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Redefining mathematics learning evaluation: From traditional assessment to technology-based holistic competency assessment

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Abstract

The development of digital technology encourages the redefinition of evaluation systems in mathematics learning to make them more relevant to the demands of the current curriculum. This study aims to identify digital and holistic assessment forms that can comprehensively measure students' competencies, including cognitive, affective, and psychomotor aspects. The research method employed was a literature study using a Literature Review approach. The research instrument was a data extraction sheet used to record and analyze findings from selected publications. Data were collected from various databases and reputable journals published between 2014 and 2025. Out of 243 articles identified in the initial stage, 29 met the inclusion criteria and were analyzed further. The findings show that digital assessments through platforms such as Quizizz, Wordwall, and Google Form enhance interactivity, adaptivity, and student engagement. Meanwhile, project-based, portfolio, and observational assessments are proven to provide a more comprehensive picture of student learning outcomes. This study emphasizes the need for a shift from traditional evaluation to technology-based holistic evaluation in line with the demands of the 21st-century curriculum.

Keywords: Learning Evaluation, Digital Assessment, Holistic Assessment, Mathematics Learning

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INTRODUCTION

Learning evaluation is a crucial component of the educational process, serving to measure learning outcomes, assess learning effectiveness, and provide feedback to students and educators. In the context of mathematics learning, evaluation is not merely a tool for measuring cognitive knowledge and competencies. Critical thinking and problem-solving, although categorized within the cognitive domain, are positioned in this study as higher-order competencies that extend beyond basic cognition. They function as bridging skills that connect cognitive abilities with affective engagement and psychomotor application, thereby providing a more comprehensive view of students' learning outcomes (Susanti Telaumbanua et al., 2023; Zainal, 2020). However, the evaluation practices commonly carried out in schools still tend to use traditional examination models that focus on multiple-choice or essay-based written tests,

which are limited in measuring 21st-century competencies (Ansya et al., 2023; Rahmawati, 2023).

Learning evaluation is a crucial component of the educational process, serving to measure learning outcomes, assess learning effectiveness, and provide feedback to students and educators. In the context of mathematics learning, evaluation is not merely a tool for measuring cognitive knowledge and competencies. As emphasized by Agustina & Yuana, (2025); Ansya et al. (2023) authentic assessment is required to capture not only knowledge but also skills and attitudes. Critical thinking and problem-solving, although categorized within the cognitive domain, are positioned in this study as higher-order competencies that extend beyond basic cognition. They function as bridging skills that connect cognitive abilities with affective engagement and psychomotor application, thereby providing a more comprehensive view of students' learning outcomes (Susanti Telaumbanua et al., 2023; Zainal, 2020). This type of evaluation model is considered inadequate to accommodate the holistic dimensions of student competency, especially in the digital era, which demands more innovative approaches to learning and evaluation.

Along with the development of educational technology, various efforts have emerged to reform the mathematics learning evaluation system through the integration of digital media and technology-based interactive platforms, such as Quizizz, Google Form, and other evaluation applications (Amany, 2020; Hariono et al., 2021; Kristanto & Yunianta, 2021). Utilizing technology not only simplifies the evaluation process, but also provides the opportunity to implement adaptive, real-time, and data-based formative and summative assessments (Azzahro & Subekti, 2022; Maulidiya et al., 2024). Furthermore, various studies show that technology-based assessments can increase students' participation, motivation, and numeracy competency in mathematics learning (Pramesti et al., 2025; Tareq et al., 2024; Zaeni, 2022). Evaluation is not only cognitive, but also includes the psychomotor and affective aspects of students in hybrid or online learning situations (Agustina & Yuana, 2025; Veronika Sitepu et al., 2022). In summary, the integration of digital technology into mathematics learning evaluation enables more adaptive, real-time, and data-driven assessments that not only measure cognitive outcomes but also capture students' affective and psychomotor competencies. This approach enhances participation, motivation, and numeracy skills, thereby supporting a more comprehensive and holistic evaluation process.

The holistic competency assessment approach is highly relevant in supporting the implementation of the Independent Curriculum, which emphasizes the development of

Pancasila student profiles and competency-based learning outcomes. Assessment is no longer simply defined as a quantitative measurement of learning outcomes, but rather as an integral part of the learning process that plays a role in developing students' overall potential. In the context of mathematics learning, holistic assessment enables measurement of various competency dimensions, such as critical thinking, problem-solving, mathematical communication, collaboration, and creativity (Susanti Telaumbanua et al., 2023; Zainal, 2020). Unfortunately, the evaluation practices that have been dominant in schools tend to be conventional, limited to multiple-choice or essay questions that are unable to fully represent 21st-century skills (Ansya et al., 2023; Rahmawati, 2023). Therefore, redefining the evaluation system is an urgent need to assess not only what students know, but also how they think, process, and apply mathematical concepts in real life (Ashari et al., 2023; Athoillah et al., 2024; Sidabutar, 2024).

Educational technology has opened up opportunities to develop interactive and adaptive digital-based assessments, such as Quizizz, Google Forms, and other online evaluation platforms, which have been proven to increase students' motivation, participation, and mastery of numeracy competencies (Amany, 2020; Hariono et al., 2021; Kristanto & Yunianta, 2021; Pramesti et al., 2025; Tareq et al., 2024; Zaeni, 2022). In fact, technology-based assessments also provide space to assess students' affective and psychomotor aspects in the context of online or hybrid learning (Agustina & Yuana, 2025; Veronika Sitepu et al., 2022). With the support of real-time assessment data utilization, teachers can design more responsive and contextual learning interventions (Azzahro & Subekti, 2022; Maulidiya et al., 2024). Therefore, synergy between teachers, curriculum developers, and policymakers is essential to implementing an evaluation system that is transformative, adaptive to current developments, and oriented toward strengthening students' character and competencies as a whole.

Although a number of studies have examined the use of technology in evaluating mathematics learning, most studies still focus on the technical effectiveness of digital assessment tools (e.g., ease of use and speed of correction), rather than on the overall transformational aspects within a holistic competency assessment framework. Furthermore, few studies explicitly integrate cognitive, affective, and psychomotor dimensions into digital-based evaluation systems, particularly in the context of implementing the Independent Curriculum, which emphasizes the formation of Pancasila student profiles. Several studies also point to limitations in the approaches used, namely, they are more descriptive or limited to case studies, thus lacking a conceptual framework or systemic strategy for redefining mathematics learning

evaluation in the digital era (Maulidiya et al., 2024; Zaeni, 2022). Furthermore, previous research has not explored the synergy between digital device development, teacher pedagogical competency, and sustainable educational policy support.

The novelty of this article lies in the presentation of an integrated analysis of the transformation of mathematics learning evaluation by emphasizing three main aspects: (1) a paradigm shift from traditional assessment to technology-based holistic competency assessment, (2) mapping innovative forms of evaluation that cover the cognitive, affective, and psychomotor domains, and (3) formulating systemic needs as a basis for implementing effective digital assessment in mathematics education. With this approach, this article not only closes the gap in previous research but also offers a new direction in designing an evaluation system that is relevant to the demands of 21st-century education. This study aims to identify forms of digital and holistic assessment that can measure students' competencies comprehensively, including cognitive, affective, and psychomotor aspects.

Thus, this article attempts to critically examine the transformation of mathematics learning evaluation from the traditional model to a technology-based holistic competency assessment, by highlighting digital innovations, implementation challenges, and opportunities for improving the quality of educational evaluation in the digital era.

METHODS

This study employed a Literature Review (LR) approach to identify and analyze research on digital and holistic assessments in mathematics learning. The data extraction sheet was used as the primary instrument to record key findings from each selected publication. To ensure reliability in the article selection process, two reviewers conducted the screening and selection based on the inclusion and exclusion criteria, followed by discussion until consensus was reached. The analysis was carried out descriptively through thematic synthesis rather than statistical meta-analysis, since the reviewed articles varied in design, research subjects, and reported outcomes. This approach allowed a comprehensive mapping of assessment models without reducing the heterogeneity of the findings.

In the planning the review phase, the main research question was formulated: *How has the evaluation of mathematics learning transformed from traditional models toward technology-based holistic competency assessments?* At this stage, the review protocol was also developed, including the definition of keywords (*mathematics learning evaluation, technology-based assessment, holistic competency assessment*), publication year range (2014–2025), and

inclusion/exclusion criteria. Articles were included if they were written in English or Indonesian, focused on mathematics learning evaluation, discussed technology-based or holistic competency assessments, and were available in full-text. Articles that were duplicates, irrelevant, or inaccessible were excluded.

The conducting the review phase involved searching for articles across five reputable databases: Google Scholar, DOAJ, SINTA, Springer, and Scopus. The initial search yielded 243 articles. After removing 58 duplicates, 185 articles remained. Title and abstract screening resulted in 92 articles, while 93 were excluded. A full-text reading further reduced the pool to 47 articles. Following the final eligibility assessment, 29 articles were included for synthesis. Data extracted from the selected studies included author(s), year of publication, research context, objectives, key findings, and relevance to the research question.

The reporting and dissemination phase focused on synthesizing the evidence through a descriptive-qualitative analysis. This analysis mapped the trends and paradigm shifts in mathematics learning evaluation, and derived practical implications for teachers, policymakers, and technology-based assessment developers. To enhance the trustworthiness of the findings, peer debriefing and triangulation with recent policy documents and credible publications were employed.

Table 1. Summary of LR Phases

LR Phase	Activities in This Study	Outcome
Planning the Review	Defined the research question: *How has mathematics learning evaluation shifted from traditional models to technology-based holistic competency assessments?* Developed the review protocol (keywords, publication years, inclusion/exclusion criteria).	Clear research focus and established LR protocol.
Conducting the Review	Article search through Google Scholar, DOAJ, SINTA, Springer, and Scopus (2014–2025). Duplicates removed (58 articles). Title/abstract screening (185 → 92 articles). Full-text assessment (92 → 47 articles). Final eligibility selection (29 articles). Data extraction: author(s), year, context, objectives, methods, key findings, relevance.	243 articles selected for synthesis.
Reporting and Dissemination	Descriptive-qualitative synthesis. - Mapping of trends and paradigm shifts in mathematics evaluation. - Practical implications formulated for teachers, policymakers, and technology-based assessment developers. - Validation through peer debriefing and triangulation with policy documents.	Final synthesis report presenting key trends and practical implications.

Adapted from (Ghamrawi et al., 2025)

RESULT AND DISCUSSION

The research results are presented according to the stages in the systematic literature review process, namely identification, selection, data extraction, and thematic synthesis as follows:

Table 2. Coding and Thematic Categories

Theme	Thematic Categories	Key Findings	Reference
Limitations of Traditional Evaluation	Conventional Evaluation	Mathematics evaluations still predominantly measure lower-order cognitive aspects through multiple-choice or descriptive tests; they do not fully reflect higher-order thinking competencies.	(Ansya et al., 2023; Rahmawati, 2023; Susanti Telaumbanua et al., 2023; Zainal, 2020)
Evaluation Transformation through Digitalization	Technology in Evaluation	Digital platforms such as Quizizz, Google Form, Liveworksheet, and Wordwall encourage engagement, provide instant feedback, and enable personalized evaluation.	(Amany, 2020; Azzahro & Subekti, 2022; Kristanto & Yunianta, 2021; Maulidiya et al., 2024; Pramesti et al., 2025; Tareq et al., 2024; Zaeni, 2022)
Holistic Assessment and Alternative Formats	Multidimensional Approach	Project-based assessment, portfolio, observation, and reflection support the achievement of complete competencies: cognitive, affective, and psychomotor.	(Agustina & Yuana, 2025; Athoillah et al., 2024; Susanti Telaumbanua et al., 2023; Veronika Sitepu et al., 2022; Zainal, 2020)
Implementation Challenges and Systemic Needs	Infrastructure and Human Resources Constraints	Barriers such as limited infrastructure, lack of teacher training, and resistance to change require policy support and digital pedagogical training.	(Ashari et al., 2023; Ibrahim et al., 2024; Sidabutar, 2024)
Future Implications for Mathematics Evaluation	New Paradigm of Evaluation	Redefining evaluation as an integral process in learning requires collaboration between teachers, technology developers, and policy makers to design inclusive and sustainable assessments.	(Ashari et al., 2023; Athoillah et al., 2024; Liu et al., 2024)

The results of this study indicate a significant paradigm shift in mathematics learning evaluation practices, particularly over the past two decades. Evaluation, once dominated by traditional approaches, has now shifted toward technology-based and holistic competency-oriented assessment.

1. Limitations of Traditional Evaluation

The practice of evaluating mathematics learning which is still oriented towards conventional written exams shows stagnation in the assessment approach, especially at the secondary school and tertiary levels (Rahmawati, 2023; Zainal, 2020). This model typically only measures memory, understanding basic concepts, and solving routine problems, which do not fully reflect the complexity of mathematical thinking. This type of evaluation often neglects students' affective and psychomotor dimensions, such as collaboration skills, mathematical communication, or the use of digital tools in problem-solving (Ansya et al., 2023; Susanti Telaumbanua et al., 2023). In fact, according to Ashari et al. (2023) effective assessment in mathematics education should represent real contexts and be oriented towards the development of 21st century skills.

The Independent Curriculum policy currently implemented in Indonesia demands more comprehensive and contextual evaluation. The Pancasila student profile, which serves as the primary reference in this curriculum, emphasizes the importance of character, independence, critical thinking, and collaboration skills, which cannot be optimally measured through multiple-choice tests or written essays alone (Ministry of Education, Culture, Research, and Technology, 2022). In this context, evaluation needs to shift toward project-based formative assessment, digital portfolios, and student self-reflection, which allow teachers to view competency development more holistically and authentically (Fauziah et al., 2023; Heldawati et al., 2023). More than just a final assessment, process-based assessment allows students to engage in active learning that facilitates the growth of metacognition and deep conceptual understanding.

With advances in educational technology, various digital platforms can now be utilized to integrate holistic assessment into mathematics learning. The use of applications such as Google Forms, Quizizz, Edmodo, GeoGebra Classroom, and learning management systems (LMS) allows teachers to conduct adaptive, responsive, and personalized evaluations tailored to students' learning styles (Awiria et al., 2022; Rafi et al., 2020). Technology also enables the implementation of process-based skills assessments such as digital simulations, integrated projects, and online collaborative problem-solving. This aligns with findings by Muhtadi et al. (2022), which shows that the use of TPACK (*Technological Pedagogical Content Knowledge*) in mathematics evaluation can increase student participation, feedback accuracy, and continuous improvement of the learning process. Therefore, redefining evaluation is not only a pedagogical necessity but also a strategic demand in preparing future generations of learners.

2. Digital Transformation as an Innovative Response

Digital transformation in learning evaluation is an innovative response to the need for more adaptive, accurate, and *student-centered assessments*. With the advancement of information and communication technology, various platforms such as *Quizizz, Google Forms, Kahoot*, and *Liveworksheet* are increasingly being used by teachers to conduct digital formative and summative assessments (Amany, 2020; Hariono et al., 2021; Kristanto & Yunianta, 2021). These platforms facilitate highly efficient evaluation, automated answer correction, and ease of recording student performance data. In the context of the pandemic and post-pandemic, the use of online-based evaluation has become a practice that is not only an emergency measure but also forms a new habit in the digital education system (Mustakim, 2020; Warmi et al., 2020).

Furthermore, digital transformation enables teachers to conduct assessment for learning and assessment as learning more meaningfully. Through data analytics from digital evaluation platforms, teachers can map student competency achievement, provide individualized feedback, and adjust teaching strategies more quickly (Maulidiya et al., 2024; Zaeni, 2022). Real-time feedback provided through automated features accelerates students' reflection cycles on learning. Evaluation is no longer merely a measurement tool but an integral part of the learning process itself. This marks a paradigm shift from product-based assessment to process-based assessment and learning progression.

In addition, the use of gamification principles in digital evaluation can increase student motivation and engagement, especially at the elementary and secondary education levels (Pramesti et al., 2025; Putra et al., 2023). Healthy competition, interactive visuals, and game elements can reduce student anxiety about exams and create a fun learning environment. This has a positive impact on increasing active participation, courage to express opinions, and confidence in facing assessments. Thus, the digital transformation of evaluation not only adapts to the demands of the times but also paves the way for assessments that are more inclusive, adaptive, and oriented towards developing students' overall potential.

3. Holistic Competency Assessment

To improve the quality of learning evaluation, the holistic competency assessment approach is gaining increasing attention. This assessment not only measures cognitive aspects such as conceptual understanding and logical thinking skills, but also integrates affective (attitudes, interests, motivation) and psychomotor (practical and physical skills) aspects (Santoso, 2014; Veronika Sitepu et al., 2022). Evaluation methods such as digital portfolios, project-based assessments, reflective journals, and direct observation in hybrid or face-to-face

learning are effective tools for comprehensively assessing students' learning processes and products. This approach broadens the scope of evaluation to reflect students' actual competencies in life and the workplace.

Holistic evaluation also allows educators to see students as whole individuals, not simply information processors. In the context of mathematics learning, this is crucial because problem-solving skills depend not only on mastery of formulas but also on the ability to think critically, collaborate, and persist in the face of challenges. Assessing the collaborative process of completing a mathematics project, or students' reflections on their strategies for solving complex problems, provides a richer picture of learning outcomes (Azma et al., 2024). Thus, holistic assessment becomes an evaluation approach that not only measures outcomes, but also values the learning process.

The following are several types of holistic competency assessments that can be used in mathematics learning:

a. Cognitive Assessment

Cognitive assessment in the context of mathematics learning aims to measure students' understanding of concepts, procedures, and logical and critical thinking skills. In its implementation, teachers can use written tests such as multiple-choice questions, essays, online quizzes, and context-based problem-solving questions. For example, in the quadratic function topic, students are given a story problem about the trajectory of a ball thrown into the air and asked to determine the maximum height the ball reaches. This type of problem not only measures students' understanding of the quadratic function formula but also their ability to apply the concept in real life. With the integration of the latest educational technologies, such assessments can be delivered through adaptive platforms such as Quizizz, Google Form, or AI-based learning systems that automatically adjust question difficulty according to students' responses. Moreover, learning analytics embedded in these platforms allow teachers to monitor student progress in real time, providing immediate feedback and more personalized evaluation (Ashari et al., 2023; Ibrahim et al., 2024; Tareq et al., 2024). Thus, technology facilitates a more efficient, adaptive, and comprehensive assessment process, ensuring alignment between students' learning outcomes and the expected core competencies.

b. Affective Assessment

Affective assessment focuses on measuring students' attitudes, values, interests, and motivations throughout the learning process. This assessment can be implemented through classroom observation, reflective journals, questionnaires, and interviews. For example, in

group project-based learning to understand the concept of function, teachers can assess students' openness to discussion, teamwork, and enthusiasm in overcoming conceptual difficulties. Students who demonstrate positive attitudes, such as tolerance for peer opinions and actively contributing ideas to problem-solving, reflect the values of the Pancasila learner profile. This assessment is crucial for developing students' character and soft skills, which are just as important as cognitive aspects (Choirudin et al., 2025; M Choirul Muzaini, 2023; Sidabutar, 2024; Veronika Sitepu et al., 2022).

c. Psychomotor Assessment

This type of assessment assesses practical skills and the use of tools in completing mathematical tasks. In modern mathematics instruction, the use of technologies such as GeoGebra, Excel, or Desmos is highly recommended to support visual understanding of abstract concepts. For example, in a parabola lesson, students are tasked with using the Desmos app to graph a quadratic function based on real-life data and then present their findings. Teachers can assess the accuracy of the graphical representation, their application skills, and their ability to explain their work. With this approach, psychomotor assessment can detect the extent to which students have mastered technical skills and the use of digital media in the context of mathematics learning (Athoillah et al., 2024; Azma et al., 2024; Liu et al., 2024).

d. Project/Portfolio Assessment

Project or portfolio assessment is a form of authentic assessment that encompasses the overall learning process and products created by students, both individually and in groups. Teachers can assign mid-term project assignments, such as designing a simulation of building a parabolic park. In this project, students are asked to take measurements, construct a mathematical model in the form of a quadratic function, calculate construction costs, and present a report in the form of a digital portfolio. Assessment is comprehensive, encompassing critical thinking skills, creativity, collaboration, and the accuracy of the mathematical concepts used. This assessment not only reflects academic achievement but also develops the 21st-century skills students will need in the future (Choirudin et al., 2025; Santoso, 2014; Tareq et al., 2024).

This holistic assessment approach aligns with the spirit of the Independent Curriculum, which prioritizes meaningful learning and strengthening the Pancasila student profile. It assesses students holistically, not just based on the final results but also on the process and values developed during learning.

4. Implementation Challenges and Systemic Needs

While digital assessment offers numerous advantages, its implementation in the field is not without complex challenges. Limited technological infrastructure, such as uneven internet access, inadequate devices, and other technical glitches, remain major obstacles, particularly in underdeveloped, frontier, and outermost regions (3T) (Ashari et al., 2023). Furthermore, not all teachers have sufficient digital literacy to effectively design and administer online assessments. This competency gap is exacerbated by a lack of ongoing training and limited time for teachers to develop new skills.

On the other hand, resistance to changes in evaluation methods also poses a barrier. Some teachers remain comfortable with conventional methods and doubt the reliability of digital assessments in assessing the overall learning process. Concerns about the academic integrity of online exams and the validity of assessments are persistent issues (Ibrahim et al., 2024; Sidabutar, 2024). This demonstrates that the successful implementation of digital assessment depends not only on the availability of technology but also on a paradigm shift and consistent institutional support. Policies are needed that encourage the comprehensive integration of ICT into assessment and provide experimental space for teachers to try new approaches without undue pressure.

Furthermore, methodological challenges arise, particularly in measuring affective and psychomotor aspects, which are difficult to capture automatically through digital platforms. Many assessment applications focus solely on multiple-choice or objective quizzes, which do not reflect the depth of students' thinking and actual skills. Therefore, a blended assessment strategy is needed, combining digital assessment with direct observation, project-based assignments, and student self-reflection. This model can ensure that assessment remains comprehensive and contextual, while strengthening the teacher's role as a learning facilitator capable of assessing not only what is learned, but also how and why students learn.

5. Implications for the Future of Mathematics Education

The findings of this study highlight the need for a fundamental redefinition of evaluation in mathematics learning. Evaluation is no longer simply a tool for measuring learning outcomes at the end of the process, but rather an integral part of the learning journey itself. This paradigm requires teachers to utilize assessment as a means of building conceptual understanding, providing formative feedback, and encouraging students' critical reflection on their mathematical thinking processes. By positioning evaluation as a dynamic component of learning, mathematics education can transform to become more meaningful and empowering.

Going forward, the use of technology should be directed towards expanding the scope and depth of assessments. Digital platforms enable teachers to develop assessments that are more contextual, responsive to student needs, and support differentiated learning. This serves not only the cognitive domain but also affective aspects such as motivation, self-confidence, and attitudes toward mathematics. With the right technology integration, the evaluation process can be designed holistically to develop students' full potential while preparing them for 21st-century challenges that demand creativity, collaboration, and critical thinking (Liu et al., 2024).

For this transformation to be sustainable, cross-sector collaboration is essential. Teachers cannot work alone; they need support from educational technology developers to create intuitive and accessible assessment tools, and support from policymakers to introduce regulations that encourage innovation in the classroom. Continuous training programs, adequate infrastructure, and alternative assessment testing spaces are strategic steps that must be taken together. With a collaborative and adaptive education ecosystem, the future of mathematics education can be more inclusive, transformative, and oriented toward developing relevant competencies in the digital age (Athoillah et al., 2024).

CONCLUSION

Based on the findings of this literature review, it can be concluded that mathematics learning evaluation has undergone a significant paradigm shift from traditional examinations to technology-based holistic assessments. This study identified two major forms of assessment that comprehensively measure student competencies across cognitive, affective, and psychomotor domains. First, digital assessments delivered through platforms such as Quizizz, Google Forms, Wordwall, and Liveworksheet enhance interactivity, adaptivity, and provide real-time feedback. Second, holistic assessments in the form of project-based tasks, portfolios, and classroom observations offer a more authentic and comprehensive picture of students' learning achievements. These approaches not only support higher-order competencies such as critical thinking, collaboration, and creativity but also align with the Independent Curriculum and the strengthening of the Pancasila Student Profile. Despite these advances, challenges such as limited infrastructure, uneven digital literacy among teachers, and the lack of robust instruments for affective and psychomotor evaluation remain obstacles to full implementation.

Based on these findings, it is recommended that teachers continuously improve their competencies in developing comprehensive digital assessment instruments, including portfolios, context-based projects, and student self-reflection. Schools and educational

institutions need to provide infrastructure support and an integrated evaluation system that supports digital formative and summative assessments. Educational technology developers are also encouraged to create more interactive, adaptive, and inclusive evaluation platforms that can comprehensively capture a wide range of mathematical competencies. Future research could focus on the practical implementation of holistic assessment models in mathematics classrooms. While this study has mapped the paradigm shift from traditional to technology-based holistic evaluation, empirical investigations are still needed to explore how such assessments can be effectively applied in real teaching and learning contexts. For instance, researchers may examine how portfolios, project-based tasks, self-assessment, and peer-assessment can be integrated with digital platforms to capture students' cognitive, affective, and psychomotor competencies in mathematics.

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