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Innovation in Mathematics Learning Through Discovery Learning and Flashcard Media in Elementary Madrasahs

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ABSTRACT

Mathematics learning in Madrasah Ibtidaiyah often faces significant obstacles due to a lack of interest and motivation in learning among students. This is often associated with using traditional and less interesting teaching methods, which do not meet students' basic psychological needs. To overcome this problem, this study used qualitative methods and purposive sampling to select respondents according to the study's needs. Data were collected through passive observation, semi-structured interviews, and documentation techniques, which were then analyzed using an interactive analysis model. This process facilitated an in-depth evaluation of the impact of using the Discovery Learning model supported by flashcard media. The results of this study indicate an increase in student engagement and motivation with the implementation of the Discovery Learning model and flashcards, characterized by increased interaction during learning sessions and a better understanding of mathematical concepts. Based on these results, it is recommended that educators integrate interactive and student-centered teaching methods, such as Discovery Learning, to increase engagement and motivation in learning mathematics. Further research is needed to explore the long-term impact of this pedagogical approach on student learning outcomes and satisfaction by comparing it with traditional teaching methods. This study's contribution is to prove that the Discovery Learning method and the use of flashcards are effective in increasing students' mathematical engagement and understanding. This supports the use of more interactive learning approaches to increase learning motivation. In addition, this study recommends further studies to assess the long-term impact of this method compared to traditional teaching, providing an important contribution to future educational research.

INTRODUCTION

Mathematics learning in Madrasah Ibtidaiyah faces various challenges, especially low student interest and motivation in learning (Xia et al., 2022; Waswa & Al-Kassab, 2023). Low learning motivation is often caused by the unfulfilled basic needs of students, such as a sense of security and social support, as expressed in Abraham Maslow's motivation theory (Henwood et al., 2015; Hayre-Kwan et al., 2021; Bowen, 2021). On the other hand, mathematics is also often considered difficult and tedious due to a less interactive and uninteresting teaching approach (Fung et al., 2018; Russo et al., 2020; Atamosa & Dioso, 2024). These challenges indicate the need for updates in learning methods to make students more actively involved (Castro & Zermeno, 2020; Kwangmuang et al., 2021; Konak et al., 2024). This study aims to apply the Discovery Learning model supported by flashcard media as an innovative approach to increase student motivation and participation in mathematics learning. This model is designed to help students understand concepts more contextually and enjoyably, which aligns with the Ministry of Education and Culture policy, which emphasizes the importance of a scientific approach in teaching and learning.

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Previous studies have shown that low motivation is a significant challenge in mathematics learning in Madrasah Ibtidaiyah (Waskitoningtyas, 2016; Hardi et al., 2022). In this context, Maslow's motivation theory, applied by Alhashem (2022), emphasizes the importance of fulfilling students' basic needs to increase learning motivation. Contextual and interactive learning approaches, as proposed by Suryawati & Osman (2018) and Pratiwi et al. (2024), along with Piaget's constructivism theory (Pagán, 2006; Mensah, 2015), are effective in improving mathematical understanding. In addition, as discussed by Flora et al. (2020), Vygotsky's social interaction and scaffolding theories also play an essential role in children's cognitive development. The emphasis on learning media, such as flashcards, which support students' creativity and activity, has been proven by Yowaboot & Sukying (2022). However, mathematics is still often considered a scary subject (Chand et al., 2021; Weir, 2023). Based on these findings, this study aims to analyze the planning, implementation, and evaluation of the Discovery Learning learning model in mathematics learning with flashcard media to overcome these challenges.

This study uses the Discovery Learning model and flashcards to analyze three main aspects of mathematics learning. First, the planning process involving these two tools must be evaluated. Second, to investigate the effect of implementing this model on student interaction and engagement in learning sessions. Third, to assess the model's effectiveness in improving students' mathematical understanding. This study contributes significantly to mathematics education by increasing student engagement through independent exploration, supporting the development of critical thinking skills, and providing practical evaluation of learning, which helps teachers optimize teaching strategies. In addition, the inclusive approach applied allows students of various ability levels to access the material effectively, provides insights and recommendations for more innovative and engaging teaching approaches, and produces documentation of best practices in mathematics education. This study hypothesizes that using the Discovery Learning model with flashcards will increase student engagement in mathematics learning more effectively than traditional learning methods.

The Discovery Learning model, equipped with the use of flashcards, is designed to improve students' understanding of mathematical concepts and conceptual abilities. With this method, students are expected to develop their critical thinking skills more effectively during the learning process. The proposed hypothesis also states that through Discovery Learning evaluation, teachers can obtain more in-depth and valuable feedback, which will help them optimize their teaching strategies. Furthermore, the inclusive approach integrated with flashcards allows all students, including those with special needs or at various levels of academic ability, to access and understand learning materials better. This approach aims to create a supportive and efficient learning environment for each student. The effectiveness of this Discovery Learning model will be examined through systematic data collection and analysis, hypothesis verification, and evaluation of students' mathematics learning outcomes.

RESEARCH METHODS

This study uses a qualitative approach chosen based on the research objectives. The qualitative approach aims to produce descriptive data in the form of written or spoken words from research subjects, reflecting their behavior as researchers observe (Tenny et al., 2022; Lim, 2024). The type of research applied is descriptive qualitative research, where the data collected is presented in the form of words, not numbers. This approach allows researchers to provide a detailed and factual picture of the findings in the field. Research subjects were selected using purposive sampling techniques, which are carried out deliberately by considering specific categories relevant to the research objectives (Etikan et al., 2015; Turner, 2020). This technique ensures that the selected participants have characteristics or experiences that match the research needs so that the data obtained can support a more in-depth analysis and are relevant to the problems being studied.

This study collected data through three main techniques: passive participant observation, semi-structured interviews, and documentation. In the passive participant observation technique, researchers observe without being directly involved with the subjects so that their natural behavior can be observed without intervention (Creswell, 2014). Semi-structured interviews are used to obtain

in-depth information flexibly but remain focused on the research objectives (Kvale & Brinkmann, 2009). Meanwhile, documentation techniques involve collecting relevant written and visual notes to support the research results (Bowen, 2009).

The data analysis process follows the interactive analysis model proposed by Miles and Huberman (1994), which consists of three main stages: data condensation, data presentation, and conclusion. In the data condensation stage, the information obtained is summarized and focused on relevant aspects of the research. The summarized data is then organized and presented clearly in the data presentation stage. In the final stage, conclusions are drawn by identifying patterns and insights from the available data and verifying them through further analysis. The validity of the data is ensured through triangulation of sources and techniques. Information is verified by comparing data from various sources and using multiple collection techniques, thus providing the reliability and accuracy of the research findings (Patton, 2002). This method allows for valid and credible research results, supporting the overall objectives.

RESULTS AND DISCUSSION

Result

Discovery Learning Planning with Flashcards in Mathematics Learning

A comprehensive learning planning strategy and Discovery Learning approach have been implemented to improve the quality of mathematics learning at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang. Planning activities involve the preparation of documents, such as annual programs and lesson plans, which begin two weeks before learning begins. By implementing the Discovery Learning model, students actively explore and build knowledge, with the support of interactive learning methods such as PMRI and STEM and using varied learning media such as flash cards. This initiative makes the material more interesting and helps deepen students' understanding of mathematical concepts effectively.

Table 1. Learning Planning In Elementary Madrasahs

No	Findings	Description
1	Comprehensive Planning	Mathematics teachers at MI Al-Ma'arif 02 Jombang carry out comprehensive planning, including annual programs, semester programs, syllabuses, and Learning Implementation Plans (RPPs). This preparation begins two weeks before learning is implemented.
2	Implementation of Discovery Learning Model	The discovery learning model is adopted as the primary approach. In this model, students actively explore and build knowledge through problem-solving and investigation, encouraging deeper engagement and interaction.
3	Fun Learning Methods	Various methods are applied that support fun learning, including Realistic Mathematics Education (PMRI), project-based learning, and STEM, all of which support a deep understanding of mathematical concepts in authentic contexts.
4	Readiness of Learning Resources	Teachers prepare various learning resources, including textbooks, worksheets, and online resources, that support comprehensive and varied learning activities.
5	Use of Learning Media	Learning media used include flashcards, picture cards, and natural objects. These media facilitate the effective delivery of educational information and help visualize mathematical concepts.

The findings from the Discovery learning planning with flashcard media at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang show an innovative approach to teaching mathematics. Although this strategy supports interactive learning, it is necessary to ensure that all teachers are adequately trained to implement this method effectively. In addition, methods such as PMRI and STEM must be integrated, followed by a systematic evaluation to assess their effectiveness in learning outcomes. Adapting learning resources to local needs and student diversity is also crucial to ensure the material is relevant to all. Finally, using learning media such as flashcards must be accompanied by teacher training to maximize their potential. By considering these factors, the learning approach at the madrasah can be more effective and comprehensively meet students' learning needs.

Implementation of Discovery Learning with Flashcards in Mathematics Learning

The following table summarizes the significant findings of the mathematics learning process to assess the effectiveness of implementing the Discovery Learning model at Madrasah Ibtidaiyah Al-Ma'arif Jombang. This table covers various aspects, from the teacher's approach at the beginning of learning to the reflection and feedback stages, highlighting how various pedagogical strategies are applied to maximize student engagement and skill development. Each component in this table illustrates how combining innovative learning techniques and effective social interactions can enrich the learning experience, promote deep understanding, and facilitate the development of students' self-confidence and critical skills. This table provides an overview of how well-designed learning can produce positive learning outcomes.

Table 2. Implementation of MI Al-Ma'arif Jombang Learning

No	Findings	Explanation
1	Personal Approach at the Beginning of Learning	Initial activities involving attendance checks and questions about student well-being create a comfortable environment and encourage student motivation and participation in learning.
2	Implementation of Discovery Learning Model	This learning model emphasizes inquiry-based learning that makes the teacher act as a facilitator, allowing students to interact and construct their knowledge actively.
3	Activation of Prior Knowledge	Learning media such as flashcards and props such as protractors stimulate students' curiosity and activate prior knowledge, which helps build a more complex understanding of concepts.
4	Development of High-Order Thinking Skills	Students develop critical thinking skills such as analysis and evaluation through formulating questions and group discussions.
5	Collaboration and Social Interaction as Learning Media	Learning through group discussions and collaboration emphasizes Vygotsky's social constructivism theory, which states that social interaction enriches learning.
6	Use of Teaching Aids to Understand Abstract Concepts	The use of props in mathematics helps students visualize and understand abstract concepts, making the material more accessible.
7	Reflection and Feedback Process	The final stage of the learning process, when students compare their answers with the textbook material, is an opportunity for deep reflection and metacognitive learning. It is also an opportunity for teachers to provide feedback that strengthens understanding and increases student confidence.

Implementing learning at MI Al-Ma'arif Jombang shows positive steps with a personal approach, the Discovery Learning model, and practical teaching to increase student motivation and understanding. The individual approach creates a comfortable learning environment, while the Discovery Learning model allows students to interact and construct their knowledge actively. Activation of previous knowledge through media such as flashcards and teaching aids helps students understand abstract concepts better. In addition, developing critical thinking skills and collaboration through group discussions reflects the application of Vygotsky's social constructivism theory. The reflection and feedback process at the end of learning provides opportunities for students to deepen their understanding. However, several aspects, such as providing adequate scaffolding, division of roles in groups, and more structured reflection guides, need to be improved. Overall, this implementation is exemplary, but further adjustments are required to ensure optimal learning outcomes for all students.

Discovery Learning Evaluation Results with Flashcard Media

The evaluation of the implementation of the Discovery Learning model in the mathematics class of Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang revealed several significant findings that provide valuable insights into the effectiveness of this method in the context of elementary education. The findings highlight how structured and interactive learning activities can improve students' engagement and understanding of mathematics materials. Furthermore, the evaluation also showed that while most students showed increased activity and understanding, many still needed more attention to achieve the expected level of experience. Thus, these results validate the effectiveness of

using flashcard media and the Discovery Learning method and emphasize the need for more focused support strategies for students who experience difficulties.

Table 3. Student Learning Outcomes in Mathematics Learning

Activeness of Class IV A1 Students		
No.	Category	Percentage
1	Very active	31%
2	Active	56%
3	Quite active	13%
4	Less active	-
5	Very less active	-
Average value		84

Class IV A2 Student Activity		
No.	Category	Percentage
1	Very active	35%
2	Active	53%
3	Quite active	12%
4	Less active	-
5	Very less active	-
Average value		85

From the existing data, 13% of class IV A1 students are pretty active, 56% are active, and 31% are very active. The average final student activity score is 85, which means it is in the active category, with 12% quite active, 53% active, and 35% very active. The use of discovery learning models and flashcard media makes it easier to convey and understand the material and work on questions. However, some students are less active and prefer to play alone, so they need help understanding the material. In the knowledge assessment, in class IV A1, nine students got a score above the KKM, 3 got a score just above the KKM, and four got below the KKM. In class IV A2, 12 students got a score above the KKM, 1 got a score just above the KKM, and four got below the KKM. This shows that there are still students who have not completed their mathematics learning, as in the data below:

Table 4. Mathematics Learning Outcomes

Knowledge Assessment Data for Class IV A1 Students

No	Rating result	Number of students
1	Value above KKM	9
2	KKM pass value	3
3	Value below KKM	4
Amount		16

Knowledge Assessment Data for Class IV A2 Students

No	Rating result	Number of students
1	Value above KKM	12
2	KKM pass value	1
3	Value below KKM	4
Amount		17

From the mathematics knowledge assessment results for grade IV A1 and A2 students at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang, it can be seen that most students have successfully achieved and exceeded the Minimum Completion Criteria (KKM). In grade IV A1, nine students achieved scores above the KKM; in grade IV A2, the number increased to 12. However, four students in each class still score below the KKM, indicating the need for further educational intervention. The inconsistency in achieving the KKM pass score between the two classes, with three students in grade IV A1 and only 1 in grade IV A2, indicates differences in learning effectiveness that may be influenced by teaching methods or individual student factors. These data underscore the importance of a more in-depth analysis of teaching methods and the implementation of remedial strategies to help struggling students and curriculum adjustments to improve overall learning outcomes.

Discussion

Effective Collaboration in Discovery Learning Preparation

The learning preparation process at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang shows how effective collaboration between teachers and principals can strengthen the implementation of the Discovery Learning model. This collaboration, which is based on Vygotsky's (1978) social learning theory, emphasizes that learning is a process that occurs socially and becomes more effective through active interaction between students and their environment (Okita, 2012; Huang & Lajoie, 2023). The stages of this collaboration start from annual and semester program planning to developing a detailed

Learning Implementation Plan (RPP) (Suharsono et al., 2024). References from Rayuni (2010) and Koto (2020) help compile RPPs that are not only by academic standards but also relevant to current educational needs. With the active involvement of the madrasah principal, all critical aspects of the learning process, such as the preparation of portals, the creation of promissory notes, and the preparation of syllabuses, are guaranteed to be ready by the prevailing educational demands, ensuring that every step of the teaching and learning process in this madrasah is designed to achieve optimal learning outcomes (Fairuz, 2020; De Felice et al., 2023).

This collaboration not only facilitates administrative preparation but also strengthens the pedagogical approach taken by teachers in the classroom. The Discovery Learning model adopted requires teachers to be active facilitators who guide students through problem-solving and investigation (Darling-Hammond et al., 2019; Almulla, 2020). This approach is based on Piaget's constructivist theory, which emphasizes the importance of direct experience in learning to deepen understanding and knowledge construction (Piaget, 1950). Effective collaboration in planning and implementing this model ensures that all learning activities are designed to maximize student participation and offer engaging and interactive learning opportunities (Könings et al., 2020; de Jong et al., 2022).

Furthermore, this collaboration also creates a supportive environment for sharing resources and learning strategies between teachers, which enriches the learning experience and improves the overall quality of education (Benchetrit & Katz, 2019; Popkewitz, 2022). According to Slavin (1996), collaboration in the educational context can improve teaching effectiveness and student motivation. This reflects the madrasah's commitment to integrating the principles of the 2013 curriculum innovatively and effectively while ensuring that all students receive a fun and meaningful mathematics education.

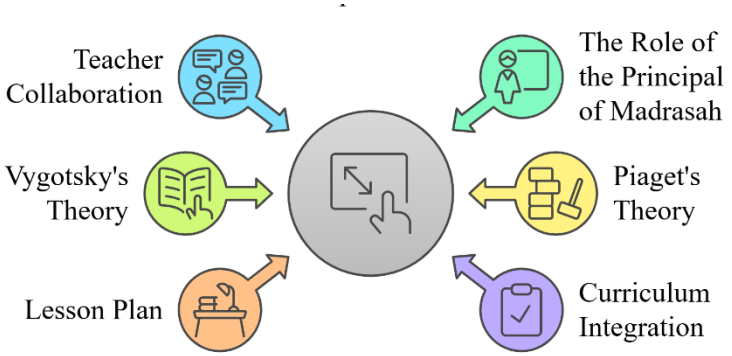

Figure 1. Collaboration in Learning Preparation

Preparation in the learning process is an essential element in preparing teaching materials. The figure illustrates collaboration between teachers, the application of Vygotsky and Piaget's theories, and the development of lesson plans, all essential for efficient curriculum development. Also, it highlights the importance of the role of the madrasah principal in supporting and facilitating educational initiatives. Although the figure shows the importance of these elements in education, more details on their implementation and effectiveness in real situations are still needed. This presentation offers a good starting point but requires further elaboration for a deeper understanding of the practical application of these concepts.

Optimizing Active Learning Through Discovery Learning Model

The application of the Discovery Learning model in fourth-grade mathematics learning at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang has shown how this method can maximize active learning. Through initial activities that check student attendance and well-being, teachers have created a comfortable learning environment essential for increasing student motivation and participation (Dewey, 1938; Zitha et al., 2023; Al-Said, 2023). This model changes teachers' role to that of facilitators who guide students to explore and construct their knowledge, inviting them to ask

questions and analyze, thus encouraging higher critical thinking and evaluation (Bruner, 1961; King, 1994).

The core activities in mathematics teaching at Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang effectively utilize learning media such as flashcards and teaching aids. Using these tools is very important because it not only triggers the activation of students' prior knowledge but also helps them interact directly with the material being studied (Chin & Osborne, 2008; Jaaska et al., 2022). By actively involving students in the learning process, they become more engaged and motivated to dig deeper into the subject matter. This is because effective learning involves more than passive reception of information, but also active interaction with the content.

Furthermore, the approach used in this learning activity is in line with the theory of social constructivism proposed by Vygotsky. According to Vygotsky (1978), learning occurs through dynamic social interactions, and knowledge is built in a social context through collaboration and dialogue with others. In this mathematics class, the teacher facilitates group discussions and collaborative activities that strengthen students' understanding of mathematical concepts and develop their social skills (Turner & Patrick, 2004; Gastager et al., 2022). This process supports students' deep understanding of the material being studied and reinforces the importance of learning together as a community of learners.

Although the Discovery Learning model provides various benefits in stimulating critical thinking and increasing student engagement, this approach also brings challenges, primarily related to the high cognitive load that students may experience (Wang, 2024). This challenge is especially felt by students with undeveloped problem-solving skills or who struggle with mathematical concepts. While beneficial, the critical thinking required in the Discovery Learning model can be a source of stress for students who do not receive adequate support during the learning process (Chusni et al., 2021; Darling-Hammond et al., 2019). Without proper guidance, students may feel overwhelmed and frustrated, hindering their academic development rather than advancing it. This underscores the importance of the effective use of scaffolding in learning, which Wood et al. (1976) emphasized as a way to support students in incrementally building their knowledge and skills.

To address this issue, teachers must actively manage classroom activities and ensure that scaffolding is tailored to students' individual needs. Good scaffolding can include providing additional instruction, breaking tasks into smaller, more manageable steps, or providing examples and models to guide students' learning (Nowell et al., 2017; McGill et al., 2023). Mayer (2004) described the importance of adapting this teaching approach to accommodate varying student ability levels, which helps minimize frustration and maximize effective learning. Through this strategy, all students, regardless of their academic ability level, are given an equal opportunity to thrive and benefit fully from the Discovery Learning approach. Thus, while supporting the development of critical thinking and problem-solving, teachers also foster an inclusive and supportive learning environment.

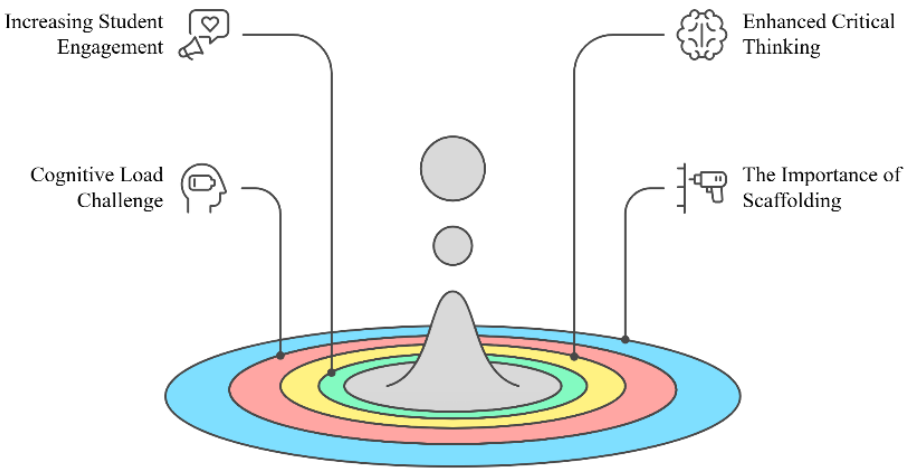

Figure 2. Application of Discovery Learning in Learning

Overall, the Discovery Learning model in Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang has improved mathematics learning outcomes by promoting critical thinking, problem-solving, and deeper conceptual understanding. With careful attention to scaffolding and classroom dynamics management, this learning process makes learning more enjoyable and meaningful, preparing students with the skills needed for future success (Hattie & Timperley, 2007; Dweck, 2006).

Effective Strategies in Optimizing Learning and Assessment in Mathematics Classrooms

At Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang, assessment in fourth-grade mathematics classes utilizes the concept of metacognition proposed by Flavell in 1979. Metacognition is students' awareness and regulation of their cognitive processes. The teacher here plays a role not only as a transmitter of material but also as a facilitator who helps students summarize and reflect on their learning (Rosi & Hopkins, 2007; Trent, 2012). This process allows students to understand better, evaluate the material taught, and identify areas for improvement, effectively increasing comprehension and retention of the material. This approach also encourages collaborative learning, where students can discuss and share learning strategies with their classmates, creating a supportive academic and social growth environment (Le et al., 2017; McKay & Sridharan, 2023). Effective teachers who implement this method provide constructive feedback that encourages student engagement and motivation. In this way, Madrasah Ibtidaiyah Al-Ma'arif 02 Jombang teaches mathematics and facilitates the development of critical and reflective thinking skills that benefit students in the long run (White, 2007; Aryal, 2024).

O'Reilly et al. (2022) added that this reflective activity is important in helping students develop their metacognitive abilities, namely the ability to think about their thinking. By encouraging students to summarize and reflect on the material being studied actively, teachers help them strengthen concepts and deepen their understanding. This process also allows students to identify areas they may not fully understand so that learning becomes more adaptive and responsive to their needs. Critically, it is important to note that this strategy requires teachers skilled in teaching techniques that support active and reflective learning (Lindner & Schwab, 2020; Hernández-Torrano et al., 2020). This requires adequate training and skills for teachers to implement metacognitive approaches effectively, focusing not only on academic learning outcomes but also on developing students' critical and reflective thinking skills. In addition, this approach must be supported by an adequate assessment system that can accommodate and value the process of critical and reflective thinking, not just the end product of learning (Golden, 2023; Michalsky, 2024).

Students are directed to summarize the learning objectives, main keywords, and mathematical concepts learned. They are invited to pray together, create a positive and respectful classroom environment, and reinforce values and academic content. The assessment results show that most students have achieved or exceeded the Minimum Completion Criteria (KKM), but there are also students in grades IV, A1, and A2 who need additional assistance. This suggests the need for more focused and remedial instructional strategies, in line with Vygotsky's Zone of Proximal Development (ZPD) theory (Borthwick et al., 2003), which recommends interventions to guide students toward more profound understanding. Approaches such as customized tasks and adequate scaffolding by teachers (van de Pol et al., 2018; Mathé & Christensen, 2024), as well as differentiation of instruction suggested by Tomlinson (Eikeland & Ohna, 2022; Langelaan et al., 2024), can help in addressing the gaps in understanding among students. The importance of ongoing formative assessment in monitoring and adjusting students' progress and providing the feedback needed to improve their knowledge and performance cannot be overstated.

Several improvements can be implemented to improve the effectiveness of closing activities and the learning process in general, such as providing remedial support and differentiation for students who do not meet the KKM (Tomlinson, 2001). Effective time management and flexible curriculum are also vital in reducing the stress associated with limited learning time, allowing students to engage more deeply with the material (Hiebert & Grouws, 2007). In addition, increasing active monitoring and scaffolding for less engaged students is essential. Teachers can assign specific tasks

to keep them focused and actively involved in learning. A more structured reflective approach at the end of the session can also help deepen students' understanding by inviting them to write about their learning experiences and areas for improvement, which will strengthen the learning process and enrich their educational experience (Flavell, 1979). These improvements can significantly improve the effectiveness of closing activities and the learning process, ensuring that every student gets the maximum opportunity to learn and develop.

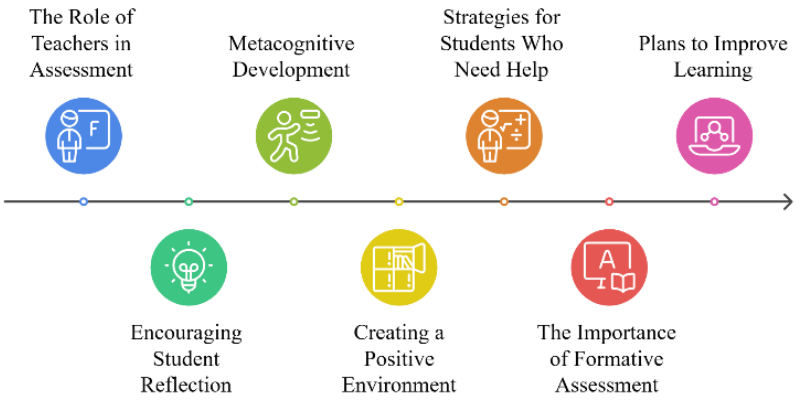

Figure 3. Learning and Assessment in Mathematics Class

The role of teachers in assessing and recognizing student abilities for effective intervention requires elaboration on optimal assessment methods for mathematics, such as formative assessment through portfolios and summative assessment through standardized tests. The importance of student metacognitive development and self-reflection is highlighted, but the figure lacks details on connecting these to concrete classroom practices, such as learning journals and group discussions. Strategies to support struggling students require further elaboration, including educational technology and individualized learning approaches. The figure also emphasizes a positive learning environment but lacks practical examples such as inclusive classroom norms or collaborative approaches. Learning improvement plans are discussed without practical examples when integrating formative assessment and curriculum adjustments based on feedback, which could provide more insight.

CONCLUSION

Collaboration in Preparation for Discovery Learning can be realized through practical cooperation between teachers and madrasah principals to maximize the Discovery Learning model. This collaboration covers all phases, from planning to developing the Learning Implementation Plan (RPP) and compiling materials that support the constructive learning approach. In implementing this model in the fourth grade of madrasah, teaching aids and activities that stimulate students' knowledge are the focus, with teachers acting as facilitators who support critical thinking. This model faces challenges such as high cognitive load, requiring effective scaffolding to ensure all students can access and understand the material well. The approach and closing of learning emphasize the importance of reflection and formative assessment, as well as the need for remedial methods and teaching whose differentiation becomes clear through varied assessment results, aiming to optimize the benefits of the Discovery Learning model and support the academic development of all students.

The theoretical implications of this study indicate that collaboration between teachers and madrasah principals in the Discovery Learning model strengthens the constructivist learning approach that emphasizes student activeness and participation. This provides new insights into the use of scaffolding to reduce cognitive load, deepens understanding of the dynamics of collaboration in education, and highlights factors that influence its effectiveness. This study suggests increasing structured collaboration in lesson plan development and resource exchange as standard policy,

training teachers in scaffolding techniques to support active and inclusive learning, and utilizing formative assessment and remedial strategies to adjust teaching based on student needs.

Recommendations for further research based on this study include comparative testing between madrasahs that use the Discovery Learning model and those that adopt traditional methods to assess student learning outcomes and satisfaction differences. Research can also focus on the long-term impact of this model on the development of students' critical and academic skills. It is also essential to evaluate the effectiveness of teacher training in implementing scaffolding and active strategies, as well as curriculum adaptation to support interactive learning. In addition, the use of technology in Discovery Learning and a multidisciplinary approach that combines psychology, sociology, and educational technology can provide deeper insights into the synergy and effectiveness of this approach in madrasah education.

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