Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar
P-ISSN. 2622-5069, E-ISSN. 2579-3403
Volume 10, Nomor 01, Tahun 2026
Available online at: http://ejournal.unp.ac.id/index.php/jippsd/index
DOI: https://doi.org/10.24036/jippsd.v10i1

The Urgency of Non-Test Assessments in Mathematics Learning for Supporting Conceptual Understanding and Student Character

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ARTICLE INFO

Article history:

Received: 01-06-2026

Revised: 29-08-2026

Accepted: 18-10-2026

Published: 03-11-2026

ABSTRACT

Mathematics learning in elementary school still tends to be dominated by test-based assessments that focus on achieving learning outcomes in the form of academic scores. This condition causes the thinking process, conceptual understanding, and strengthening of students' character to be explored optimally. This study aims to analyze the dominance of test assessments in elementary school mathematics learning, examine the urgency of non-test assessments in supporting students' conceptual understanding, and describe their contribution to strengthening students' character. The research method used is a literature study with a conceptual-critical approach through the analysis of various relevant scientific sources. The results of the study show that test-based assessments have limitations in describing the thinking process and overall learning development of students. On the other hand, non-test assessments such as observations, interviews, portfolios, reflection journals, and project assessments are able to provide more comprehensive information related to conceptual understanding and student character. In addition, non-test assessments also support more meaningful learning because they emphasize the learning process, not just the final outcome. Thus, the integration of test and non-test assessments is an important step in realizing a more holistic, authentic, and development-oriented evaluation of mathematics learning in a sustainable manner.

Keywords: non-test assessment; elementary mathematics; conceptual comprehension; student character

How to cite:
Ahmad, S., Masniladevi, & Rahmi, I. A. (2026). The Urgency of Non-Test Assessments in Mathematics Learning for Supporting Conceptual Understanding and Student Character. *Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar (JIPPSD), 10*(01), 58-70. DOI https://doi.org/10.24036/jippsd.v10i1

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1. INTRODUCTION

Mathematics learning in elementary school has a fundamental role in developing students' logical, critical, systematic, and creative thinking skills. Mathematics is not only seen as a subject oriented towards mastering numbers and calculation procedures, but also as a means to build problem-solving skills, mathematical communication, and character formation of students. In the context of 21st century education, mathematics learning is required to be able to develop higher order thinking skills, deep conceptual understanding, and characters such as honesty, responsibility, discipline, cooperation, and resilience in facing learning challenges (OECD, 2023; Ministry of Education and Culture, 2022).

However, the practice of mathematics learning in elementary schools still shows the dominance of test-based assessments as the main instrument in assessing student learning outcomes. Test assessments such as daily tests, mid-term assessments, and final exams are more widely used to measure students' cognitive achievement through academic scores. This condition causes the learning process to tend to be product-oriented rather than process-oriented. As a result, meaningful conceptual understanding and character strengthening of students have not been developed optimally (Black & Wiliam, 1998; Brookhart, 2013).

The dominance of test-based assessments also has an impact on the limited space for teachers to understand the student learning process as a whole. Test assessments tend to only be able to measure the final results of students' answers, without providing a clear picture of thinking strategies, problem-solving processes, and misconceptions experienced by students. In fact, in mathematics learning, success is not only determined by the correct answer, but also by the thought process used to achieve the answer. This condition has the potential to make mathematics learning mechanistic, where students are used to memorizing procedures without understanding concepts in depth (Darling-Hammond et al., 2020).

This problem is also reflected in the achievement of mathematical literacy of Indonesian students which is still relatively low. The results of the Programme for International Student Assessment (PISA) in 2022 show that only about 18% of Indonesian students achieve at least Level 2 in mathematics, while the average OECD country reaches 69% (OECD, 2023). At this level, students are expected to be able to interpret simple mathematical situations, use mathematical concepts in a real-life context, and perform basic reasoning. This low achievement shows that students' conceptual comprehension, mathematical reasoning, and contextual problem-solving skills still need to be significantly improved.

In addition to having an impact on cognitive aspects, the dominance of test-based assessments also has the potential to affect the development of students' character. Excessive focus on academic grades can encourage students to be more outcome-oriented rather than the learning process. In the long run, this can reduce the development of character values such as honesty, perseverance, responsibility, and resilience in the face of learning difficulties (Rambe et al., 2024; Fatwasrie, 2024). In fact, basic education has an important role in forming the foundation of students' character as a whole.

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On the other hand, non-test assessments such as observations, interviews, portfolios, reflection journals, project assessments, and self-assessments have strategic potential in supporting more meaningful mathematics learning. Non-test assessments allow teachers to obtain more comprehensive information about students' thinking processes, the development of conceptual understanding, and attitudes and behaviors that arise during the learning process. Through non-test assessments, teachers not only assess the final results, but can also understand how students build mathematical concepts gradually (Wiliam, 2011; Panadero et al., 2016).

In addition, non-test assessments also have an important role in internalizing students' character values. Through observation, teachers can assess students' honesty and discipline in the learning process. Project assessments encourage students to develop responsibility, cooperation, and perseverance in completing tasks. Meanwhile, the journal of reflection and self-assessment provides space for students to evaluate their learning process honestly, so that they can foster self-awareness, responsibility, and resilience when facing learning difficulties. Thus, non-test assessments not only function as an evaluation tool, but also as a means of building character in a sustainable manner.

In line with the implementation of the Independent Curriculum, assessment is seen as an integral part of the learning process that is oriented towards developing students' competencies and character through the Pancasila Student Profile. Assessments are no longer only focused on measuring the final results, but also on the learning process experienced by students. In this context, non-test assessments have a very important position because they are able to capture cognitive, affective, and social dimensions more holistically than test assessments alone (Ministry of Education and Culture, 2022).

However, in learning practice in elementary schools, non-test assessments are still often positioned as a complement to test assessments, not as a strategic instrument in mathematics learning. Many previous studies have focused more on the development of test instruments and the measurement of cognitive learning outcomes, while studies that specifically place non-test assessments as an important strategy in supporting conceptual understanding and character internalization are still relatively limited (Brookhart, 2013; Black & Williams, 1998).

Based on this description, this article aims to analyze the dominance of test assessments in elementary school mathematics learning, examine the urgency of non-test assessments in supporting students' conceptual understanding, and describe the contribution of non-test assessments to strengthening students' character. Thus, non-test assessments are expected to be a complement to test assessments in building mathematics learning that is not only oriented to academic achievement, but also to understanding concepts and developing students' character.

2. METHOD

This study uses a literature review method with a conceptual-critical approach to review, analyze, and synthesize various theories, research results, and scientific documents related to non-test

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assessments in elementary school mathematics learning. This approach is used to gain a deeper understanding of the dominance of test-based assessments, the urgency of non-test assessments, and its contribution in supporting conceptual understanding and strengthening student character.

Research data sources are in the form of secondary data derived from national and international journal articles, scientific books, proceedings, and other academic documents relevant to the research focus. Data collection is carried out through documentation techniques by tracing various scientific sources in academic databases. The search process was carried out using keywords in Indonesian and English, including: non-test assessment, elementary school mathematics learning, conceptual understanding, student character, non-test assessment, authentic assessment, mathematics learning, conceptual understanding, character education, and elementary school mathematics.

The data was analyzed using content analysis techniques through several stages, namely: (1) identification and selection of literature based on predetermined criteria; (2) classification of data according to the research theme; (3) analysis and synthesis of various study results; and (4) drawing conclusions critically on research findings. The results of the analysis were used to obtain an overview of the urgency of non-test assessments in elementary school mathematics learning as an approach that supports conceptual understanding and strengthening students' character.

3. RESULTS & DISCUSSION

The Dominance of Test Assessments and Their Limitations in Elementary Mathematics Learning

The practice of assessment in elementary school mathematics learning still shows a tendency to use written tests as the main instrument in determining the learning success of students (Setiawan et al., 2017). Teachers generally use assessments to obtain information about students' scores, completeness levels, and academic results. Although test assessments have an important function in measuring the achievement of certain competencies, their overly dominant use has the potential to limit the function of assessment only as a tool for evaluating learning outcomes (OECD, 2023; Ministry of Education and Culture, 2022).

This tendency indirectly forms a learning culture that is more results-oriented than the learning process. In the practice of mathematics learning, students are often trained to solve problems through repetitive procedures so that they focus more on finding the correct answer than understanding the reasoning behind the mathematical concepts being learned. As a result, the ability to explain the relationships between concepts, develop problem-solving strategies, and build conceptual understanding has the potential to be less developed optimally. Darling-Hammond et al. (2020) explain that learning that is too outcome-oriented tends to reduce students' opportunities to develop deep and reflective thinking skills.

In addition, test-based assessments have limitations in describing the overall learning development of students. Written tests generally emphasize more on the final learning outcomes so that

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students' thought processes, problem-solving strategies, and misconceptions are difficult to identify in depth (Wibowo et al., 2024). In mathematics learning, students who get the correct answers do not necessarily have good conceptual understanding, while students with low test scores do not necessarily do not understand the concepts learned.

In addition to having an impact on the cognitive aspect, the orientation of assessments that overemphasize results also has the potential to affect the development of students' character. Excessive focus on academic grades can encourage learning behaviors that are more oriented towards achieving scores rather than process, responsibility, honesty, and perseverance in learning. In fact, mathematics learning should not only produce students who are able to get the right answers, but also individuals who think critically, are disciplined, honest, and have resilience in facing learning challenges (Zannurrain et al., 2025).

These various limitations show that assessments in elementary school mathematics learning need to be understood not only as a tool to measure learning outcomes, but also as a means of understanding the thinking process, development of conceptual understanding, and student character more comprehensively (Rahmawati et al., 2026). Therefore, an assessment approach is needed that can complement the function of test assessment so that the assessment process is able to provide a more complete picture of student development.

The Urgency of Non-Test Assessments in Elementary Mathematics Learning

The development of the educational paradigm requires assessment not only to be understood as a tool to measure learning outcomes, but also as an integral part of the learning process that is able to provide a comprehensive picture of student development (Nadia & Ucee, 2025). In elementary school mathematics learning, the ideal assessment not only serves to find out the final achievement of students, but also to understand how students build concepts, develop thinking strategies, and show attitudes during the learning process (Arta, 2024).

In this context, non-test assessments have a strategic position in supporting more meaningful mathematics learning. Non-test assessments allow teachers to obtain information that cannot be obtained through written tests, especially related to the student learning process. Through observation, interviews, portfolios, reflection journals, project assessments, and self-assessments, teachers can trace how students construct mathematical understanding gradually and how they overcome difficulties in the learning process.

Various studies show that non-test assessments play an important role in supporting process-oriented learning. Panadero et al. (2023) emphasized that reflection-based assessments and self-assessments can increase students' awareness of their thinking processes and encourage active involvement in learning (assessment as learning). This shows that non-test assessments not only function as an assessment technique, but also as a means of learning that encourages students to be more reflective and independent in learning.

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In addition, non-test assessments also provide space for teachers to understand the development of students' mathematical competencies more authentically. The information gained from learning activities such as group discussions, contextual problem-solving, and math projects allows teachers to assess not only the final outcome, but also the quality of students' thinking processes and collaboration. Thus, non-test assessments support learning that places more emphasis on the development of conceptual understanding and higher-level thinking skills.

In line with the implementation of the Independent Curriculum which emphasizes competency-based learning and character strengthening, non-test assessments have an urgency to be integrated into elementary school mathematics learning practices. This assessment not only enriches information about student learning outcomes, but also strengthens the role of teachers in facilitating learning development in a more holistic manner. Therefore, non-test assessments can be seen as an important component in an assessment system that is more authentic, meaningful, and oriented towards the overall development of students.

The role of non-test assessments in supporting students' conceptual understanding

Non-test assessments have a strategic role in supporting the development of students' conceptual understanding in elementary school mathematics learning. Conceptual understanding is not only shown through the ability to give the correct final answer, but also through the ability to explain reasons, connect between concepts, and choose problem-solving strategies that are appropriate to the situation at hand. Therefore, an assessment process that focuses only on the final outcome is not enough to describe the quality of students' mathematical understanding as a whole (NCTM, 2023).

In various studies, non-test assessments are seen as able to provide more in-depth information about students' thinking processes compared to test-based assessments. Through classroom observation, teachers can observe how students build problem-solving strategies, how they discuss, and how they respond to contextual math problems. This process allows teachers to identify not only the results of students' work, but also the mindsets used in solving problems (Brookhart, 2020).

In addition to observation, interviews are also a form of non-test assessment that is effective in exploring students' conceptual understanding. Through interviews, teachers can trace the reasons behind students' answers, so that misconceptions that are not seen in the answer sheets can be identified more clearly. This is important because in mathematics learning, the correct answer does not necessarily reflect the correct understanding of the concept, nor does the wrong answer always indicate an overall misunderstanding (heritage, 2021).

For example, after the students solve the downward multiplication problem (kabataku) $12 \times 3 = 36$, the teacher conducts a short interview:

Teacher: "Why is the number 1 in the number 12 multiplied by 3 the result to 30?"

Student: "Because the number 1 is 10, so $10 \times 3 = 30$."

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The snippet shows that students understand the concept of place values in multiplication operations, not just following the calculation steps. On the other hand, if students answer that the calculation is done only because they follow the multiplication rule of layers, then it shows that the conceptual understanding has not been formed optimally.

A similar approach can also be applied to other materials. For example, in the 1/2 +1/4 fraction addition operation, the teacher can ask the reason why the students equate the denominator before adding the fractions. In the division material, teachers can explore students' understanding of the meaning of division as a process of dividing equally. Meanwhile, in geometry material, interviews can be used to find out students' understanding of the different properties of flat buildings, such as squares and rectangles. Thus, interviews allow teachers to get a deeper picture of the mastery of concepts in various elements of elementary school mathematics learning.

Therefore, assessment through interviews not only serves as a tool for evaluating learning outcomes, but also as a means of understanding students' thinking processes in building mathematical concepts more completely.

Non-test assessments such as portfolios also make an important contribution in seeing the development of students' conceptual understanding in a sustainable manner. Through a collection of student work results from time to time, teachers can observe changes in thinking patterns, the development of solving strategies, and the improvement of students' mathematical representation skills. Thus, the portfolio not only records the final results, but also shows the process of developing concept understanding gradually (Ministry of Education and Culture, 2022).

Furthermore, the journal of reflection and self-assessment provides students with the opportunity to reflect on their own understanding of the material studied. This activity encourages students to realize how they understand mathematical concepts, which parts they have mastered, and what difficulties they still face. This reflective process contributes to the formation of a more meaningful conceptual understanding because students are actively involved in evaluating their own learning process (Andrade, 2020).

A number of studies have shown that process-oriented assessments, such as non-test assessments, are more effective in supporting conceptual understanding than assessments that only emphasize the end result. This is because non-test assessments provide space for teachers and students to explore ways of thinking, strategies, and the reasons behind a mathematical answer. Thus, non-test assessments not only function as an evaluation tool, but also as a means to strengthen the learning process itself.

Thus, it can be concluded that non-test assessments have an important role in helping teachers understand how students build mathematical concepts more deeply. This assessment allows the learning process to be not only oriented to the end result, but also to the thinking process that is the basis for the formation of a strong conceptual understanding.

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3.4 The Role of Non-Test Assessments in Strengthening the Character of Elementary Students

Character strengthening is one of the important goals in basic education that cannot be separated from the learning process, including mathematics learning. In addition to developing cognitive abilities, mathematics learning also has great potential in forming character values such as honesty, discipline, responsibility, cooperation, and resilience. However, the development of these characters cannot be optimally measured through written test-based assessments that focus more on final answers (Ameyda, 2024).

In this context, non-test assessments have a strategic role in identifying and developing students' character during the mathematics learning process. Unlike written tests that only assess final results, non-test assessments allow teachers to observe the student learning process directly through various learning activities. This includes how students work together in groups, how they complete assignments, and how they respond to challenges in the math problem-solving process (Qorimah, 2025).

Character building is not only related to the formation of positive behaviors, but also the development of students' social and emotional skills during the learning process. Characters such as responsibility, discipline, and the ability to interact positively develop through learning experiences that involve reflection, cooperation, and independent completion of tasks. Therefore, mathematics learning needs to be designed not only to achieve academic competence, but also to support the continuous development of students' character (Ahmad et al., 2025).

Observation is one of the important non-test assessment techniques in seeing the development of students' character. Through observation, teachers can assess students' attitudes such as honesty in doing assignments, discipline in participating in learning, and responsibility in completing work. In addition, student cooperation in group discussions can also be observed as an indicator of the development of social character in mathematics learning (Ngazizah et al., 2021).

Observation is one of the important non-test assessment techniques in seeing the development of students' character. In mathematics learning, observation allows teachers to assess students' character through the process of solving problems, not just based on the final answer obtained. For example, when students are working on a problem of summing fractions 1/2 + 1/4 = ..., the teacher can observe the students' honesty in solving the problem independently without copying a friend's answer or waiting for an answer from another student. In addition, teachers can also identify resilience, which is the ability of students to continue to try to solve problems even though they have difficulty in determining the same denominator. Students who retry the completion step after making a mistake show a better level of learning resilience than students who give up immediately when faced with difficulties.

A similar example can be observed in the multiplication material stacked downwards (kabataku). When students solve questions 12 × 3 = ..., the teacher can observe whether students continue to try to recalculate when the results obtained are not correct or immediately stop because they feel incapable.

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The behavior of trying again, correcting mistakes, and persevering in solving problems shows the existence of resilience in the mathematics learning process. Thus, observation not only helps teachers assess students' academic achievements, but also provides an overview of character development such as honesty, responsibility, and resilience in facing learning challenges. and interacting positively during learning shows the development of social and emotional aspects that are important in character formation (Ahmad et al., 2025;Ahmad, 2022). In addition, honest character can also be observed through the habit of students conveying the results of their work according to their own abilities and admitting mistakes when the answers obtained are not correct. It is important to develop honesty so that students are used to acting based on the truth and are responsible for their learning process (Ahmad, 2022).

In addition to observation, project assessment in mathematics learning also contributes to strengthening students' character. In project activities, students are not only required to produce the final product, but also through the process of planning, implementation, and reflection. This process encourages students to develop an attitude of responsibility, cooperation, and perseverance in completing tasks gradually (Subrata & Rai, 2019). Thus, project assessments not only assess the results, but also the process of building the student's character.

Journals of reflection and self-assessment also have an important role in building students' character. Through this activity, students are trained to evaluate themselves, recognize their strengths and weaknesses, and develop an honest attitude towards their learning process. This reflective activity indirectly fosters an attitude of responsibility and self-awareness in learning mathematics, students are trained to evaluate their own understanding, recognize learning difficulties, and develop an honest attitude towards the learning process experienced (Ahmad et al., 2025). Information from the reflection journal helps teachers identify the level of mastery of concepts and determine learning follow-up according to students' needs.

For example, after learning the addition and subtraction of fractions, a student wrote in his study journal:

"I already understand how to add and subtract fractions with different denominators."

While another student wrote:

"I can only add and subtract fractions with the same denominator, while I don't understand fractions with different denominators to the maximum."

Similar reflections can arise in other elements of mathematics learning. After learning to multiply in a row down (kabataku), students can write:

"I already understand how to store numbers in stacked multiplication."

While another student wrote:

"I still often get the numbers wrong so the multiplication results are not correct."

In the measurement material, students can write:

"I already understand how to change the unit of length from meters to centimeters."

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While in geometry materials:

"I'm still confused about the distinction between square and rectangular properties."

The journal excerpt shows that non-test assessments through self-reflection not only help teachers understand students' mastery of mathematical concepts in various learning elements, but also identify characters such as honesty, responsibility, and self-awareness in the learning process.

In line with the implementation of the Independent Curriculum, character strengthening is no longer positioned as an additional aspect, but as an integral part of the learning process. Therefore, non-test assessments are very relevant because they are able to capture affective and social aspects that cannot be reached by conventional test assessments. Thus, non-test assessments not only function as an evaluation tool, but also as an important instrument in shaping the character of students in a sustainable manner (Nugraheni et al., 2025).

Based on this description, it can be concluded that non-test assessments have a significant contribution to strengthening students' character in elementary school mathematics learning. Through various techniques such as observation, project assessment, reflection journals, and self-assessment, teachers can get a more complete picture of the development of students' character, so that mathematics learning is not only oriented to academic achievement, but also to the formation of positive character.

Integration of Test and Non-Test Assessments in Elementary Mathematics Learning

Assessment in elementary school mathematics learning basically cannot rely only on one specific type of assessment. Test assessments have an important role in measuring students' cognitive competency achievements, especially in the aspects of factual, procedural, and structured problem-solving knowledge. Through a written test, teachers can get an overview of the level of material mastery and the achievement of competency standards that have been set in the curriculum (Ministry of Education and Culture, 2022).

However, test assessments have limitations when used as the only assessment instrument. Focusing on the final result causes aspects of the learning process, thinking strategies, and the development of students' attitudes and characters to be less optimally accommodated. Therefore, a more comprehensive assessment approach is needed by integrating non-test assessments as a complement (Suhendra, 2021).

Non-test assessments play a role in providing information that cannot be reached by written tests, especially related to the thought process, conceptual understanding, and character development of students. Through observation, interviews, project assessments, reflection journals, and self-assessments, teachers can get a more complete picture of how students build mathematical understanding, interact in learning, and show their learning attitudes. Thus, non-test assessments expand the evaluation function from just measuring results to understanding the learning process (Qorimah, 2025).

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The integration of test and non-test assessments is a more ideal approach in elementary school mathematics learning. Both have complementary functions, where test assessments focus on measuring cognitive learning outcomes, while non-test assessments focus on the learning process and affective aspects of students. The combination of the two allows teachers to get a more comprehensive picture of student development, both in terms of knowledge, skills, and attitudes.

This integrative approach is in line with the policy direction of the Independent Curriculum which emphasizes assessment as part of the learning process that is oriented towards the development of students' competencies and character. In this context, assessment not only functions as a final selection or measurement tool, but also as a means of learning reflection that assists teachers in designing learning that is more meaningful and in accordance with the needs of students (Kemendikbudristek, 2022).

Thus, the integration of test and non-test assessments in elementary school mathematics learning is an important need to realize a more holistic, authentic, and development-oriented assessment system as a whole. This approach is expected to reduce the dominance of results-based assessments, as well as encourage mathematics learning that not only emphasizes academic achievement, but also conceptual understanding and balanced character formation.

4. CONCLUSION

Based on the studies that have been conducted, it can be concluded that mathematics learning in elementary schools still shows the dominance of the use of test-based assessments in assessing student learning outcomes. This condition causes assessments to focus more on achieving academic scores, so that aspects of the thinking process, conceptual understanding, and character development of students have not been fully accommodated optimally.

Test-based assessments have limitations in describing students' abilities as a whole, especially in identifying thinking processes, problem-solving strategies, and the development of students' attitudes and characters. This shows the need for a more comprehensive assessment approach in elementary school mathematics learning.

Non-test assessments have an important role in supporting students' conceptual understanding through observation of the learning process, exploring thinking strategies, and reflection on students' understanding. In addition, non-test assessments also contribute to strengthening students' character such as honesty, responsibility, discipline, cooperation, and resilience that arise during the learning process.

Thus, the integration between test and non-test assessments is a necessary approach in elementary school mathematics learning. This approach allows assessment not only to function as a measuring tool for learning outcomes, but also as a means to understand the learning process more fully, thereby supporting the development of conceptual understanding and students' character in a balanced manner

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