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Systematic Literature Review: Planning, Implementation, and Evaluation of Assessment for Learning-Based Feedback In Elementary School Mathematics Learning

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ABSTRACT
Background: Mathematics learning at the elementary school level continues to face challenges in feedback management that has not been optimally integrated into the learning process. Although Assessment for Learning (AfL) has positioned feedback as a critical component, in practice its planning, implementation, and evaluation are often carried out separately and inconsistently, resulting in a lack of comprehensive understanding. *Method:* This study employed a Systematic Literature Review (SLR) methodology guided by the PRISMA framework to ensure a systematic and transparent article selection process. Literature searches were conducted across Google Scholar and Scopus databases spanning 2020–2025 using relevant keywords, progressing through stages of identification (100 articles), screening (60 articles), eligibility (40 articles), and final inclusion of 22 articles subjected to in-depth analysis. *Result and Disussions:* Findings indicate that feedback planning is increasingly oriented toward diagnostic assessment and varied instruments, yet remains dependent on teacher competence. Feedback implementation demonstrably improves student engagement and learning autonomy, despite constraints related to time and strategy variation. Feedback evaluation shows a positive impact on learning outcomes, though instrument quality and implementation sustainability require further strengthening. Overall, AfL-based feedback management requires more systematic integration to effectively support meaningful and effective mathematics learning.
Keywords: Assessment For Learning, Elementary School, Feedback, Mathematics Learning, Systematic Literature Review

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INTRODUCTION

Education at the elementary level plays a pivotal role in shaping students' critical, logical, and systematic thinking. This foundation is essential for equipping learners with the competencies required to navigate the complex dynamics of the 21st century (Barus, 2024). Contemporary educational approaches place students at the center of the learning process through meaningful, contextually relevant, and continuous experiences designed to foster deep understanding (Mat & Jamaludin, 2024). Modern curricula are holistically designed to cultivate comprehensive competencies, balancing sharp cognitive development, affective growth, and psychomotor skills. This ideal approach goes beyond pursuing final outcomes it embraces the learning process itself as the heartbeat of students' holistic and meaningful development (Hutagalung et al., 2024). As such, appropriate instructional strategies become the cornerstone for achieving high-quality elementary education that not only equips children with knowledge but also ignites their motivation to face the future.

Educational transformation now represents a fundamental paradigm shift, moving from teacher-centered models toward approaches that afford students broad autonomy to actively explore and construct their own knowledge (Bajac & Fišer, 2024). Supportive learning environments fully encourage students to develop critical thinking, engage in collaborative work, and build independent understanding with confidence (Tang, 2023). Teachers emerge as skilled facilitators who guide the learning process to align precisely with the unique needs and characteristics of each student. Students' dynamic engagement at every stage of learning serves as an important indicator of the success of this transformation (Gayathri, 2024). Ultimately, effective learning emerges from meaningful interactions between students, teachers, and content interactions that sustain a lifelong love of learning.

Mathematics learning at the elementary school level serves as a primary bridge for developing students' numeracy skills and logical reasoning, gradually laying a solid foundation for their future lives (Astri, 2023). Mathematics extends far beyond rigid formulas; it is a powerful thinking tool that enables students to solve complex, real-world problems with intelligence (Lin, 2023). An ideal approach involves students

through open exploration, engaged discussion, and deep reflection on each concept encountered. Teachers are responsible for creating interactive, challenge-rich learning environments that spark curiosity (Widiastuti & Nindiasari, 2022). In essence, this dynamic approach to mathematics produces students with strong conceptual understanding and sharp applicability, prepared to conquer the real world with confidence. Mathematical abstraction is a cognitive process that encourages students to construct their own mathematical knowledge, and its outcomes depend on how concepts are introduced (Hutagalung & Pangaribuan, 2020).

High-quality mathematics learning requires a delicate balance between deep conceptual mastery and precise procedural skills, creating a robust learning foundation (Lischka & Rhodes, 2025). Students deserve ample space to build authentic understanding through meaningful learning experiences, rather than mechanical memorization of procedural steps. Diverse and engaging learning activities naturally cultivate higher-order thinking skills in students (Lischka & Rhodes, 2025). Teachers must design intelligent strategies that prompt students to ask curious questions, engage in lively discussions, and reflect on their own learning achievements (Ernie et al., 2023). Ultimately, this innovative approach becomes an important catalyst for elevating the quality of mathematics into an unforgettable learning experience.

Assessment for Learning (AfL) places the learning process at the heart of every evaluation, transforming assessment from a final measurement tool into a driver of progress (Hansen, 2024). This approach maximizes student learning data to continuously and adaptively refine the instructional process (Van Orman et al., 2025). Feedback emerges as a vital central element, offering an honest picture of student achievement and learning opportunities with high sensitivity. Effective feedback stimulates deep reflection in students while activating their engagement in more intensive learning (Arumugham et al., 2025). In summary, the targeted use of feedback dramatically elevates the quality of learning, creating a vibrant and transformative learning cycle.

In planning feedback, teachers must consider the intellectual developmental stage of elementary school students, who are still at the concrete operational stage. This aligns with the view of Al Fath, Aristya & Sari (2022) that elementary students can more readily grasp abstract mathematical concepts when concrete objects are used to support understanding of learning material. Feedback planning in mathematics learning involves establishing clear objectives, carefully designed strategies, and appropriate forms of communication tailored to each student's unique needs (Wang, 2025). Its implementation demands excellent communicative competence from teachers, ensuring that messages are delivered clearly and leave a lasting impression (Wibowo et al., 2025). Feedback evaluation is equally critical for assessing the extent to which feedback genuinely improves learning outcomes. These three pillars must be closely interconnected, creating a synergy that produces maximum impact on the learning process (Mahlangu, 2025). In essence, the systematic management of feedback forms the backbone of successful Assessment for Learning.

High-quality feedback must be specifically targeted, constructive, and entirely focused on the sustained improvement of student learning. As observed in classroom practice, teachers provide feedback to students and reinforce discussion outcomes, while also giving students opportunities to ask questions about material they have not yet understood (Salam, Akbar & Hanafiah, 2024). It must extend beyond simple right-or-wrong labels and include step-by-step guidance that clearly directs students toward improvement (Mahlangu, 2025). Students must be actively engaged in receiving and applying feedback, making it an integral part of their individual learning journeys (Asante, 2025). Dynamic interactions between teachers and students during the feedback process are the key to successful and vibrant learning. Ultimately, effective feedback boosts students' motivation and autonomy, propelling them toward peak achievement (Brandmo & Gamlem, 2025).

Nevertheless, the implementation of mathematics learning at the elementary level frequently falls short of optimal outcomes. The dominance of rigid, teacher-centered instructional approaches leads to minimal two-way interaction during the conceptual understanding process. Teacher feedback is often generic, reduced to numerical grades without meaningful depth. This situation leaves students confused, unable to understand the roots of their mistakes or how to address them. Although feedback should serve as a powerful tool for improving learning quality, it has instead become underutilized, leaving untapped potential.

The challenges of feedback management are compounded by gaps in teachers' pedagogical competence that still require development. Teachers often struggle to design feedback tailored to the unique personal needs of each student. Limited instructional time further complicates the delivery of deep and meaningful feedback. Accumulating administrative burdens also prevent teachers from exploring innovative instructional strategies. These phenomena underscore the urgent need for greater attention to improving feedback management, with the expectation that an optimized feedback system can significantly enhance the effectiveness and motivation of student learning.

In real classroom settings, students still appear disengaged, with low involvement in mathematics learning. They typically receive grades without exploring the meaning embedded in the feedback provided. The poor quality of feedback impedes students from genuinely reflecting on their own learning processes. Consequently, their critical thinking and problem-solving abilities are undermined, creating lasting limitations on their future potential. Sihotang, Kusnadi & Hutagalung (2020) underscore that a critical component of

mathematics learning is the development of individuals capable of solving problems. The conspicuous gap between ideal aspirations and field realities demands decisive action to address these shortcomings.

These issues reveal the urgency of deeply examining feedback practices in mathematics learning. A comprehensive study is essential for understanding how feedback is planned, implemented, and evaluated across diverse learning contexts. Analysis of prior research opens broad insights into best practices that can be confidently applied. A systematic literature approach emerges as a relevant and incisive pathway for addressing this challenge. New research that integrates findings systematically will serve as a guiding light, bringing genuine transformation to the world of mathematics education.

A number of literature-based studies highlight that the provision of feedback makes a substantial contribution to optimizing students' academic achievement. These studies demonstrate that feedback significantly helps students retain concepts firmly and correct their learning errors. However, most studies still address aspects of feedback in a fragmented manner, without unifying planning, implementation, and evaluation into a holistic whole. Research specifically examining AfL-based feedback in elementary school mathematics remains sparse and limited. This research gap, however, opens wide opportunities for deeper exploration in the service of a brighter and more comprehensive educational future.

This study employs a Systematic Literature Review as an analytical instrument to examine diverse findings on AfL-based feedback management. This methodology empowers researchers to systematically investigate, evaluate, and synthesize research results in a structured and rigorous manner. The process flows through the screening of relevant literature based on strict, uncompromising criteria. Primary attention is directed toward the planning, implementation, and evaluation of feedback in elementary school mathematics learning. The anticipated findings will sow the seeds of more effective learning practices, opening a new era of mathematics education filled with inspiration and tangible impact.

This research is intended to paint a comprehensive and clear map of feedback management trends in dynamic mathematics learning. Its findings will provide a solid foundation for teachers to craft more effective and innovative learning strategies. The results are also ready to serve as a compass for other researchers pursuing deeper inquiry. This study has the potential to bridge the significant gap between abstract theory and lived classroom practice in mathematics. Ultimately, its contributions aim to elevate the quality of elementary education to a sustained and inspired level.

METHOD

This study employed a qualitative approach through a Systematic Literature Review (SLR) method to analyze feedback planning, implementation, and evaluation practices based on Assessment for Learning in elementary school mathematics. This approach draws on the literature review methodology used in various prior studies and was selected because it aligns with the research objectives namely, to identify, evaluate, and synthesize empirical findings from previous studies in a thorough and systematic manner. The SLR is defined as a systematic, explicit, and replicable approach for locating, evaluating, and integrating research evidence relevant to a specific focus of inquiry (Snyder, 2020). Through this method, diverse research findings are comprehensively analyzed using procedures that are structured, transparent, and accountable at every stage (Fazira et al., 2023).

In its implementation, this study was also guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure that the identification, selection, and reporting of articles were conducted in a systematic and transparent manner (Page et al., 2021). The application of PRISMA was intended to minimize bias and to enhance the validity and reliability of the synthesized findings. Accordingly, this study was designed to address the following research questions: (1) How is AfL-based feedback planned in elementary school mathematics learning? (2) How is feedback implemented to support the student learning process? and (3) How is feedback evaluated to improve the quality of mathematics learning for elementary school students.

The stages of the SLR process following the PRISMA guidelines comprised:

1. Identification Stage. The initial stage involved formulating research questions aligned with the established problem statements, specifically concerning the planning, implementation, and evaluation of AfL-based feedback in elementary school mathematics learning. Literature identification and retrieval were subsequently conducted across Scopus, ScienceDirect, ERIC, and Google Scholar databases, using keywords such as "assessment for learning," "feedback," "mathematics learning," and "elementary school," with a publication year range of 2020–2025.
2. Screening Stage. Article selection was carried out by applying inclusion and exclusion criteria. Inclusion criteria encompassed scientific journal articles relevant to the topic of AfL-based feedback in elementary school mathematics learning and addressing aspects of feedback planning, implementation, or evaluation. Exclusion criteria included articles that were irrelevant, not fully available in full text, or did not meet scientific publication standards.
3. Eligibility Stage. Screening was conducted in stages and in greater detail, beginning with 100 articles obtained in the initial search phase. Forty articles were subsequently eliminated due to misalignment with the research topic, leaving 60 articles. A further screening step excluded 20 additional articles 15 lacking a DOI and 5 deemed

irrelevant based on title and abstract review resulting in 40 articles meeting the eligibility criteria.

4. Inclusion Stage. From the 40 eligible articles, 22 of the most relevant articles were selected for in-depth analysis in accordance with the research objectives.
5. Analysis Stage. The analysis stage involved reviewing, categorizing, and synthesizing findings from the 22 selected articles into tabular and narrative forms. This process aimed to generate systematic, objective, and in-depth discussion aligned with the research questions.

The entire SLR process is presented in the form of a flowchart depicting the stages of identification, screening, eligibility assessment, and article inclusion (n = 22), rendering the research process more transparent and comprehensible. The following presents the SLR research flowchart following PRISMA guidelines:

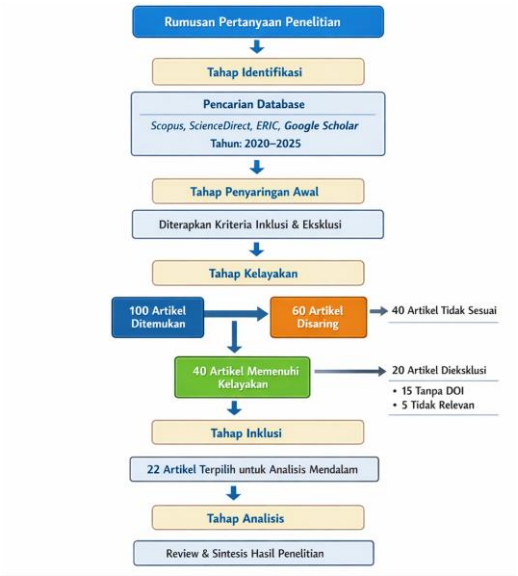

Figure 1. SLR Stage Flowchart (PRISMA)

RESULTS AND DISCUSSION

Feedback Planning Based on Assessment for Learning

Table 1 below presents findings from studies relevant to feedback planning based on Assessment for Learning :

Table 1. Feedback Planning Based on Assessment for Learning

No	Title	Author	Journal	Year	Key Findings
1	Description of Assessment: AfL and AaL	Rahmad Hidayat, Imam Sujadi, Budi Usodo	Journal of Educational Research and Evaluation	2023	Assessment was designed as an integrated component of learning, student-oriented, and emphasizing authentic evidence of learning achievement.
2	Implementation of Assessment in the Merdeka Curriculum at the Elementary School Level	Anas Tasya Aprillia Hadi, Sulistyowati, Nurul Hikmah	KARTIKA: Jurnal Studi Keislaman	2025	Assessment planning begins with diagnostic assessment to map student needs as a foundation for differentiated instruction.
3	Implementation of Cognitive Diagnostic Assessment at Elementary School	Sinta Afrilia, Yunika Afryaningsih, Dessi Setyowati	Jurnal Pendidikan Universitas Garut	2025	Assessment planning employed varied instruments adapted to student ability levels and subject characteristics.
4	How is the impact of assessment for learning (AfL) on mathematics learning in elementary schools?	Eri Yusron, Sudiyatno Sudiyatno	Jurnal Prima Edukasia	2021	AfL planning involves identifying student ability levels and planning instructional follow-up actions.
5	Training and Mentoring in Designing Portfolio-Based Assessment for Learning Instruments for School Teachers	Jenny Indrastoeti Siti Poerwanti, Retno Winarni	Jurnal Widya Laksana	2021	Portfolio-based AfL planning enhanced teachers' competence in developing assessment instruments.
6	Teachers' Perceptions and Practices of Assessment in Primary Schools	Alena Letina, Alma Skugor, Suzana Tomas	European Journal of Educational Research	2025	Effective assessment and feedback planning requires strengthening teacher competence, providing instruments such as rubrics, and integrating AfL into instructional design.

No	Title	Author	Journal	Year	Key Findings
7	The effect of assessment for learning on pre-service mathematics teachers' higher-order thinking skills in algebra	Ayanaw Yigletu, Kassa Michael, Mulugeta Atnafu	Journal of Pedagogical Research	2023	AfL was designed through learning modules with self-assessment and peer-assessment strategies that enhanced understanding and learning engagement.
8	Assessment for Learning as a Driver for Active Learning and Learner Participation in Mathematics	Sizwe Blessing Mahlambi	International Journal of Educational Methodology	2021	AfL was designed as a student-centered learning approach that promotes active participation in mathematics learning.

Feedback planning based on Assessment for Learning (AfL) demonstrates that assessment is no longer positioned as a terminal activity, but rather as an integral component of the learning process. Hidayat et al. (2023) affirm that assessment is designed in an integrated manner, student-oriented, and emphasizing authentic evidence of learning achievement. This is consistent with Hadi et al. (2025), who state that assessment planning begins with diagnostic assessment to map student needs. Furthermore, Yusron and Sudiyatno (2021) show that AfL planning involves the identification of students' prior ability levels and the planning of follow-up instructional actions. These findings indicate that feedback planning within AfL is systematic and grounded in students' actual conditions.

Moreover, feedback planning within AfL also emphasizes the use of varied and contextually relevant instruments. Afrilia et al. (2023) demonstrate that assessment planning incorporates multiple instruments adapted to student characteristics and subject matter. This is reinforced by Poerwanti and Winarni (2021), who found that portfolio-based planning enhanced teachers' competence in developing assessment instruments. Letina et al. (2025), meanwhile, highlight the importance of using rubrics and integrating AfL into instructional design to improve the quality of learning outcomes. These findings indicate that the quality of feedback planning is significantly influenced by the readiness of the instruments employed. Consequently, sound planning must focus not only on objectives but also on the relevance of the measurement tools used.

Nevertheless, upon closer analysis, feedback planning within AfL continues to face challenges in its implementation. Yigletu et al. (2023) demonstrate that despite the design of strategies such as self-assessment and peer-assessment, their application still requires readiness on the part of both students and teachers. Mahlambi (2021) further affirms that student-centered AfL planning necessitates a paradigm shift in learning that is not always easily accomplished. Letina et al. (2025), meanwhile, reiterate that teacher competence is a key factor in the success of feedback planning. This indicates that sound planning does not necessarily yield optimal implementation if teacher capacity is insufficient. There is therefore a need to strengthen teacher professionalism in designing feedback.

Examined more closely, AfL-based feedback planning shows a tendency toward more reflective and participatory learning. Hidayat et al. (2023) emphasize the importance of authentic evidence as a basis for planning, while Hadi et al. (2025) underscore the role of diagnostic assessment in differentiated instruction. Mahlambi (2021), meanwhile, demonstrates that AfL planning promotes students' active engagement in the learning process. These differences in emphasis indicate that feedback planning is not monolithic but evolves in accordance with the learning context. AfL-based feedback planning can thus be understood as a dynamic process that demands continuous adaptation.

Overall, AfL-based feedback planning demonstrates that effective learning begins with thorough, structured, and student-needs-oriented planning. Such planning encompasses not only the determination of objectives but also the strategies, instruments, and approaches employed in delivering feedback. Sound planning must also accommodate student diversity and promote active engagement in learning. However, the success of planning depends heavily on teacher competence and implementation readiness in the field. Therefore, strengthening teacher capacity is the key factor in optimizing AfL-based feedback planning.

Feedback Implementation in Supporting the Learning Process

Table 2 below presents various studies relevant to feedback implementation in supporting the learning process:

Table II. Feedback Implementation in the Learning Process

No	Title	Author	Journal	Year	Key Findings
1	Effectiveness of the NHT Model Based on Assessment for Learning in Terms of Mathematics Learning Independence	Asri Fauzi, Aisa Nikmah Rahmati	Journal of Elementary Education	2023	The NHT model based on AfL improved learning independence, although the effect size was relatively modest (N-Gain: 0.364).

No	Title	Author	Journal	Year	Key Findings
2	Application of Assessment for Learning in Enhancing Students' Reflective Skills	Ahmad Fauzi, Awaluddin Al-zainuri	PENDIRI: Jurnal Riset Pendidikan	2024	Formative feedback combined with self-assessment enhanced students' reflective and metacognitive skills.
3	Assessment for Learning: Changes in the Role of Assessment in Learning	Tatang Mulyana, Surti Kurniasih, Didit Ardianto	IJORER: International Journal of Recent Educational Research	2021	AfL promoted student engagement and repositioned the teacher as a learning facilitator.
4	Interactive Feedback for Learning Mathematics in a Digital Learning Environment	Alice Barana, Marina Marchisio, Matteo Sacchet	Education Sciences	2021	Interactive feedback helped identify student difficulties and supported adaptive learning.
5	Study on the Role and Problems of Learning Feedback in Primary School Mathematics Classroom Teaching	Huimin Liu	Proceedings of the 3rd International Conference on Social Psychology and Humanity Studies	2025	Feedback implementation still faces constraints, including low frequency, limited variety, and time restrictions.
6	Improving Assessment and Feedback in the Learning Process: Directions and Best Practices	Tatiana Tutunaru	Research and Education	2023	Feedback was delivered through varied forms such as written comments, discussions, and direct interaction. Effective feedback must be specific, constructive, and balanced between strengths and areas for improvement.
7	Supporting primary students' mathematical reasoning practice: the effects of formative feedback and the mediating role of self-efficacy	Robbert Smit, Heidi Dober, Kurt Hess, Patricia Bachmann, Thomas Birri	Research in Mathematics Education	2022	Feedback was tailored to student ability levels and contributed to improving self-efficacy and mathematical reasoning.
8	Students' perspective on feedback in mathematics in high school	Ann Karin Sandal, Ann Kristin Sperle	Cogent Education	2024	Feedback implementation was not yet systematically integrated, resulting in students experiencing difficulty in utilizing feedback for learning improvement.

The role of feedback in mathematics learning is increasingly recognized as an integral part of the learning process, rather than merely an evaluative activity at the conclusion of instruction. Fauzi and Rahmati (2023) demonstrate that the application of the Numbered Heads Together model based on Assessment for Learning can foster students' learning independence, though the improvement remains relatively moderate. This finding is corroborated by Fauzi and Al-zainuri (2024), who affirm that formative feedback combined with self-assessment can help students reflect more deeply on their own learning processes. Mulyana et al. (2021) also reveal that the implementation of AfL contributes to increased student engagement and repositions the teacher's role as a learning facilitator. This demonstrates that feedback holds considerable potential for creating more active and meaningful learning.

Variation in feedback delivery is an important factor influencing its effectiveness. Barana et al. (2021) show that interactive feedback in digital learning environments assists teachers in identifying student difficulties more quickly and accurately. Tutunaru (2023), meanwhile, explains that feedback can be delivered in multiple forms both written and verbal as long as it provides clear direction. Smit et al. (2022) found that adapting feedback to students' ability levels can enhance their confidence and mathematical thinking. These findings suggest that flexibility in feedback strategies is, in fact, a strength in supporting the diverse learning needs of students.

Field practice reveals that feedback implementation is not yet fully optimal. Liu (2025) notes that feedback is frequently delivered at limited frequency and with insufficient variety, diminishing its impact on learning. Sandal and Sperle (2024) similarly found that feedback has not been systematically integrated into the learning process, making it difficult for students to utilize it as a means of improvement. Even Fauzi and Rahmati (2023) note that the presence of feedback has not yet significantly improved student learning outcomes. This situation indicates that the primary issue lies not in whether feedback is provided, but in the quality of its implementation in the classroom.

The substantive quality of feedback is a crucial factor determining its effectiveness in supporting learning. Tutunaru (2023) asserts that effective feedback must be specific, clear, and provide concrete guidance for students. This aligns with Smit et al. (2022), who show that targeted feedback can boost students' confidence in solving mathematical problems. Fauzi and Al-zainuri (2024) also emphasize the importance of student involvement in the reflection process to make feedback more meaningful. Feedback thus functions not only as an indicator of errors but also as a guide to improvement that fosters sustained learning development.

Overall, feedback implementation makes a significant contribution to improving the quality of student learning. It promotes engagement, independence, and deeper levels of thinking. Nevertheless, a range of challenges persist including time constraints, insufficient variety, and suboptimal integration into learning. In addition, the quality of feedback remains a primary determinant of its success. Therefore, more targeted and systematic feedback management is an important need for enhancing instructional effectiveness. This is also consistent with the finding that social media has shaped younger generations' communicative habits toward more concise, symbolic, and varied language use, suggesting that teachers' feedback delivery approaches should adapt accordingly (Putri & Widyaningsih, 2021).

Feedback Evaluation in Learning

Table 3 below presents various studies relevant to feedback evaluation in learning:

Table III. Feedback Evaluation in the Learning Process

No	Title	Author	Journal	Year	Key Findings
1	Assessment for Learning Oriented toward Higher-Order Thinking Skills to Stimulate Numeracy Literacy Competence	Khoiriah	Jurnal Didaktika Pendidikan Dasar	2022	AfL effectively improved students' numeracy literacy with high achievement rates (80–82%).
2	Three Paradigms of Educational Evaluation: A Developmental Map	Agung Prihantoro	AoEJ: Academy of Education Journal	2021	AfL serves to improve the learning process and complement summative assessment.
3	Formative Assessment and Mathematics Education: The Perspective of In-Service Mathematics Teachers	Alejandra Balbi, Micaela Bonilla, Maria Alejandra Otamendi, Karina Curione, Pablo Beltrán-Pellicer	Acta Scientiae	2022	AfL was effective, yet requires adequate time, adaptation, and teacher readiness for implementation.
4	Feedback in mathematics education research: a systematic literature review	Sharmin Soderstrom, Torulf Palm	Research in Mathematics Education	2024	Feedback is a critical component in improving the quality of mathematics learning; interactive feedback assists in identifying student difficulties and supports adaptive learning.
5	How is the impact of assessment for learning (AfL) on mathematics learning in elementary schools?	Eri Yusron, Sudiyatno Sudiyatno	Jurnal Prima Edukasia	2021	AfL evaluation demonstrated improvements in learning outcomes, as well as the need for enhanced evaluation instruments and time management.
6	The Effect of Teacher's Feedback on Student Academic Achievement: A Literature Review	Angelos Charalampous, Maria Darra	Journal of Education and Learning	2024	Feedback significantly improves learning outcomes, particularly when delivered in a descriptive, corrective, and sustained manner throughout the learning process.

Evaluation of feedback implementation in learning demonstrates that its presence has a significant impact on improving the quality of student learning, particularly in the context of mathematics education. Khoiriah (2022) found that the application of Higher-Order Thinking Skills-oriented Assessment for Learning effectively improved students' numeracy literacy with notably high achievement rates of 80–82%. These findings demonstrate that feedback functions not merely as an evaluation instrument but also as a strategy for developing higher-order thinking skills. Nevertheless, these achievements also indicate that AfL's effectiveness depends heavily on how the evaluation process is designed and systematically implemented. In other words, feedback success does not occur automatically it requires well-considered evaluation planning.

From a more conceptual perspective, Prihantoro (2021) explains that educational evaluation has developed across several paradigms, with AfL occupying an important position as a complement to summative assessment. AfL is not only used to measure final outcomes but also to continuously improve the learning process. This demonstrates that feedback evaluation should be formative and process-oriented, rather than solely focused on results. In practice, however, many instructional settings still treat evaluation as a purely terminal activity, leaving feedback's potential as an improvement tool inadequately exploited. This situation reveals a gap between the ideal concept of evaluation and its actual field implementation.

Further, Balbi et al. (2022) reveal that feedback evaluation in mathematics learning is considered effective by teachers, yet its implementation requires adequate time, adaptation, and readiness. This suggests that while feedback theoretically offers substantial benefits, its practical application is not always straightforward. Teachers frequently face time constraints and heavy workloads, preventing feedback evaluation from being conducted optimally. These findings also indicate that the success of feedback evaluation is determined not only by the method employed but also by the readiness of human resources to manage it. Teacher support is therefore a critical aspect of improving the quality of learning evaluation.

As Al Fath (2021) emphasizes, students are no longer passive; they actively learn and develop the capacity to manage their own learning rather than relying on being spoon-fed.

The systematic review conducted by Söderström and Palm (2024) reinforces the importance of feedback evaluation in mathematics learning. That research demonstrates that interactive feedback helps teachers identify student difficulties and supports more adaptive learning. Furthermore, feedback is positioned as a core component in improving the overall quality of mathematics learning. Nevertheless, feedback's effectiveness is significantly influenced by how evaluation of the feedback itself is conducted. If evaluation fails to accurately capture students' needs, the feedback provided risks becoming less relevant. Feedback evaluation must therefore be conducted in a reflective, data-driven manner.

Findings from Yusron and Sudiyatno (2021) indicate that AfL evaluation contributes to improved learning outcomes for elementary school students. However, that research also highlights the need for improvement in evaluation instruments and time management during implementation. This demonstrates that feedback evaluation is concerned not only with achieved outcomes but also with the quality of the measurement tools employed. Inadequate instruments can cause the feedback provided to be insufficiently accurate and misaligned with student needs. The development of valid and reliable evaluation instruments is therefore of great importance in supporting feedback effectiveness.

Meanwhile, Charalampous and Darra (2024) affirm that feedback exerts a significant influence on students' academic achievement, particularly when delivered in a descriptive, corrective, and sustained manner. This demonstrates that feedback evaluation assesses not only whether feedback is given, but also its quality and continuity. General, non-specific feedback tends to produce little meaningful impact on students. Conversely, clear and sustained feedback enables students to understand their errors and improve their learning processes. The quality of feedback evaluation is thus a key factor in determining learning success.

Overall, feedback evaluation in learning demonstrates that while it holds considerable potential for improving learning outcomes, implementation continues to face various challenges. The gap between concept and practice, time constraints, and suboptimal evaluation instruments are factors that require attention. In addition, the quality of feedback produced depends significantly on how the evaluation process is conducted. There is therefore a need for more systematic efforts in designing, implementing, and evaluating feedback so that it genuinely supports effective and sustainable learning.

This study acknowledges several limitations that must be transparently disclosed to enable proportional interpretation of the findings. First, only articles indexed in specific databases Google Scholar, ERIC, and Scopus were included, meaning that relevant studies outside these databases may not have been captured. Second, the publication range was restricted to 2021–2025, excluding important findings from research conducted prior to that period. Third, most analyzed articles were written in English or Indonesian; studies in other languages, such as Mandarin, Spanish, or Arabic, were not considered. Fourth, the number of articles analyzed per theme (planning, implementation, and evaluation) was relatively limited, ranging from 6 to 8 articles per category, necessitating caution in generalizing findings. Fifth, this study did not perform statistical meta-analysis to quantify effect sizes, meaning that conclusions are descriptive-interpretive in nature. Sixth, the research contexts examined varied widely from elementary schools in Indonesia to international settings so differences in educational systems, classroom cultures, and curricula may affect the relevance of findings when applied to specific contexts.

CONCLUSION

The findings of this review reveal that AfL-based feedback management in elementary school mathematics learning encompasses three interrelated aspects: planning, implementation, and evaluation. At the planning stage, effective feedback begins with diagnostic assessment, the use of varied instruments, and orientation toward students' genuine needs; however, its success is critically determined by teachers' competence in designing the process. At the implementation stage, feedback demonstrably improves student engagement, learning independence, and reflective capacity, though it remains constrained by time limitations, infrequent delivery, and insufficient strategy variation in practice. At the evaluation stage, feedback that is descriptive, corrective, and sustained consistently contributes to improved learning outcomes, yet the quality of evaluation instruments and teacher readiness remain primary obstacles. Taken as a whole, the effectiveness of AfL is not determined solely by the presence of feedback, but by the quality of its design, the consistency of its application, and the continuity of its evaluation.

Based on these findings, future research should be directed toward experimental or quasi-experimental studies to measure the causal impact of AfL-based feedback; quantitative meta-analyses with broader scope to generate more accurate effect size estimates; and longitudinal research to examine how the impact of feedback develops over time. Additionally, cross-cultural comparative studies and the development of contextually appropriate feedback models within the Merdeka Curriculum framework are urgently needed. The findings of this study carry concrete practical implications: teachers must integrate feedback as a routine instructional component with specific and structured strategies; schools must provide professional development programs and adequate resource support; and policymakers must establish operational AfL technical guidelines while incorporating formative feedback competence as a mandatory element in teacher training, given that teacher capacity is the most critical factor in ensuring successful feedback implementation in the field.

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