdeka Curriculum.

Interviews with junior and senior high school Science teachers in MGMP Muaro Jambi revealed several issues that arise in the assessment process, particularly in project-based assessments under the Merdeka Curriculum. The findings are categorized into five major areas: planning, implementation, scoring and reporting, reflection and follow-up, technology integration, and the development of HOTS questions.

1. Common Issues in the Implementation of Assessment

Teachers reported that the most dominant obstacle is students' low literacy and numeracy skills, which directly affect their ability to understand and respond to questions. In addition, the wide variation in students' cognitive abilities leads to differences in their comprehension of the material, resulting in many students not achieving mastery learning. Teachers also mentioned limited time, low student participation, and difficulties in designing stimulus questions as well as productive, imaginative, and open-ended assessments as significant challenges.

These interview findings align with both international and national studies showing that low literacy and numeracy levels are directly associated with students' performance in science assessments, while differences in cognitive abilities explain variations in academic achievement (Shi & Qu, 2022). Moreover, limited time and insufficient teacher training hinder the ability to design and implement effective formative assessments, including HOTS-oriented items (Marôco et al., 2024; Schildkamp et al., 2020).

2. Challenges in Planning Project-Based Assessment

In the planning phase of project-based assessment, teachers face various challenges stemming from both conceptual and technical limitations. Teachers reported difficulties in designing stimulus questions that can promote deep inquiry and higher-order thinking, a challenge also identified in recent studies showing that many teachers are not yet able to develop coherent and interconnected assessment components from learning objectives to instruments and scoring indicators (van der Steen et al., 2023). Recent research within the context of the Merdeka Curriculum likewise reveals that

teachers still lack understanding of Project-Based Learning (PjBL) concepts and its assessment mechanisms, including the development of project modules containing activity sequences, assessment criteria, and evaluation rubrics (Aditama et al., 2022).

These planning challenges are further compounded by students' lack of readiness for project-based learning, as many students have not yet mastered the collaborative and investigative processes that characterize PjBL. This aligns with recent literature emphasizing that the effectiveness of project assessment is strongly influenced by students' readiness to work independently, collaborate, and understand the authentic tasks assigned to them (Dewi et al., 2025; Holm, 2011). Moreover, contemporary studies also highlight that project assessment requires a systematic and multidimensional design from blueprinting to instrument and rubric development which teachers often struggle to master without specialized training (Nabilah et al., 2024). Teachers' limited knowledge of creative and authentic alternative assessment strategies, such as the use of digital media, further indicates that insufficient pedagogical capacity remains a major obstacle in planning project-based assessments (O'Rourke & Doyon, 2024). Thus, the findings of this study are consistent with recent literature underscoring that planning project-based assessment demands strong pedagogical competence, deep methodological understanding, and continuous professional training for teachers.

3. Kendala dalam Pelaksanaan Asesmen Berbasis Proyek

In the implementation of project-based assessment, many teachers reported that structural constraints such as limited time, insufficient teacher training, and students' lack of understanding of project mechanisms significantly hinder its effectiveness. These findings align with recent literature; for example, a multi-school study revealed that time management is a major obstacle in applying Project-Based Learning (PjBL), making it difficult for teachers to allocate sufficient time to provide intensive guidance or thoroughly assess students' project outcomes (Ukobizaba et al., 2025).

Addition, contextual studies in Indonesia indicate that the lack of teacher training in PjBL methods also serves as a key barrier, particularly regarding project design, facilitation, and adaptive assessment (Yulia & Syamsyurizal, 2025). This issue is further exacerbated when some teachers continue to rely on traditional approaches, making it challenging to maintain consistency in project assessment implementation consistent with literature noting that curriculum flexibility and professional support are essential for effective PjBL practice (Anggraeni et al., 2025). Moreover, students' activeness and readiness also play an important role: when students are unfamiliar with or do not fully understand their roles and responsibilities within a project, the assessment process becomes less effective. This is supported by findings that variations in students' skills and low

participation can hinder the achievement of key project-based learning outcomes, such as the development of creativity, collaboration, and deep conceptual understanding (Nadila et al., 2025).

Thus, your field findings are consistent with current literature showing that successful implementation of project-based assessment requires adequate time management, intensive teacher training, student readiness, as well as curricular adaptation and supporting resources—without which project assessment tends to be carried out only partially or suboptimally.

4. Processing and Reporting Assessment Results

In the stage of processing and reporting assessment results, teachers encountered various challenges related to both student readiness and teachers' capacity to apply the assessment standards of the Merdeka Curriculum. Many students were reported to lack adequate understanding of how to construct proper project reports, including organizing data, describing processes, and presenting findings in a systematic manner. This finding is consistent with recent studies showing that students' literacy in reporting and documentation within project-based learning remains low and requires gradual habituation. A 2024 study found that students often struggle to process project information and prepare reports aligned with academic formats, resulting in project reports that do not fully represent the learning process (O'Rourke & Doyon, 2024).

Time constraints also emerged as a major barrier in reporting project-based assessments. Recent research highlights that processing project assessment data requires significantly more time than traditional assessments particularly for verifying the authenticity of students' work, analyzing performance evidence, and conducting rubric validation (Ukobizaba et al., 2025). In the Indonesian context, these time limitations are compounded by teachers' need to balance regular teaching responsibilities with the more complex documentation requirements of the Merdeka Curriculum.

Beyond technical aspects, some teachers also reported difficulty in understanding project-based assessment reporting procedures aligned with Merdeka Curriculum standards. A 2025 national study revealed that teachers require targeted training and guidance to ensure that assessment results are reported consistently, accurately, and in accordance with the principles of competency-based formative and summative assessment (Anggraeni et al., 2025). Thus, the challenges in processing and reporting assessment results stem not only from student-related factors but also from teachers' limited understanding of the new procedures introduced under the Merdeka Curriculum. These findings underscore the need for strengthening teacher capacity and simplifying reporting guidelines to support more effective implementation of project-based assessment.

5. Reflection and Follow-Up of Assessment

In the reflection and follow-up stage of assessment, teachers in this study reported that low student scores and limited time were the main barriers to conducting in-depth reflection and designing appropriate follow-up actions. These findings align with the principle that assessment should not merely be conducted to obtain grades—assessment outcomes must be followed by teacher reflection to evaluate the effectiveness of instruction and adjust teaching strategies as needed.

As outlined in the assessment guidelines for the Merdeka Curriculum, reflection and follow-up are integral components of the learning and assessment cycle: teachers, students, and/or school leaders are expected to periodically evaluate assessment planning, implementation, and results in order to improve future learning processes (Efriani et al., 2024). However, teachers' reports indicate that many of them still do not fully understand the procedures for conducting assessment reflection. Teachers remain uncertain about how to determine indicators of success, identify appropriate follow-up actions, or document the results of reflection.

Time constraints further worsen the situation, as conducting reflection and planning follow-up actions require dedicated time both for reviewing instructional practices, discussing assessment outcomes, and planning improvement measures. When time is limited and workloads are high, reflection is often neglected. This phenomenon has been observed in school settings, where assessment without systematic reflection and feedback tends to become merely administrative data with little real contribution to improving learning quality.

Thus, the findings of this study indicate that without clear procedural understanding and adequate time allocation, the reflection and follow-up phase in project-based assessment is at risk of being carried out suboptimally ultimately hindering efforts to enhance the quality of learning and assessment in schools.

6. Technology Integration in Project-Based Assessment

Teachers also highlighted technical challenges, such as limited internet connectivity, inadequate ICT facilities at schools, and students' low proficiency in using computer devices. Some teachers further stated that they had not yet developed sufficient understanding of how to integrate technology effectively into the assessment process.

7. Development of HOTS-Based Assessment Items

In developing High Order Thinking Skills (HOTS)-based assessments, teachers encountered several challenges primarily related to their ability to formulate questions aligned with Bloom's taxonomy while still remaining comprehensible to students. Teachers reported difficulties in constructing questions that require analytical, evaluative, and creative thinking due to their limited

understanding of the characteristics of HOTS items and how to translate these into learning contexts. This finding is supported by recent studies showing that teachers still require intensive training to develop valid and rigorous HOTS-oriented items, particularly within curricula that emphasize higher-order thinking competencies (Lucas & Vandergon, 2024).

Students' low literacy levels and limited analytical abilities further complicate the implementation of HOTS items, as many students are not accustomed to processing complex information, connecting concepts, or providing logical reasoning for their answers. A 2023 study found that low literacy levels directly impact students' performance on evaluative and analytical questions, which are core components of HOTS competence (Liline et al., 2024).

Teachers also pointed out that developing HOTS items requires more time than constructing lower-level questions, as it involves the formulation of contextual scenarios, difficulty-level analysis, and the development of appropriate scoring rubrics. Recent research on the design of 21st-century skills assessments notes that crafting HOTS questions requires a more extensive structural process, including content validation and cognitive-level testing (Li et al., 2024). Additionally, students themselves still experience difficulties in analyzing HOTS items, particularly when the questions involve lengthy stimuli or authentic contexts requiring cross-conceptual understanding—an issue widely reported in HOTS diagnostic studies (Sitanggang & Syahputra, 2023).

Overall, the challenges teachers face in developing HOTS items highlight the need for enhanced pedagogical capacity, strengthened student literacy, and sustained professional development to ensure more effective implementation of HOTS-based assessments.

8. Teachers' Recommendations for Improving Assessment Quality

Most teachers in this study emphasized the need for advanced training in assessment design, particularly in project-based assessment and the development of HOTS items. Teachers perceived that improving assessment competence cannot be achieved without systematic coaching and mentoring from experts or experienced facilitators. This aligns with international research indicating that teacher professional development is a key factor in improving assessment quality, especially when schools implement competency-based curricula and project-based learning approaches (Darling-Hammond et al., 2017). Furthermore, a Scopus-indexed study shows that continuous assessment training programs significantly enhance teachers' abilities to design authentic instruments, understand cognitive taxonomies, and implement more reliable scoring rubrics (Schildkamp et al., 2020). In the national context, recent literature also affirms that the implementation of the Merdeka Curriculum requires teachers to master diagnostic, formative, and summative assessment models, as well as project-based and 21st-century skills assessments

competencies that are often lacking without intensive training support (Pusat Kurikulum dan Pembelajaran Kemendikbudristek, 2022). In line with this, other studies have shown that workshops and technical mentoring significantly improve the quality of HOTS assessment design and the effectiveness of project-based assessment practices (Paramartha & Dewi, 2021). Therefore, the recommendations provided by teachers in this study are well-founded and strongly aligned with the academic literature: continuous training, mentoring, and professional development are urgent priorities to ensure that teachers can produce more valid, high-quality assessments aligned with the demands of the Merdeka Curriculum.

The novelty of this study lies in its comprehensive mapping of the implementation of contextual HOTS assessment strengthening in science learning under the Merdeka Curriculum by integrating three data sources questionnaires, in-depth interviews, and assessment practice analysis which collectively capture the real conditions of MGMP science teachers in Muaro Jambi Regency. Unlike previous studies that tend to focus on a single aspect of assessment (such as item development or project implementation), this research identifies teachers' challenges holistically across planning, implementation, data processing, reflection, technology integration, and HOTS item development, directly linking them to the contextual demands of the Merdeka Curriculum.

This study also produces an updated empirical profile of teacher readiness, assessment competence gaps, and student preparedness for authentic project-based tasks findings that have rarely been reported in a focused manner at the MGMP community-of-practice level. Thus, this research offers a novel and holistic field-based evidence base that serves as a strategic foundation for designing training interventions and strengthening teachers' assessment competencies within a competency-based curriculum.

The findings of this study have direct implications for teacher competency development and the strengthening of the Merdeka Curriculum implementation, particularly in HOTS assessment and project-based assessment. Data showing significant gaps in planning, implementation, data processing, and reflection indicate that schools and local governments should prioritize more structured, continuous, and needs-based assessment training programs for MGMP teachers.

Additionally, findings on students' low literacy and limited readiness underscore the importance of reinforcing learners' foundational skills before implementing complex authentic assessments. Technical constraints such as limited ICT facilities, weak internet connectivity, and insufficient teacher understanding of technology integration also highlight the need for schools to improve basic infrastructure and provide relevant digital training to enable more effective project-based assessment practices.

Overall, this study provides a strong empirical basis for policymakers, school leaders, and MGMP groups to design targeted interventions for improving assessment quality in accordance with the demands of the Merdeka Curriculum.

4. CONCLUSION

The community empowerment activity aimed at strengthening teachers' competencies in designing and implementing contextual HOTS-based assessments in science learning has successfully achieved most of its set objectives. This is evidenced by the increased teacher understanding of assessment concepts, their ability to formulate HOTS items, and their awareness of the importance of diagnostic, formative, and project-based assessments within the Merdeka Curriculum. The empowerment methods employed—comprising training, mentoring, and MGMP discussions—proved well-suited to teachers' needs and challenges, particularly regarding limited assessment knowledge, time constraints, technology integration, and low student readiness.

The impact of the program is reflected in teachers' increased confidence in designing assessment instruments, their capacity to critically identify assessment issues, and the development of a commitment to implement assessments that are more authentic and competency-oriented. Long-term benefits include the reinforcement of a reflective culture, improved quality of science learning, and the creation of opportunities for sustained collaboration among teachers within the MGMP community. For future empowerment initiatives, it is recommended to provide more specific follow-up training, continuous technical mentoring, and school policy support in providing time, ICT facilities, and collaborative spaces, thereby further optimizing assessment quality under the Merdeka Curriculum.

ACKNOWLEDGMENT

The author would like to thank the MGMP IPA Muaro Jambi Regency, the participating teachers, and the school for supporting the implementation of activities and data collection in this study.

CONFLICT OF INTERESTS

The authors declare that they have **no conflicts of interest** related to the research, authorship, or publication of this article.

REFERENCES

Aditama, M. G., Shofyana, M. H., Muslim, R. I., Pamungkas, I., & Susiati, S. (2022). Peningkatan Kompetensi Guru dalam Project Based Learning melalui Temu Pendidik Daerah. *Buletin KKN Pendidikan*, *4*(1), 90–98. https://doi.org/10.23917/bkkndik.v4i1.18215

Anggraeni, I., Mulyanti, D., Marlina, T., & Rahmawati, A. (2025). A Systematic Literature Review : Model Pembelajaran Berbasis Proyek dalam Meningkatkan Hasil Belajar Siswa. *Jurnal Pendidikan Tambusai*, *9*(2), 22350–22360.

Ardianti, Y., & Amalia, N. (2022). Kurikulum Merdeka: Pemaknaan Merdeka dalam Perencanaan Pembelajaran di Sekolah Dasar. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *6*(3), 399–407. https://doi.org/10.23887/jppp.v6i3.55749

Aulia, R., Sulistiawan, M. J., Wagiran, & Naryatmojo, D. L. (2024). Rekontruksi Asesmen Formatif Modul Ajar Teks Deskripsi Bagi Siswa SMP di Era Merdeka Belajar. *Jurnal Onoma: Pendidikan, Bahasa, Dan Sastra*, *10*(1), 257–267. https://doi.org/10.30605/onoma.v10i1.3188

Berliana, D., & Atikah, C. (2024). Implementasi Asesmen Dalam Kurikulum Merdeka Di Pendidikan Anak Usia Dini. *Jurnal Citra Pendidikan*, *4*(1), 1545–1552.

Budiono, A. N., & Hatip, M. (2023). Asesmen Pembelajaran Pada Kurikulum Merdeka. *Jurnal Axioma : Jurnal Matematika Dan Pembelajaran*, *8*(1), 109–123. https://doi.org/10.56013/axi.v8i1.2044

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective Teacher Professional Development (A report prepared for the Learning Policy Institute.)* (Issue June). https://learningpolicyinstitute.org/sites/default/files/product-files/Effective_Teacher_Professional_Development_REPORT.pdf

Darwin, D., Boeriswati, E., & Murtadho, F. (2023). Asesmen Pembelajaran Bahasa Dalam Kurikulum Merdeka Belajar Pada Siswa Sma. *Lingua Rima: Jurnal Pendidikan Bahasa Dan Sastra Indonesia*, *12*(2), 25. https://doi.org/10.31000/lgrm.v12i2.8639

Dewi, C. A., Khafid, M., Widiarti, N., & Yuwono, A. (2025). Systematic Review of Problem Based Learning Student Worksheets for Developing Critical Thinking. *Indonesian Journal of Innovation Studies*, *26*(4). https://doi.org/10.21070/ijins.v26i4.1634

Efriani, A., Hamzah, R. A., Sari, R., Tirta, G. A. R., Utami, G. A. O., Yawan, H., Suhendi, Hayati, R. M. N., Zulaeha, O., Istamala, M. S., Mutaqin, A., Rahmawati, S., Persada, Y. I., Yansa, H., Janna, M., & Effendi. (2024). *Asesmen dalam Kurikulum Merdeka*. PT. Mifandi Mandiri Digital.

Faujiah, P. M., Shilvani, R., Amrina, T. I., Nirwan, A. F., & Hamidah, S. (2024). Analisis Penerapan Asesmen Pembelajaran Bahasa Indonesia di Kelas VII SMP Negeri 3 Baleendah. *Jurnal Belaindika :Pembelajaran Dan Inovasi Pendidikan*, *6*(1), 24–28.

Firmanzah, D., & Sudibyo, E. (2021). Implementasi Asesmen Diagnostik Dalam Pembelajaran Ipa Pada Masa Pandemi Covid-19 Di Smp/Mts Wilayah Menganti, Gresik. *Pensa E-Jurnal : Pendidikan Sains*, *9*(2), 165–170.

Hasanah, U., Edwita, & Januar, A. (2020). Pelatihan Pengembangan Digital Assesment Bagi Guru Sekolah Dasar Di Kepulauan Seribu. *BERNAS: Jurnal Pengabdian Kepada Masyarakat*, *1*(4), 338–346. https://doi.org/10.31949/jb.v1i4.448

Hasmawati, & Muktamar, A. (2023). Asesmen dalam Kurikulum Merdeka Perspektif Pendidikan

Agama Islam Institut Agama Islam As ' adiyah Sengkang. *Indonesian Journal of Innovation Multidisipliner Research*, *1*(3), 197–211.

Hendayani, S., Nurlaila, E., & Fitria, N. (2023). Kesiapan Guru Dalam Menyusun Asesmen Diagnostik Non Kognitif Peserta Didik Ditinjau dari Perspektif Psikologi. *Jurnal Pendidikan Tambusai*, *7*(3), 28139–28146.

Holm, M. (2011). PROJECT-BASED INSTRUCTION: A Review of the Literature on Effectiveness in Prekindergarten through. *InSight: RIVIER ACADEMIC JOURNAL*, *7*(2), 1–13. https://www.researchgate.net/publication/329000774_PROJECT-BASED_INSTRUCTION_A_Review_of_the_Literature_on_Effectiveness_in_Prekindergarten_through_12th_Grade_Classrooms

Junaidah, Ambiyar, Jalinus, N., Waskito, & Wulansari, E. (2023). Meta-Analisis Pengaruh Model Pembelajaran Problem Based Learning terhadap Hasil Belajar Peserta Didik SMK. *Jurnal PTI (Jurnal Pendidikan Teknologi Informasi)*, *10*(1), 48–54. https://doi.org/10.35134/jpti.v10i1.147

Khasanah, V. A., & Muthali'in, A. (2023). Penguatan Dimensi Bernalar Kritis Melalui Kegiatan Proyek Dalam Kurikulum Merdeka. *Jurnal Dimensi Pendidikan Dan Pembelajaran*, *11*(2), 172–180. https://doi.org/10.24269/dpp.v11i2.7100

Li, D., Fan, X., & Meng, L. (2024). Development and validation of a higher-order thinking skills (HOTS) scale for major students in the interior design discipline for blended learning. *Scientific Reports*, *14*(1), 1–20. https://doi.org/10.1038/s41598-024-70908-3

Liline, S., Tomhisa, A., Rumahlatu, D., & Sangur, K. (2024). The Effect of the Pjb-HOTS learning model on cognitive learning, analytical thinking skills, creative thinking skills, and metacognitive skills of biology education students. *Journal of Turkish Science Education*, *21*(1), 175–195. https://doi.org/10.36681/tused.2024.010

Lucas, K. L., & Vandergon, T. L. (2024). Science Identity in Undergraduates: A Comparison of First-Year Biology Majors, Senior Biology Majors, and Non-STEM Majors. *Education Sciences*, *14*(6), 624. https://doi.org/10.3390/educsci14060624

Makrif, M., Sari, N., Muhardini, S., Ratu, T., & Erfan, M. (2023). Pelatihan Implementasi Kurikulum Merdeka Bagi Guru Sdn 1 Banyumulek Tahun 2023. *Jurnal Warta Desa (JWD)*, *5*(3), 203–212. https://doi.org/10.29303/jwd.v5i3.283

Marfuah, I., Mentari, E. G., & Oktavia, P. (2023). Problematika Guru PAUD dalam Menerapkan Kurikulum Merdeka Belajar. *Tarbiyah Jurnal: Jurnal Keguruan Dan Ilmu Pendidikan (Tarbiyah Journal: Journal of Teaching and Educational Sciences)*, *1*(02), 601–610.

Marôco, J., Harju-Lukkainnen, H., & Rautopuro, J. (2024). Worldwide predictors of science literacy in lower-secondary students: a TIMSS 2019 analysis. *International Journal of Science Education*, 1–19. https://doi.org/10.1080/09500693.2024.2394239

Maut, A. O. W. (2022). Pentingnya Asesmen Diagnostik dalam Implementasi Kurikulum Merdeka (IKM) di SD Negeri Tongkuno Kecamatan Tongkuno Kabupatem Muna Sulawesi Tenggara. *Jurnal Pendidikan Masyarakat Dan Pengabdian*, *02*(4), 1305–1312.

Muzharifah, A., Ma'alina, I., Istianah, P., & Lutfiah, Y. N. (2023). Persepsi Guru Terhadap Implementasi Kurikulum Merdeka di Madrasah Ibtidaiyah Walisongo Kranji 01 Kedungwuni. *Concept: Journal of Social Humanities and Education*, *2*(2), 161–184. https://doi.org/10.55606/concept.v2i2.306

Nabilah, N., Istiyono, E., & Widihastuti, W. (2024). Redefining assessment: Creating a groundbreaking prototype for domain affective in project-based learning. *Contemporary Mathematics and Science Education*, *5*(1), ep24005. https://doi.org/10.30935/conmaths/14457

Nadila, A. D., Lestari, O., & Faelasup. (2025). Pengalaman Siswa dalam Mengikuti Pembelajaran Proyek (Project-Based Learning) pada Kurikulum Merdeka. *Jurnal Pendidikan Dan Pembelajaran*, *4*(02 SE-Artikel), 338–346. https://ojs.smkmerahputih.com/index.php/juperan/article/view/874

O'Rourke, M., & Doyon, A. (2024). Rethinking assessment strategies to improve authentic representations of learning: using blogs as a creative assessment alternative to develop professional skills. *International Journal of Educational Technology in Higher Education*, *21*(1), 49. https://doi.org/10.1186/s41239-024-00483-0

Paramansyah, A., Masitho, S., Yanih, S., Sumarsih, T., Yuningsih, N., & Ramdhani, D. (2023). Pengembangan Assesmen Pembelajaran PAI pada Lembaga Pendidikan Madrasah dan Pondok Pesantren dalam Era Digital. *Jurnal Dirosah Islamiyah*, *5*(3), 763–770. https://doi.org/10.47467/jdi.v5i3.4171

Paramartha, A. A. G. Y., & Dewi, L. J. E. (2021). The Development of search engine service for official academic documents. *Journal of Physics: Conference Series*, *1810*(1), 12030. https://doi.org/10.1088/1742-6596/1810/1/012030

Purwanto, ahmad teguh. (2024). Perencanakan pembelajaran bermakna dan asesmen kurikulum merdeka. *Jurnal Ilmiah Pedagogy*, *20*(1), 75–94.

Putri, F., & Zakir, S. (2023). Mengukur Keberhasilan Evaluasi Pembelajaran: Telaah Evaluasi Formatif Dan Sumatif Dalam Kurikulum Merdeka. *Dewantara: Jurnal Pendidikan Sosial Humaniora*, *2*(4), 172–180.

Rahmawati, E., Kholid, I., & Riyuzen, R. (2021). The Effect of Training and Teaching Experiences on the Performance of Elementary School Teachers. *Journal of Contemporary Islamic Education*, *1*(2), 154–164. https://doi.org/10.25217/cie.v1i2.1696

Rini, R., Hariri, H., Sudjarwo, Efendi, U., Sukamto, I., & Handoko. (2023). WORKSHOP PENGGUNAAN ANDROID DALAM MEMBANTU PROSES PENILAIAN PASCA PANDEMI PADA GURU DI KABUPATEN PESAWARAN PROVINSI LAMPUNG. *JURNAL KREATIVITAS PENGABDIAN KEPADA MASYARAKAT (PKM)*, *6*(3), 1139–1148.

Rizal, M., & Kurniasari, I. H. (2023). Analisa Pengalaman Mengajar Mentor terhadap Kepuasan Peserta di. *Prosiding FRIMA (Festival Riset Ilmiah Manajemen Dan Akuntansi)*, *10*(6), 372–376.

Schildkamp, K., van der Kleij, F. M., Heitink, M. C., Kippers, W. B., & Veldkamp, B. P. (2020). Formative assessment: A systematic review of critical teacher prerequisites for classroom practice. *International Journal of Educational Research*, *103*, 101602. https://doi.org/https://doi.org/10.1016/j.ijer.2020.101602

Shi, Y., & Qu, S. (2022). The effect of cognitive ability on academic achievement: The mediating role of self-discipline and the moderating role of planning. *Frontiers in Psychology*, *13*, 1014655. https://doi.org/10.3389/fpsyg.2022.1014655

Simarmata, M. Y., Yatty, M. P., & Fadhillah, N. S. (2022). ANALISIS KETERAMPILAN BERBICARA MELALUI PROYEK PENGUATAN PROFIL PELAJAR PANCASILA DI

SMP NEGERI 1 KUALA MANDOR B. *VOX EDUKASI: Jurnal Ilmiah Ilmu Pendidikan*, *13*(1), 47–59. https://doi.org/10.31932/ve.v13i1.1564

Sitanggang, M. M., & Syahputra, E. (2023). Analisis Kesulitan Siswa Dalam Menyelesaikan Soal-Soal Higher Order Thinking Skills. *Journal of Student Research*, *2*(1), 10–22. https://doi.org/10.55606/jsr.v2i1.2081

Sobri, M., Liani, A., Zuwiranti, A., Myati, T., & Widiyati, R. N. (2023). Penerapan kurikulum merdeka sd/mi di indonesia. *Journal of Development and Reseacrh in Education*, *3*(2), 26–34.

Susanti, H., Fadriati, F., & B.S, I. A. (2023). Problematika Implementasi Kurikulum Merdeka di SMP Negeri 5 Padang Panjang. *ALSYS:Jurnal Keislaman Dan Ilmu Pendidikan*, *3*(1), 54–65. https://doi.org/10.58578/alsys.v3i1.766

Suwandi, F. P. E., Rahmanigrum, K. K., Mulyosari, E. T., Mulyantoro, P., Sari, Y. I., & Khosiyono, B. H. C. (2023). Strategi Pembelajaran Diferensiasi Konten Terhadap Minat Belajar Siswa dalam Penerapan Kurikulum Merdeka. *Prosiding Seminar Nasional Pendidikan Dasar*, *1*(1), 57–66.

Tanggur, F. S. (2023). Tantangan Implementasi Kurikulum Merdeka Bagi Guru Sekolah Dasar Di Wilayah Pedesaan Pulau Sumba. *HINEF : Jurnal Rumpun Ilmu Pendidikan*, *2*(2), 23–29. https://doi.org/10.37792/hinef.v2i2.993

Ukobizaba, F., Maniraho, J. F., & Uworwabayeho, A. (2025). Exploring mathematics teachers' insights and practices of project-based learning in primary schools of Nyamasheke district, Rwanda. *Frontiers in Education*, *Volume 10*. https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2025.1709849

van der Steen, J., van Schilt-Mol, T., van der Vleuten, C., & Joosten-ten Brinke, D. (2023). Designing Formative Assessment That Improves Teaching and Learning: What Can Be Learned from the Design Stories of Experienced Teachers? *Journal of Formative Design in Learning*, *7*(2), 182–194. https://doi.org/10.1007/s41686-023-00080-w

Wiranti, R. (2021). Pengaruh pengalaman mengajar dan motivasi mengajar terhadap profesionalisme guru taman kanak-kanak se-kecamatan Way Jepara. *Jurnal Humaniora Dan Ilmu Pendidikan*, *1*(1), 27–37. https://doi.org/10.35912/jahidik.v1i1.297

Yulia, A., & Syamsyurizal, S. (2025). Systematic Literature Riview dengan Metode Prisma: Modul Ajar Biologi dalam Kurikulum Merdeka. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*, *4*(1), 2596–2605. https://doi.org/10.31004/jerkin.v4i1.1494

Zakirman, Z., Sukmayadi, D., Aprianti, R., Widiasih, W., & Nadiyyah, K. (2023). Desain kelas MOOCs digital asesmen untuk meningkatkan profesionalisme guru di era digital. *Paedagoria: Jurnal Kajian, Penelitian Dan Pengembangan Kependidikan*, *14*(2), 139–144.