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Challenges in Implementation and Strengthening Strategies for Technology-Based Learning Assessment Reporting

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Abstract

The advancement of digital technology has significantly transformed the systems of assessment and the reporting of learning outcomes. This article aims to comprehensively examine the concept of technology-based assessment reporting, its associated benefits, the challenges encountered in field implementation, and strategic approaches that educational institutions can adopt. This study employs a literature review method by analyzing relevant sources, including scholarly books, national and international journals, as well as educational policy documents. The findings indicate that the use of digital platforms in assessment reporting—such as Learning Management Systems (LMS), e-report card applications, and learning analytics dashboards—enhances transparency, accuracy, time efficiency, and strengthens communication between teachers, students, and parents. However, challenges such as digital infrastructure gaps, limited digital literacy, and resistance to change remain significant barriers to effective implementation. Recommended strategies include capacity building for teachers, provision of adequate technological tools, supportive government policies, and the integration of ICT-based training into professional development programs. When implemented effectively, technology-based assessment reporting holds great potential to sustainably improve the quality of learning.

INTRODUCTION

The changing era, marked by the Fourth Industrial Revolution and digital transformation, has had a profound impact on various aspects of life, including the

field of education. One of the most evident implications of this change is the increased use of technology in learning and assessment processes. Technology is no longer limited to a learning medium but also serves as a tool to manage, analyze, and report assessment results more efficiently and informatively (Anderson et al., 2001). In this context, technology-based assessment reporting has become a necessity that must be adopted by educational institutions to create an adaptive, transparent, and quality-oriented learning ecosystem (OECD, 2019).

In general, assessment is an integral part of the learning process. It not only serves to measure learning outcomes but also functions as a reflective tool that allows teachers to adjust their instructional strategies (Brookhart, 2013). In the 21st-century learning paradigm, assessment is viewed as an ongoing process involving active learner participation and facilitating meaningful learning (Black & Wiliam, 2010). Therefore, assessment reporting should not merely be seen as the presentation of numbers or scores, but as a communicative process that delivers learning outcome information in a comprehensive, accurate, and easily understandable manner for various stakeholders, including students, teachers, parents, and educational policymakers (Guskey, 2000).

However, in practice, assessment reporting in Indonesia still faces numerous challenges. Many educational institutions still rely on conventional methods, such as manually written narratives or printed reports, which fail to present real-time data or allow longitudinal analysis of student achievement. This situation limits teachers' ability to dynamically monitor student progress and reduces parental involvement in the learning process. Yet, international studies show that assessment reporting through digital platforms can enhance the effectiveness of educational communication, accelerate response to student needs, and strengthen family engagement in the learning process (OECD, 2019).

Within the national education policy framework, the currently implemented Merdeka Curriculum emphasizes the importance of continuous formative and summative assessments, as well as the utilization of learning data to develop responsive teaching strategies. However, these policy instruments are not yet fully supported by integrated and accessible digital reporting systems. Meanwhile, rapid advancements in digital technology have offered various solutions, ranging from Learning Management Systems (LMS) to reporting dashboards that enable real-time and predictive visualization of assessment data (Lestari et al., 2025). In this regard, technology-based assessment reporting emerges as an essential innovation that urgently needs to be widely adopted.

Previous studies have indeed explored the use of technology in learning and assessment. For example, Brookhart emphasized the importance of formative assessment and high-quality feedback in improving student learning outcomes (Brookhart, 2013). Black and Wiliam (2010) noted that the quality of assessment largely depends on how its results are analyzed and reported. Nevertheless, there is

still a lack of research explicitly addressing technology-based assessment reporting, particularly in the context of Indonesian education. Moreover, existing studies mostly focus on the technical aspects of digital applications or platforms, without viewing them as integral components of educational decision-making systems.

Based on these considerations, a research gap clearly exists: the absence of a comprehensive study that discusses assessment reporting as a strategic process involving information technology to present educational data in an interactive and meaningful way. Therefore, this article aims to provide a theoretical and practical foundation for technology-based assessment reporting through a holistic approach. The main focus of the article is to examine effective reporting models, challenges faced by schools, and opportunities for technology adoption in alignment with national education policies.

The novelty of this article lies in its approach, which positions assessment reporting not merely as the final product of an evaluation process, but as an integral part of the digital learning ecosystem. This perspective connects assessment data with differentiated and inclusive instructional strategies. In addition, this article contributes to educational discourse by presenting a model of technology-based assessment reporting that is evidence-based and contextually relevant to Indonesia.

METHODS

This study employed a qualitative descriptive approach using the library research method. This method was chosen as it is suitable for in-depth exploration of concepts, practices, and the implementation of technology-based assessment reporting in contemporary educational contexts (Given, 2007). Library research allows researchers to gather data from various written sources such as books, scholarly journal articles, educational policy reports, and credible online resources (Sugiyono, 2013). The data analysis technique applied was thematic qualitative analysis. This process involved identifying, categorizing, and interpreting emerging themes from the literature, such as LMS-based reporting systems, teacher and student engagement, assessment result visualization, and the role of educational policies in supporting digital reporting ecosystems (Braun & Clarke, 2006). Thematic analysis enabled the researcher to discover recurring patterns and build a holistic understanding of the phenomena studied (Creswell & Creswell, 2018). Data validity in this library study was maintained through source triangulation, by comparing and confirming findings from various types of sources (books, journals, policy documents) to ensure consistency and accuracy of information (Moleong, 2007). Furthermore, the relevance and currency of sources were strictly observed by only using literature published within the last ten years, except for classical references with theoretical value (Sugiyono, 2013).

RESULT AND DISCUSSION

1. Benefits of Technology-Based Assessment Reporting

Technology-based assessment reporting offers significant strategic benefits in modern learning processes. First, technology enables the presentation of learning outcomes in real-time, in measurable and more transparent ways. Teachers no longer need to manually compile assessment data, as digital systems such as Learning Management Systems (LMS), online reporting applications, or analytic dashboards can automatically process and display detailed student performance information (Persico et al., 2014).

The presence of technology in assessment reporting facilitates informative data visualization. What was once just numerical scores can now be presented in the form of achievement graphs, color-coded indicators, heat maps, and descriptive analytics that show student progress trends over time. Digital assessment result visualizations greatly assist teachers in identifying student performance patterns and developing targeted learning interventions (Persico et al., 2014).

Second, technology-based reporting supports broader accessibility for all educational stakeholders, including students and parents. Reporting platforms such as Google Classroom, Moodle, as well as local applications like Raport Digital Madrasah (RDM) and e-Rapor Kurikulum Merdeka allow parents to monitor their children's learning achievements regularly without having to wait until the end of the semester. This strengthens school-family collaboration in supporting student learning. The OECD asserts that parental involvement in education is strongly influenced by access to their children’s learning outcome data (OECD, 2019).

Third, technology-based reporting accelerates the formative feedback process. In instructional approaches that view assessment as a process—not merely an end product—speed and accuracy of feedback are crucial (Brookhart, 2013). With the help of technology, teachers can provide direct feedback on students’ digital work, including written notes, voice recordings, or even explanatory videos, making the evaluation process more personal and meaningful (Guskey, 2000). Hal This aligns with the findings of Black and Wiliam, who emphasized that formative assessment is only effective when accompanied by timely and informative reporting (Black & Wiliam, 2010).

Fourth, digital reporting allows for longitudinal and predictive analysis of student performance. Data-driven reporting systems can record learning progress over time, analyze trends, and predict future achievement potential or academic gaps. This analysis is highly valuable for schools in developing data-driven learning strategies and making policy decisions that directly impact educational quality.

Finally, another critical benefit is administrative efficiency. Reporting technologies reduce the administrative burden on teachers in compiling manual learning outcome reports, which often consume significant time and energy. According to Brookhart, digital reporting systems allow teachers to focus more on pedagogical activities, as administrative loads are significantly minimized (Brookhart, 2013). This positively affects the quality of teacher-student interaction and improves the overall teaching and learning process.

Thus, technology-based assessment reporting not only provides technical convenience but also promotes more adaptive, collaborative, and personalized learning. Therefore, digital reporting should be positioned as a core component of the current education system—not merely a complement to conventional assessment.

2. Digital Reporting Platforms and Systems

The development of information and communication technology (ICT) has brought about various digital platforms that not only serve as online learning tools but also function as systems for managing and reporting student assessment outcomes. These platforms are generally equipped with features that allow teachers to create assessments, input grades, monitor student learning progress, and present assessment reports in various visual formats that are informative and easy to interpret (Aranda, 2024).

Some widely used platforms in education today include Google Classroom, Moodle, Microsoft Teams for Education, and Edmodo. In Indonesia, the Ministry of Education and Culture has developed platforms such as e-Rapor for primary and secondary education, as well as Raport Digital Madrasah (RDM) developed by the Ministry of Religious Affairs. These platforms aim to facilitate schools in compiling and delivering student learning reports digitally, quickly, and in a standardized format (Fajrin & Machali, 2023).

For example, Google Classroom allows teachers to assign tasks, conduct assessments, and provide comments and feedback directly. Student scores are automatically stored in the system and can be downloaded as learning reports. This feature is very useful for shortening reporting time and providing direct access for both students and parents. The use of Google Classroom during the Covid-19 pandemic helped teachers organize more systematic learning reports, although technical challenges were still present in some schools (Fauzi et al., 2021).

Meanwhile, Moodle is a feature-rich open-source platform that supports assessment reporting in the form of performance charts, student activity logs, and integration of advanced reporting plugins. Moodle is considered effective in supporting both formative and summative assessments digitally due to its system flexibility that can be tailored to curriculum needs across countries (Fernando, 2020).

At the national level, e-Rapor and RDM have become the standard digital reporting tools mandated for use in public schools and madrasahs. These systems are integrated with the Data Pokok Pendidikan (Dapodik) and the Education Management Information System (EMIS), allowing the government to monitor student performance nationwide and promote evidence-based policymaking in education. However, despite the many platforms developed, challenges persist in terms of system interoperability, data integration with final grade reporting, and teachers' digital literacy to fully utilize all reporting features. Research by Widiastuti shows that many teachers use platforms merely for assignments, without fully exploring their assessment reporting functions.

Moreover, many reporting platforms are not yet designed to be adaptive and responsive to the needs of students with special needs, and they are not fully aligned with competency-based and differentiated curricula. Therefore, future digital reporting system designs must not only meet administrative requirements but also be rooted in strong pedagogical principles. The development of assessment reporting platforms also requires the involvement of edtech developers, academics, and policymakers to ensure that the systems created are not only technologically advanced but also aligned with holistic and humanistic educational evaluation principles.

3. Challenges of Implementation and Strengthening Strategies

The implementation of technology-based assessment reporting in Indonesian schools marks a significant step forward in the digital transformation of education. However, this process is not without complex challenges, both technically, pedagogically, and in terms of policy. To address these issues, comprehensive and contextualized strengthening strategies are needed.

a. Implementation Challenges

First, the digital literacy gap among teachers and students. Many teachers, particularly in underdeveloped, remote, and frontier areas (3T regions), still have limited digital literacy. This affects their ability to optimally utilize the available reporting features on digital platforms, such as progress charts, formative assessment analytics, or digital student portfolios. Low teacher digital literacy remains a major barrier to the full implementation of Learning Management Systems (LMS) (Avci & Ergün, 2019).

Second, disparities in technological infrastructure. Another challenge is unequal access to technology infrastructure, such as internet connectivity, hardware (computers, tablets), and adequate software. The success of digital assessment is highly influenced by the availability of ICT infrastructure in schools (Rawal, 2024).

Third, lack of system integration. Existing reporting platforms often function as standalone systems and are not integrated with the school's academic system. This complicates teachers' efforts to create comprehensive

and well-documented learning reports in a single system. A study by Ifenthaler et al. (2019), highlights that digital assessment system interoperability is a global challenge that must be addressed through open system architecture designs.

Fourth, insufficient technical training and mentoring. Many teachers rely on short-term technical training that does not cover the pedagogical aspects of digital assessment. However, to produce valid, reliable, and communicative assessment reports, teachers require structured and continuous training. The effectiveness of assessment reporting is highly influenced by teachers' understanding of instrument design and student learning outcome analysis.

Fifth, suboptimal application of authentic and differentiated assessment principles. Digital reporting tends to focus on quantitative scores, while the Merdeka Curriculum emphasizes authentic and student-centered assessment. This weakness prevents digital reporting from fully reflecting holistic learning processes. Good assessment should be formative, continuous, and offer a comprehensive picture of student competencies.

b. Strengthening Strategies

First, enhancing digital literacy and teacher assessment competence. The government and educational institutions must organize ongoing training that is not only technical but also pedagogical. This training should cover how to develop rubrics, use assessment data analytics, and deliver formative feedback via digital platforms (Gunawan et al., 2024). The TPACK (Technological Pedagogical Content Knowledge) framework is among the recommended approaches for comprehensive teacher training (Rosenberg & Koehler, 2015).

Second, strengthening infrastructure and technology access. This includes providing free internet access in schools, distributing ICT devices, and developing national cloud servers for centralized and secure learning result reporting. Collaborations with edtech service providers can accelerate digitalization efficiently and effectively (Rawal, 2024).

Third, integrating academic information systems with reporting platforms. It is essential to design reporting systems integrated with national databases such as Dapodik, EMIS, and school LMSs. This integration minimizes redundant work for teachers and enables real-time and comprehensive reporting. International interoperability models such as SCORM (Sharable Content Object Reference Model) and xAPI can be used as design references (Ifenthaler et al., 2019).

Fourth, developing adaptive and inclusive reporting systems. Reporting platforms must be user-friendly, responsive to students with special needs, and supportive of differentiated learning reporting. This aligns with the principles of Universal Design for Learning (UDL), which emphasize media and method flexibility to support all learners.

Fifth, incentive policies and periodic evaluations. The government should offer incentive-based policies for schools that successfully implement effective digital reporting systems, such as performance-based school operational funds (BOS). Simultaneously, regular evaluations of the effectiveness of school digital reporting systems are necessary to ensure that assessment data is indeed used to improve learning quality.

Sixth, multi-stakeholder collaboration. Strengthening technology-based assessment reporting cannot rely solely on teachers and schools. Synergy between digital platform developers, academics, research institutions, and parents is essential to designing accurate, communicative, and accessible reporting. A study by Dron & Anderson (2016) emphasizes the importance of learning analytics as a bridge between data, systems, and humans in digital education systems.

CONCLUSIONS AND RECOMMENDATIONS

Technology-based assessment reporting is a crucial part of the digital transformation in education, serving not only as a documentation tool for student achievement but also as a strategic instrument in pedagogical decision-making and policy formulation. The findings of this study reveal that the use of technology in assessment reporting brings several significant benefits, including real-time data presentation, increased transparency, easier access for all stakeholders, informative data visualizations, administrative efficiency, and accelerated formative feedback to students.

Nonetheless, the implementation of digital reporting in Indonesia still faces substantial challenges. These include low digital literacy among teachers, disparities in ICT infrastructure, lack of integration between reporting and academic systems, limited comprehensive technical training, and the suboptimal application of authentic and differentiated assessment aligned with the Merdeka Curriculum. These issues are exacerbated by inadequate adaptation of systems for students with special needs and insufficient use of assessment data in learning decision-making.

To address these challenges, a comprehensive strengthening strategy is required. This strategy includes improving teachers' digital literacy and assessment pedagogy through TPACK-based training, strengthening digital infrastructure and equitable internet access, integrating reporting systems with national databases (Dapodik/EMIS), developing adaptive and inclusive reporting systems based on Universal Design for Learning (UDL) principles, and implementing performance-based incentive policies. Moreover, multi-stakeholder collaboration between schools, government, edtech developers, academics, and parents is critical to create a responsive, efficient, and meaningful assessment reporting ecosystem.

In conclusion, technology-based assessment reporting must be positioned as a central pillar in the digital learning ecosystem. Reporting transformation is not

merely the digitalization of administrative processes but a systematic effort to improve learning quality and ensure that each student receives appropriate interventions based on their needs. Moving forward, integrated, adaptive, and evidence-based digital reporting will be essential prerequisites for realizing quality, inclusive, and sustainable education in the digital age.

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