IMPLEMENTATION OF DIFFERENTIATED LEARNING: STUDENT AND TEACHER PERSPECTIVES IN THE CONTEXT OF MATHEMATICS IN PRIMARY SCHOOLS

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Abstract

Differentiated learning is an approach that aims to accommodate students' needs and learning styles in the learning process. In learning mathematics in primary schools, students often face challenges in understanding abstract concepts, so flexible and responsive teaching strategies are required. This study aims to explore the application of differentiated learning methods in mathematics at State 2 Wameo Primary School, Baubau City, and evaluate teachers' and students' perspectives on the effectiveness of this approach. The research used a qualitative method with a case study approach. Data collection techniques included in-depth interviews with teachers and students, observation of learning activities, and analysis of learning documents. Participants consisted of fourth and fifth grade students who have various learning styles, as well as teachers involved in the implementation of differentiated learning. The results show that differentiated learning helps students understand math materials better through media and tasks that suit their learning styles. However, teachers face challenges in providing equal attention, adjusting learning strategies and distributing tasks fairly due to limited time and resources. This research contributes to the development of more inclusive and adaptive mathematics learning strategies and provides a basis for educational policies that support students' diverse learning needs, but still provides a basis for educational policies that support students' learning needs.

A. INTRODUCTION

Students have the right to a quality education, through an inclusive learning environment so this need is increasingly urgent in the world of education. Moreover, students have their own uniqueness and each student with different learning styles, different ability levels, and different backgrounds, certainly requires a different approach. One approach that is considered effective in meeting the needs of diverse students is the differentiated learning method. This method focuses on recognizing the various learning styles and individual needs of studentsso that learning can be tailored to the uniqueness of each student. In the context of mathematics education, this method is very relevant, where many students experience difficulties. The presence of the redesigned

curriculum, advocates the use of a differentiated learning approach as an effort to provide flexibility for teachers to adjust materials, learning activities, and assessments based on the level of students' abilities, interests, and learning needs. This is in line with research (Herwina, 2021) which shows that differentiated learning can improve student learning outcomes. Similarly, research (Wahyuningsari et al., 2022) found that providing space for students to show what they have learned in a way that suits their interests and skills makes students more involved in their learning process. In addition, this approach also according to (Kinanthi et al., 2024) that can contribute to the development of an inclusive learning environment, where all students, including those with special needs can be actively involved in the learning process without any discrimination.

Inclusive education in practice requires strong support from school management and training for teachers to implement appropriate learning methods. Research (Rasdi et al., 2023) shows that training and professional development for teachers is essential to improve their capability to implement differentiated learning and create a welcoming environment for all students. In addition, the view of (Amalia, 2020) that to support differentiated learning, it is necessary to involve information and communication technology (ICT) in learning to enrich students' learning experience.

In learning mathematics, which is considered a challenging subject, the differentiated learning method certainly plays an important role in dealing with students' learning needs. In line with the view of(Wahyuningsari et al., 2022) (Wahyuningsari et al., 2022) that to make it easier for students to understand complex mathematical concepts, it is necessary to adapt learning to suit individual needs so that students are more motivated to learn. Therefore, to ensure that every student gets a quality education that suits their needs, it is important for educators to continuously develop their skills in implementing diverse and inclusive learning methods.

The current basic education curriculum emphasizes the achievement of various basic competencies in mathematics. According to (Stacey, 2011) that mathematics education not only focuses on mastering concepts, but also on developing students' critical thinking and problem solving skills.

However, the challenges faced by teachers in achieving these goals are often caused by differences in students' abilities and interests. According to (Shareefa et al., 2019) in his research shows that these differences can significantly affect student motivation and learning outcomes. Therefore, to answer the learning challenges, a differentiated learning process is needed.

The differentiation approach in learning has been proven to improve student motivation and understanding. This is in line with the findings of (Mardhatillah & Suharyadi, 2023) and (Lestari et al., 2023) which show that when teachers implement differentiation strategies,

students feel more engaged and have the opportunity to learn according to their style and needs. Implementing this approach can help teachers to meet students' diverse learning needs. But despite the promise of this approach, many teachers still experience difficulties in implementing it effectively in the classroom. One of the obstacles is teachers' lack of understanding and experience in implementing the differentiation approach. This is evidenced by (Mutmainah et al., 2023) in their research shows that many teachers feel unprepared to implement this strategy due to lack of adequate training and support. Similarly, (Mirawati et al., 2022) pointed out the importance for educational institutions to provide better training and the necessary resources for teachers to implement the differentiation approach more effectively. Overall, although the curriculum has emphasized the achievement of diverse basic competencies in mathematics, the challenges faced by teachers in dealing with differences in students' abilities and interests certainly require serious attention. A differentiated learning approach can be an effective solution, but its success depends on teachers' understanding and skills in implementing it, so the level of success depends on how teachers can manage the learning process that contains elements of differentiation.

Students' and teachers' perspectives are key elements in understanding the application of differentiated learning, especially in the context of mathematics education in primary schools. Students who come from diverse backgrounds have different ways of learning so it is important to listen to their voices and experiences. (Herwina, 2021) points out that differentiated learning can help students achieve optimal learning outcomes because this method allows students to express their understanding through various products that suit their interests and learning styles. In line with the view of (Rosyidatul Kholidah & Anwar Badruttamam, 2023a) that by providing space for students to demonstrate what they have learned, teachers can better understand students' learning needs and preferences, which in turn can increase the effectiveness of the learning process.

Teachers' perspectives are also very important in this context, because teachers often face challenges in implementing differentiated learning, so further information is needed regarding what obstacles teachers experience in carrying out this approach and how teachers approach the various diversity of student learning styles. Research (Dian Fitriani et al., 2023) that differences in student characteristics that require a variety of approaches are one of the challenges in implementing differentiated learning. Similarly, the view of (Rahmah et al., 2022) shows that teachers need to adapt the methods and approaches used in learning, to meet the diverse learning needs of students including their learning readiness and interests. Therefore, according to (Affandi, 2023) it is necessary to listen to teachers' experiences in facing challenges and celebrate their successes in implementing differentiated learning.

Similarly, the view of (Rasdi et al., 2023) that listening to teachers' experiences can provide valuable insights for the development of better pedagogical practices in the future.

Thus, the role of the teacher as a facilitator in an inclusive learning process can be strengthened so that every student can benefit from a more personalized learning approach that suits their characteristics (Defitriani, 2019). This study aims to explore how differentiated learning methods are applied in mathematics subjects in primary schools and to evaluate students' and teachers' perspectives on the effectiveness of this approach. Through this research, it is expected to produce a deeper understanding of the application of differentiated learning in the context of mathematics in elementary schools. The results of this study are expected to contribute to the development of curriculum and teaching strategies that are more responsive to students' needs.

B. RESEARCH METHOD

This research uses a qualitative approach with a case study research type. The qualitative approach was chosen because it aims to explore the perceptions and views of students and teachers regarding the application of differentiated learning methods in mathematics learning at primary schools. Case studies allow researchers to explore specific situations in selected elementary schools, as well as to understand in depth the dynamics that occur in the context of differentiated mathematics learning.

1. Location and Research Subjects

This research will be conducted in one of the primary schools in Baubau city that has implemented differentiated learning in mathematics, namely SD Negeri 2 Wameo Baubau City. The research subjects consist of teachers who teach mathematics in grades IV and V, and have implemented differentiated learning methods. Furthermore, the fourth and fifth grade students who participated in mathematics learning with differentiation approach. The students selected were students with various learning styles, which were identified based on information provided by the teacher, and strengthened through the results of preliminary observations.

2. Data Collection Technique

In this study, some data will be collected through in-depth interview techniques with teachers and some students, to get an in-depth perspective on their experiences and views on differentiated learning. The interviews are semi-structured, with flexible guiding questions so that the researcher can further explore the informants' answers.

Furthermore, the researcher will make observations of the mathematics learning process in the classroom, focusing on the application of differentiated learning. This observation aims to see how teachers design and implement differentiation strategies in teaching mathematics, as well as how students respond to the method. These observations will be recorded in the form of *field notes* and documented according to predetermined procedures.

Documentation in the form of learning tools such as lesson plans, modules, and student work will be collected and analyzed to see how differentiated learning principles are integrated in mathematics learning materials and activities. The following are the interview grids for teachers and students, as well as the observation sheet grids that cover the elements of differentiated learning:

Table1 . *Teacher and Student interview grids*

No.	Aspects	Teacher	Students
1	Understanding of differentiated learning	What do you know about differentiated learning methods?	-
2	Lesson planning	How do you design differentiated lesson plans?	-
3	Implementation	How do you implement differentiated learning in the classroom? What are the strategies used?	How did the teacher teach the lesson so that you could understand it more easily?
4	Engagemen	How do you ensure engagement of students with diverse needs	Do you feel involved in the learning? What makes you excited about learning?
5	Obstacles	What was the biggest challenge you faced when using this method?	Was there any part of the lesson that was difficult for you to understand? How did you overcome it?
6	Results and Evaluation	How do you evaluate the success of differentiated learning?	Do you feel this way of learning helps you understand math better?

Table 2. *Lattice of observation indicators*

Aspects	Observation Indicator
Planning	The lesson plan has a variety of strategies
	Relevant and varied media
	Tasks vary in difficulty
Implementation	Teachers use a variety of methods
	Students are free to choose how to learn
	Tasks according to students' abilities
	Teacher accompanies students
	Seating supports flexibility
Teacher and student interaction	Teacher gives personalized feedback
	The teacher motivates students to be active
	The teacher pays attention to difficulties
Student engagement	Students are enthusiastic about learning
	Students according to their learning style
	Students are active in discussion
	Students creatively complete tasks
Learning evaluation	Varied evaluation
	Students choose the assignment format
	The teacher gives immediate feedback
	Teachers record student progress
Adjustment for student diversity	Teacher initial assessment of student needs
	Groups are strategized
	The teacher adjusts the strategy

3. Data Analysis Technique

The data that has been collected will be analyzed using thematic analysis. The steps of thematic analysis include:

a. The data transcription of the interviews conducted will be transcribed verbatim to facilitate analysis.

b. Performed initial coding, by reading and categorizing the data into initial codes relevant to the research focus.

c. The development of themes, by looking for patterns and relationships between codes, then compiling the main themes that emerged from the data.

d. Theme assessment, by reviewing existing themes to ensure relevance and connection to differentiated learning theory.

e. Data interpretation, by providing in-depth interpretations of the findings obtained from data analysis, and connecting them with relevant theories and literature.

4. Data Validity

To ensure the validity of the data, this research will apply several verification techniques, namely:

a. Triangulation of data sources will be obtained from various sources, namely teachers, students, and learning documents, so that a richer perspective can be obtained.

b. Member check, where the researcher will re-examine the results of interviews with participants to ensure that the results written are in accordance with the intentions expressed by the participants.

c. The audit trail, i.e. all steps of the research including the process of data collection, analysis, and interpretation, will be well documented to maintain transparency and accountability of the research.

5. Research Procedure

The research process will be carried out through several stages, the first is preparation, by making an initial approach to the school to get permission and determine the research schedule. In addition, researchers will also prepare interview and observation instruments. Second, data collection through interviews, classroom observations, and document collection for several weeks to obtain complete and in-depth data. Third, analyzing data simultaneously during the data collection process to identify patterns of preliminary findings. Fourth, reporting the results of the research in descriptive and interpretative form in accordance with the findings obtained.

This method is designed to provide an in-depth picture of how differentiated learning is applied in mathematics learning in primary schools, and how students' and teachers' experiences and perspectives of the method can be revealed in detail.

C. RESULTS AND DISCUSSION

The implementation of differentiated learning at SD Negrei 2 Wameo has a positive impact on students' understanding and motivation in learning mathematics. However, the success of this method is highly dependent on adequate resources, as well as the teacher's ability to manage the class well. Given the abstract nature of mathematics material, it is often difficult for students with different ways of learning to understand. Through differentiation, it can improve concept understanding and student involvement in the learning process (Ayunis & Belia, 2021). Teachers need to design learning activities that can accommodate various learning styles of students, such as the use of diverse learning models, creating an inclusive learning environment, where every student feels valued and encouraged to actively participate (Hidayanti et al., 2020), because approaches that pay attention to the individual needs of students can increase their motivation and

confidence in learning mathematics (Negara et al., 2023).

From the students' perspective, differentiated learning provides opportunities for them to learn in ways that suit their needs and preferences. Students who have a visual learning style, for example, can more easily understand mathematical concepts through the use of visual media images or videos (Nadiyah et al., 2019). In addition, approaches that involve students in the learning process, such as group discussions or collaborative projects, can increase their engagement and understanding of the material (Irnawati et al., 2018).

To understand teachers' and students' perspectives on the implementation of differentiated learning, data were collected through interviews, observations, and document analysis. The following table presents the results of thematic analysis based on the results of interviews, observations, and document analysis starting from the planning, implementation, and evaluation stages:

1. Lesson Planning

Lesson planning is a very important initial stage in implementing differentiated learning. At this stage, teachers are tasked with developing lesson plans, preparing media, and designing assignments that can meet the needs of students with different learning styles and abilities (Kusumaningpuri, 2024). This is in line with research (Sabrina et al., 2024). which states that effective learning planning involves adjusting methods and media

according to student characteristics. The analysis in this aspect is conducted to see the extent to which lesson planning has been adjusted to the principle of differentiation. The following is a table of thematic analysis results for the learning planning aspect:

Table 3. *Aspects of lesson planning*

	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
Guru merancang RPP berbasis diferensiasi	Apakah RPP memuat variasi kegiatan belajar untuk memenuhi kebutuhan siswa dengan gaya belajar yang berbdea?	Guru Menyusun RPP dengan variasi strategi belajar, tetapi kurang mendalam untuk memenuhi semua kebutuhan siswa	-	RPP mencakup variasi tugas, tetapi kurang spesifik untuk setiap gaya belajar siswa	Waktu terbatas untuk membuat RPP yang komprehensif sesuai kebutuhan siswa
Guru menyediakan materi dan media pembelajaran yang variatif	Apakah tersedia materi pembelajaran berupa teks, gambar, video, atau alat bantu lainnya sesuai kebutuhan siswa?	Guru menggunakan media sederhana seperti manipulatif, gambar, dan video pembelajaran	Siswa merasa lebih mudah memahami materi dengan media visual seperti balok angka	Guru menggunakan media manipulatif sederhana, tetapi tidak tersedia untuk semua siswa	Keterbatasan sumber daya, terutama alat digital seperti proyektor atau tablet
Guru membuat rencana penyesuaian tugas	Apakah guru memberikan opsi tugas yang berbeda sesuai kemampuan atau minat siswa?	Guru memberikan tugas dengan tingkat kesulitan berbeda, tetapi sulit mendistribusikan secara merata	Siswa merasa senang dengan tugas kreatif seperti menggambar atau membuat poster	Beberapa siswa mendapatkan tugas yang bervariasi, tetapi distribusinya tidak merata	Sulit mengelola tugas yang berbeda untuk setiap siswa dalam waktu yang terbatas

The differentiated learning planning stage in the data table 3, it can be seen that teachers try to design lesson plans with a variety of learning strategies to meet the needs of students with different learning styles. However, teachers feel that the lesson plans are still not in-depth enough to cover all students' needs optimally. In providing learning materials and media, teachers use simple tools such as manipulatives, pictures and videos. These media are considered quite effective by students, especially visual media such as number blocks, which help them understand the material more easily. However, the limitations

of digital tools such as projectors and tablets are an obstacle in providing more varied learning media.

In addition, teachers try to design tasks with varying levels of difficulty to meet the needs of students with different abilities. Students feel happy and more motivated when given creative tasks, such as drawing posters or solving story problems. However, teachers face difficulties in distributing tasks fairly and according to each student's ability, mainly due to limited time and resources. As a result, low-ability students often need additional assistance, while high-ability students need more challenging tasks.

The gaps found in the lesson planning stage include the lack of depth in planning lesson plans that are fully differentiation-based, the limitations of variable learning media, and constraints in the distribution of tasks that suit the needs of each student. This shows that although teachers have tried to implement differentiated learning, support in the form of time, training and resources is still needed to overcome these obstacles. Research (Novela et al., 2024) shows that teachers involved in collaborative coaching can improve their ability to develop lesson plans and syllabus, which in turn has a positive impact on the learning process in the classroom.

2. Learning Implementation

Learning implementation is the core of differentiated learning implementation, where teachers play an important role in implementing varied and flexible strategies to meet students' needs. According to (Putra, 2023) that varied and flexible strategies in teaching can increase student motivation. In this stage, teachers are expected to be able to deliver material using various methods, provide choices to students in how to learn, and adjust tasks to the abilities of each student. Diverse teaching methods allow students to choose the way of learning that best suits their learning style (Rosyidatul Kholidah & Anwar Badruttamam, 2023b). In addition, personal attention and flexible classroom management are important elements in creating an inclusive and responsive learning environment. Teachers need to recognize students' learning readiness, interests and profiles to adjust learning tasks and activities (Ningrum et al., 2023). The following table presents the results of the thematic analysis for the implementation aspect of learning:

Table 4. *Aspects of learning implementation*

Indikator	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
Guru memberikan penjelasan materi dengan berbagai cara	Apakah guru menggunakan berbagai metode, seperti penjelasan verbal, demonstrasi, atau penggunaan alat bantu?	Guru mencoba menggunakan media visual seperti gambar dan manipulative, tetapi strategi verbal kurang efektif untuk beberapa siswa	Siswa merasa lebih mudah memahami materi dengan visual seperti gambar dan manipulatif	Guru menggunakan gambar dan manipulative, tetapi strategi verbal dan kinestetik belum konsisten diterapkan	Guru membutuhkan pelatihan untuk memaksimalkan penggunaan metode yang beragam secara efektif
Guru memberikan pilihan kepada siswa dalam cara belajar	Apakah siswa diberi kebebasan memilih cara belajar (misalnya individu, kelompok, atau diskusi)?	Guru memberikan kebebasan kepada siswa untuk memilih cara belajar	Siswa lebih suka belajar dalam kelompok karena merasa lebih nyaman bekerjasama dengan teman	Siswa lebih aktif dalam kelompok, tetapi siswa pasif tampak kurang terlibat dalam kegiatan diskusi	Guru kesulitan memotivasi siswa pasif untuk mengambil peran aktif dalam pembelajaran kelompok
Guru memberikan tantangan atau tugas dengan tingkat kesulitan yang bervariasi	Apakah guru memberikan tugas yang disesuaikan dengan kemampuan masing-masing siswa (mudah, sedang, sulit)?	Guru memberikan tugas dengan tingkat kesulitan berbeda sesuai kemampuan siswa	Siswa merasa tertantang dengan tugas kreatif dan berjenjang, tetapi beberapa merasa kesulitan tanpa arahan tambahan	Guru memberikan tugas dengan tingkat kesulitan yang bervariasi, tetapi siswa dengan kemampuan rendah kesulitan menyelesaiakn tanpa bantuan	Guru membutuhkan lebih banyak waktu untuk mendampingi siswa dengan kemampuan rendah
Guru memastikan semua siswa mendapatkan perhatian yang sama	Apakah guru memberikan pendampingan kepada siswa yang memerlukan bantuan tambahan?	Guru memberikan perhatian khusus kepada siswa yang kesulitan, tetapi hal ini sering mengurangi perhatian kepada siswa lain	Siswa merasa diperhatikan jika dibimbing langsung, tetapi beberapa merasa kurang diperhatikan dalam kelompok besar	Guru memberikan pendampingan intensif kepada siswa tertentu, tetapi siswa lain kurang mendapatkan perhatian yang merata	Guru kesulitan memberikan pendampingan secara adil kepada semua siswa dalam waktu yang terbatas
Guru mengelola kelas secara fleksibel	Apakah pengaturan tempat duduk memungkinkan siswa bekerja dalam kelompok atau individu sesuai kebutuhan?	Guru mencoba mengatur tempat duduk secara fleksibel untuk mendukung diskusi kelompok dan kerja individu	Siswa merasa lebih nyaman dengan pengaturan kelas yang memungkinkan diskusi kelompok kecil	Pengaturan kelas fleksibel, tetapi siswa pasif tetap kurang terlibat meskipun ada kelompok kecil	Sulit mengelola fleksibilitas tempat duduk tanpa mengorbankan keterlibatan dan control kelas

Based on table 4, differentiated learning at the learning implementation stage shows teachers' efforts to meet students' needs through various approaches. Teachers try to use varied methods, such as verbal explanation, demonstration, and visual media such as pictures and manipulatives. From the students' perspective, visual media helps them understand the material more easily. However, teachers face challenges in maximizing the use of learning methods because not all strategies are consistently applied, especially kinesthetic and auditory methods.

Teachers also give students the freedom to choose how to learn, such as working individually, in groups, or through discussions. Students prefer to study in groups because they feel more comfortable working together. However, passive students often just follow along without making any real contribution, which shows that group learning has not been fully effective. Another challenge is motivating passive students to be more involved in the learning process.

In addition, teachers design tasks with varying levels of difficulty to meet the needs of students with different abilities, students feel challenged by creative and leveled tasks, but low-ability students often struggle to complete tasks without additional direction. Teachers face time constraints to provide personalized guidance to students with special needs, especially in classes with large numbers of students.

Teachers also try to give equal attention to all students, especially those with learning difficulties. Students feel valued when they get direct assistance from the teacher. However, teachers' attention is often focused on certain students so that some other students feel less cared for. This is due to the limited time to assist all students equally.

In the classroom management aspect, teachers arrange seating flexibly to support individual and group work. Students are comfortable with the flexible arrangement, but this flexibility has not fully supported passive students to engage more actively. Teachers face challenges in managing classroom flexibility without compromising engagement and control, especially when the number of active and passive students is not balanced. Overall, teachers have tried to implement differentiated learning in various ways, but challenges in the application of diverse methods, equal attention, and motivation of passive students are still obstacles that need to be improved.

3. Teacher and Student Interaction

Interaction between teachers and students is a key element in differentiated learning. Through effective interaction, teachers can provide personalized feedback, motivate students to actively participate, and provide special assistance to students who face difficulties. Constructive feedback helps students understand their mistakes and encourages active participation in the learning process (Budi et al., 2021). The teacher acts as a facilitator who not only conveys information, but also assists students in their learning process. This interaction not only supports students' understanding of the material, but also

creates an inclusive and supportive learning environment. Through personalized feedback, high motivation and an approach that considers individual needs, teachers can help students reach their full potential in the learning process (Dhea Septiandhika, 2023). The following table presents the results of thematic analysis for aspects of teacher and student interaction:

Table 5. *Aspects of teacher and student interaction*

	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
	Guru memberikan umpan balik yang spesifik dan personal	Apakah guru memberikan komentar yang membangun berdasarkan hasil kerja siswa?	Guru memberikan umpan balik langsung	Siswa merasa lebih paham jika diberikan arahan langsung	Guru memberikan umpan balik	Guru harus memberikan umpan balik personal kepada semua siswa dalam waktu terbatas
	Guru menanyakan pemahaman siswa terhadap materi yang diajarkan	Apakah guru aktif bertanya untuk memastikan semua siswa memahami konsep?	Guru memberikan penghargaan verbal kepada siswa yang aktif, dan tetap memberikan motivasi siswa yang pasif	Siswa merasa percaya diri jika diberi motivasi langsung	Sebagian siswa aktif bertanya dan menjawab, tetapi siswa pasif tampak enggan terlibat	Guru sulit menyeimbangkan keaktifan siswa dalam diskusi atau kegiatan kelompok
	Guru mendukung siswa dengan kebutuhan khusus	Apakah siswa dengan kesulitan belajar diberikan bantuan atau perhatian khusus?	Guru mendampingi siswa yang kesulita, tetapi sulit memberikan perhatian kepada semua siswa lainnya	Siswa merasa lebih diperhatikan jika dibimbing langsung, terutama saat tugas dianggap sulit	Guru fokus pada siswa tertentu, tetapi siswa lainnya tampak kurang terpantau	Guru kesulitan membagi wakti untuk memberikan perhatian secara merata kepada seluruh siswa

Based on table 5, the findings on differentiated learning at the stage of interaction between teachers and students show the teacher's effort to give individualized attention to students and motivate them to be actively involved in learning. Teachers give personalized and direct feedback to students based on their work. From the students' perspective, such feedback helps them understand the material better, especially when it is delivered in person. However, the main challenge teachers face is the limited time to provide personalized feedback to all students equally, especially in classes with a large number of students.

The teacher also actively asked students to ensure they understood the concepts taught and tried to motivate passive students. Students feel more confident when the teacher gives verbal rewards for their participation. Observations show that some students actively contribute to learning, but passive students are still difficult to engage optimally. This shows that teachers face challenges in balancing attention between active and passive students, especially in group discussions.

In addition, teachers support students with special learning needs through direct assistance. Students feel cared for if they get help when facing difficulties. However, teachers often have to focus on certain students who are considered difficult, so attention to other students becomes less than optimal. Observations show that some students need adequate assistance due to the limited time and capacity of teachers to assist all students equally.

At the interaction stage, teachers have shown good efforts to create inclusive learning by providing personalized feedback, motivating students, and supporting students with special needs. However, time constraints and difficulties in distributing attention evenly are the main challenges that need to be overcome to improve the effectiveness of differentiated learning. Support in the form of additional time allocation or more effective classroom management strategies can help teachers overcome these obstacles.

4. Student Engagement

Actively engaged students tend to show enthusiasm, participate in discussions, choose ways of learning that suit their learning style, and show creativity in completing tasks. According to (Naibert et al., 2022) that social engagement in various active learning activities provides important insights into the social dimension of student engagement. Through differentiated learning, teachers create a learning environment that allows each student to feel motivated and contribute according to their abilities. The following table presents the results of thematic analysis for the aspect of student engagement:

Table 6. *Aspects of student engagement*

Indkator	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
Siswa terlihat antusias dan aktif dalam pembelajaran	Apakah siswa menunjukkan minat dan perhatian selama proses belajar berlangsung?	Guru mencatat bahwa siswa lebih antusias saat pembelajaran menggunakan media visual atau manipulatif	Siswa merasa lebih termotivasi jika pembelajaran melibatkan alat bantu gambar atau video	Sebagian besar siswa terlihat aktif, tetapi beberapa siswa cenderung pasif terutama saat materi abstrak	Materi abstrak atau sulit dipahami menyebabkan motivasi siswa menurun pada pembelajaran tertentu
Siswa bekerja sesuai dengan gaya belajarnya (visual, suditori, kinestetik)	Apakah siswa memilih alat atau cara belajar yang sesuai dengan preferensinya?	Guru menyebutkan bahwa siswa cenderung memilih alat visual seperti gambar atau alat manipulatif	Siswa merasa lebih nyaman belajar dengan alat bantu seperti balok angka atau kertas kerja visual	Sebagian siswa terlihat menggunakan media sesuai gaya belajar mereka, tetapi ada yang masih kesulitan memilih cara belajar	Tidak semua siswa memahami preferensi gaya belajar mereka, sehingga masih membutuhkan arahan
Siswa berpartisipasi dalam diskusi atau kegiatan kelompok	Apakah siswa memberikan tanggapan, ide, atau bertanya dalam diskusi kelompok atau kelas?	Guru mencatat bahwa siswa lebih aktif dalam kelompok kecil, tetapi siswa pasif cenderung hanya mengikuti teman	Siswa merasa nyaman bekerja dalam kelompok, tetapi beberapa siswa tidak aktif memberikan ide	Diskusi kelompok berjalan dengan baik, tetapi beberapa siswa hanya mengikuti tanpa berkontribusi nyata	Siswa pasif sulit didorong untuk lebih berkontribusi dalam diskusi kelompok
Siswa menunjukkan kreativitas dalam menyelesaikan tugas	Apakah siswa menghasilkan solusi atau produk yang berbeda berdasarkan pilihan tugas yang tersedia?	Guru mencatat bahwa siswa menunjukkan kreativitas, tetapi sering kali membutuhkan panduan untuk menghasilkan ide yang baik	Siswa merasa lebih percaya diri jika tugas memungkinkan mereka memilih cara penyelesaian seperti menggambar atau membuat diagram	Sebagian siswa menunjukkan kreativitas, tetapi beberapa siswa hanya meniru jawaban dari teman	Kurangnya panduan untuk mendorong siswa menghasilkan ide kreatif secara maksimal

Based on table 6 presented, the findings regarding differentiated learning at the student engagement stage show how teachers and students respond to the learning strategies implemented. Teachers noted that students look more enthusiastic when learning using visual media such as pictures or manipulative tools. From the students' perspective, such learning media help them better understand the material and increase motivation. However, challenges are found in abstract materials that make students' motivation decrease, especially for students with certain learning styles that are less accommodated.

Teachers also mentioned that students tend to choose tools or ways of learning that suit their preferences, such as visual or manipulative media. Students feel more comfortable learning with tools such as number blocks or visual worksheets. However, not all students understand their learning style preferences so they still need further direction from the teacher.

In group or class discussions, teachers noted that some students were active in providing responses and ideas, especially in small groups. Students feel comfortable working in groups, but some students do not actively contribute because they feel inferior or lack confidence. This shows that passive students need more encouragement to engage in group discussions or activities. In addition, teachers noted that students showed creativity in completing tasks, such as making diagrams or answering questions in unique ways. Students felt confident when given tasks that allowed them to choose the method of completion. However, some students simply copied answers from friends without providing original ideas, which shows a lack of guidance

from the teacher to encourage maximum creativity.

At the student engagement stage, teachers have tried to facilitate differentiation learning through the use of visual media, group discussions, and creative assignments. However, challenges are still found in motivating students to actively engage, especially passive students, and in optimally supporting students' creativity. A more specific approach in helping students recognize their learning styles as well as providing guidance in creative assignments can help address this gap.

5. Learning Evaluation

Learning evaluation in differentiation focuses not only on the end result, but also on the learning process. Teachers are expected to use a variety of evaluation methods, give students the freedom to choose how to complete tasks, and provide immediate feedback to help them improve their understanding. According to (Naylah et al., 2024) that students who are given choices in how they learn, tend to be more engaged in their learning activities. In addition, recording students' individual progress is an important aspect to monitor their progress in detail. The following table shows the results of the thematic analysis for the learning evaluation aspect:

Table 7. *Learning evaluation*

Indkator	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
Guru menyediakan metode evaluasi yang beragam	Apakah evaluasi dilakukan melalui tes, proyek, atau kegiatan lainnya yang bervariasi?	Guru menggunakan evaluasi berupa tes, proyek, dan diskusi kelompok, tetapi tidak selalu merata diterapkan	Siswa merasa evaluasi berbasis proyek lebih menyenangkan dibandingkan tes tertulis	Evaluasi dilakukan secara bervariasi, tetapi proyek siswa sering tidak mendapat penilaian mendalam	Waktu terbatas membat guru sulit mengevaluasi semua proyek siswa secara terperinci
Guru memberikan kesempatan siswa memilih cara mengerjakan tugas	Apakah siswa diperbolehkan memilih bentuk atau format tugas (misalnya menjawab soal cerita, membuat diagram, dll.)?	Guru memberikan kebebasan kepada siswa untuk memilih bentuk tugas, seprti membuat poster atau menjawab soal cerita	Siswa merasa lebih termotivasi saat diberi pilihan tugas sesuai minat, tetapi beberapa merasa bingung tanpa arahan	Siswa terlihat lebih kreatif saat diberi pilihan, tetapi beberapa siswa masih bingung memilih format tugas	Guru membutuhkan waktu tambahan untuk memberikan panduan terkait format tugas kepada setiap siswa
Guru menggunakan evaluasi formatif untuk memberikan umpan balik langsung	Apakah guru memberikan umpan balik segera setelah siswa menyelesaikan tugas?	Guru memberikan umpan balik langsung	Siswa merasa lebih paham jika guru memberikan umpan balik langsung	Guru memberikan umpan balik personal kepada siswa	Guru kesulitan memberikan umpan balik secara mendalam
Guru mencatat perkembangan individu siswa secara terperinci	Apakah guru mendokumentasikan kemajuan masing-masing siswa untuk analisis lebih lanjut?	Guru mencatat hasil evaluasi siswa, tetapi dokumentasi perkembangan individu tidak selalu diperbarui	Siswa merasa senang jika perkembangan mereka dijelaskan langsung oleh guru	Dokumentasi hasil evaluasi terlihat tidak terorganisasi dengan baik, sehingga kemampuan siswa sulit dipantau	Guru membutuhkan sistem pencatatan yang lebih terstruktur untuk memantau perkembangan siswa

Based on table 7 presented, differentiated learning at the learning evaluation stage shows that teachers use various evaluation methods such as tests, projects and discussions. From the students' perspective, they feel that they enjoy project-based evaluation more than written tests. However, observations show that although evaluation is done with diverse methods, not all students get in-depth assessment, especially on project results. Teachers face challenges in allocating time to evaluate all students' assignments in detail.

Teachers also give students the freedom to choose how to complete the tasks, such as making diagrams, posters, or answering story problems. Students feel more motivated when given a choice of tasks that match their interests, but some students still have difficulty understanding the tasks without additional direction. This may indicate that although freedom in choosing tasks can increase

motivation, direction from the teacher is still needed to ensure students' understanding of the tasks.

In addition, teachers try to give immediate feedback to students after completing tasks. Students feel they understand the material better when they get immediate feedback from the teacher. However, observations show that teachers often find it difficult to provide in-depth, personalized feedback to all students due to time constraints.

Teachers also record the progress of individual students to monitor their progress, but documentation of evaluation results is often not updated regularly. Students feel more valued when evaluation results are explained directly by the teacher. However, the lack of an organized record-keeping system makes it difficult for teachers to track each student's progress effectively.

At the learning evaluation stage, teachers have tried to implement differentiated learning by using diverse evaluation methods and giving students freedom in completing tasks. However, the main challenge lies in the limited time to evaluate tasks in depth, provide personalized feedback and document students' progress in detail. Support in the form of additional time, a more structured evaluation system and clear assignment guidelines can help address this gap.

6. Adjustment to Student Diversity

Adjustment to student diversity is at the heart of differentiated learning. Teachers need to understand students' needs, learning styles and abilities through initial assessments to design relevant learning strategies. According to (Serani & Hairida, 2024), systematic and continuous assessment can help teachers monitor and evaluate students' learning progress and adjust teaching methods according to individual needs (Mujiburrahman et al., 2023). Challenges in implementing this curriculum often relate to teachers' understanding of assessment and ability to adapt teaching methods according to students' needs (ANANDA MUHAMAD TRI UTAMA, 2022). In addition, the formation of learning groups according to students' abilities or interests and flexibility in adjusting learning strategies based on class dynamics are important steps to create inclusive learning. The following table shows the results of thematic analysis for the aspect of adjusting to student diversity:

Table 8. *Adjustment to student diversity*

Indkator	Fokus Pengamatan	Hasil Wawancara Guru	Hasil wawancara Siswa	Hasil observasi	Tantangan dan hambatan
Guru mengidentifikasi kebutuhan belajar siswa sejak awal	Apakah guru mengadakan asesmen awal untuk mengetahui kebutuhan, gaya belajar, atau kemampuan siswa?	Guru melakukan asesmen awal sederhana, tetapi hanya mencakup tes tertulis dan belum mendalam untuk semua siswa	Siswa merasa lebih nyaman jika kebutuhan mereka dipahami sejak awal melalui tugas atau tes yang relevan	Asesmen awal dilakukan melalui tes sederhana, tetapi kurang mampu mengidentidikasi kebutuhan spesifik siswa	Waktu terbatas membuat asesmen mendalam sulit dilakukan untuk seluruh siswa
Guru Menyusun kelompok belajar berdasarkan kemampuan atau minat siswa	Apakah pengelompokan siswa dilakukan secara strategis untuk mendukung pembelajaran diferensiasi?	Guru membagi kelompok belajar berdasarkan tingkat kemampuan, tetapi beberapa siswa merasa tidak cocok dengan kelompoknya	Siswa merasa nyaman bekerja dalam kelompok, tetapi terkadang kesulitan jika ada teman yang terlalu dominan	Kelompok belajar berjalan dengan baik, tetapi beberapa siswa terlihat kurang cocok dengan dinamika kelompoknya	Guru sulit menyusun kelompok belajar yang benar-benar seimbang dalam hal kemampuan dan minat siswa
Guru mengubah strategi pembelajaran sesuai dinamika kelas	Apakah guru fleksibel menyesuaikan metode pengajaran berdasarkan respon siswa?	Guru mencoba menyesuaikan strategi pembelajaran saat siswa terlihat bosan atau tidak paham materi	Siswa merasa lebih senang jika guru mengganti strategi pembelajaran yang lebih interaktif saat belajar	Guru mengganti strategi pembelajaran di tengah proses belajar, tetapi hasilnya tidak selalu efektif	Guru membutuhkan pelatihan lebih lanjut untuk membaca dinamika kelas dan merespons dengan strategi yang tepat

Based on Table 8, differentiated learning at the stage of adjusting to student diversity shows teachers' efforts to recognize students' needs, arrange strategic learning groups, and

adjust learning strategies based on class dynamics.

Teachers conduct initial assessments to determine students' needs, learning styles or abilities. However, the assessments are still simple, in the form of written tests, so they lack depth in identifying students' specific needs. From the students' perspective, they feel more comfortable if their needs are understood from the beginning through relevant tasks or tests. Observations show that the initial assessment has not been able to provide a comprehensive picture of students' individual needs, especially to support differentiated learning. Lack of assessment guidelines and preparation of appropriate instruments are the main obstacles.

Teachers organize study groups based on students' ability levels or interests. Although some students feel comfortable working in groups, some students feel unsuitable with group dynamics, especially if there is a member who is too dominant. Observations show that the study groups are running well, but not yet fully balanced in terms of students' abilities and interests. Teachers face the challenge of putting together groups that are truly strategic to optimally support differentiated learning.

Teachers try to adapt the learning strategy to the students' responses in class. Teachers change strategies when students look bored or do not understand the material. Students feel happier if the learning strategies are more interactive, especially when they are actively involved in the learning. However, observations show that although teachers try to adjust the strategies, the results are not always

effective for all students. Teachers need additional training to understand classroom dynamics and apply more appropriate learning strategies.

At the stage of adjusting to student diversity, teachers have tried to recognize student needs, arrange learning groups, and adjust learning strategies. However, limitations in initial assessment, management of group dynamics, and flexibility of learning strategies show that there are still gaps in the implementation of differentiated learning.

D. CONCLUSION

The results showed that the implementation of mathematics learning in elementary schools has been carried out through the stages of planning, implementation, interaction, evaluation, and strategy adjustment to student needs. Teachers try to prepare lesson plans, provide varied learning media, and give assignments with different levels of difficulty. Students find visual media and creative assignments helpful, but motivation decreases on abstract material, and passive students often have difficulty contributing. Evaluation is done using various methods, such as projects and discussions, but often lacks depth due to time constraints. Initial assessments and grouping of students have been conducted but have not been fully effective in identifying specific needs. Time constraints, in-depth attention, and lack of training on learning strategies are the main challenges that need to be addressed to improve the effectiveness of differentiated learning.

E. ACKNOWLEDGMENTS

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