Journal of Pedagogical Research
Volume 10, Issue 1, 2026
https://doi.org/10.33902/JPR.202638721

Research Article

Adapting mathematics teaching for pupils with learning difficulties: Norwegian teachers' experiences

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This study examines how Norwegian primary and lower-secondary teachers adapt mathematics instruction for pupils with learning difficulties. Drawing on qualitative interviews with seven teachers from diverse school contexts, it explores instructional strategies, decision-making, and the perceived impact of pedagogical adaptations. The findings are organised using Molbaek's inclusive teaching framework, comprising four dimensions: relational, didactic, organisational, and framing. Teachers emphasised the importance of emotional safety, structure, and positive teacher–pupil relationships in supporting struggling learners. Common strategies included differentiated instruction, formative assessment, and digital tools to enhance engagement and conceptual understanding. Despite their efforts, teachers reported encountering systemic constraints such as limited time, inadequate staffing, and lack of specialist resources. The study highlights the role of teacher agency, professional judgement, and classroom culture in fostering inclusive mathematics education. It calls for stronger institutional support and targeted professional development to ensure meaningful participation for all pupils, particularly those with mathematics learning difficulties.

Keywords: Adapted education; Learning difficulties; Mathematics; Norway; Primary and lower secondary

Article History: Submitted 27 August 2025; Revised 3 November 2025; Published online 3 December 2025

1. Introduction

Mathematics learning difficulties [MLDs] affect a significant number of pupils and continue to present challenges for both learners and teachers. For many pupils, these difficulties extend beyond academic performance, influencing motivation, self-belief, and emotional well-being. Over time, such experiences can establish a persistent sense of failure and lead to disengagement from the subject. These challenges are not purely cognitive; they are also shaped by emotional and environmental factors, including the quality of teaching and classroom support (Holm, 2012; Skaalvik & Skaalvik, 2015).

Teachers play a central role in creating learning environments that foster pupils' confidence and promote a sense of mastery. Research highlights that teacher expectations, constructive feedback, and supportive relationships can significantly influence pupils' attitudes and outcomes in mathematics (Beswick, 2008). However, despite the importance of responsive teaching, many teacher education programmes offer limited preparation for recognising and supporting pupils

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How to cite: Bergstrand, A. M. E., & Xenofonto, C. (2026). Adapting mathematics teaching for pupils with learning difficulties: Norwegian teachers' experiences. *Journal of Pedagogical Research, 10*(1), 1-17. https://doi.org/10.33902/JPR.202638721

with MLDs. This gap is reflected in Hanssen et al.'s (2025) survey of Norwegian dyslexia-friendly schools (i.e. schools accredited by the Norwegian Dyslexia Association for meeting specified criteria), where nearly a quarter of teachers rated their competence in supporting pupils with MLDs as low or very low. Identifying such difficulties also remains complex, partly due to the absence of reliable assessment tools (Fuchs et al., 2005). These issues are often under-researched and receive insufficient attention in classroom practice (Lunde, 2010).

This study addresses the central research question: *How do teachers adapt their teaching to support pupils with mathematics learning difficulties?* Rather than focusing on prescribed methods, it foregrounds teachers' lived experiences and the practical dilemmas they encounter in striving for inclusive education. The investigation explores how primary and lower-secondary teachers in Norway respond to diverse learning needs within real classroom contexts, offering insights into the conditions that enable or constrain adaptive teaching. It contributes to ongoing debates on equity in mathematics education by showing that teacher agency, contextual knowledge, and access to collaborative support structures are critical for addressing the persistent risk of exclusion faced by pupils with MLDs.

2. Theoretical Considerations

To contextualise this study, it is important to situate it within broader national and international debates on mathematics learning difficulties, adaptive teaching, and differentiated instruction. This section also outlines the analytical framework employed to interpret our findings.

2.1. Understanding Mathematical Learning Difficulties

Although definitions of MLDs remain contested (Mazzocco & Myers, 2003; Nelson et al., 2022), we use the term to refer to persistent difficulties with basic arithmetic and number sense that hinder classroom progress, cannot be explained by general intellectual disability, and may relate to cognitive limits (e.g., working memory), affective factors (e.g., maths anxiety), or instructional conditions. MLDs are heterogeneous and context-dependent: pupils may show skills that diverge sharply from what their age, schooling, or learning opportunities would suggest (Holm, 2012). They result from the interplay of individual cognition, the complexity of mathematics, and teaching quality (Lunde, 2010); poor instruction or an unsupportive environment can worsen these challenges (Dowker, 2005). While many improve with targeted support, some continue to struggle despite intervention (Gersten et al., 2005; Gifford & Rockliffe, 2012).

MLDs also vary in presentation. Pupils with general learning difficulties may struggle across subjects, often due to limited working memory or slower processing speed. Those with challenges in both reading and maths are especially at risk of falling behind (Gersten et al., 2005), with issues ranging from recalling number facts to interpreting word problems (Dowker, 2005). In contrast, pupils with specific MLDs (sometimes called dyscalculia) may succeed elsewhere but face persistent barriers in maths (Holm, 2012; Ostad, 2010). However, the term "dyscalculia" may be too narrow to capture this diversity. Such pupils often rely on inefficient strategies or struggle to develop number sense, even with support (Gersten et al., 2005). Cognitive factors like working memory and processing speed are central to these difficulties (Aunio et al., 2021; Holm, 2012). If key information drops from memory mid-task, problem-solving can quickly feel overwhelming (Gersten et al., 2005). Emotional factors also contribute. Maths anxiety and fear of failure can create a cycle of avoidance and disengagement (Holm, 2012), where pupils begin to shut down (Skaalvik & Skaalvik, 2015).

Assessment should go beyond categorising pupils. As Holm (2012) argues, it must reveal how pupils think, not just which answers they get right or wrong. Early identification is vital, as small number-sense gaps can grow over time if unaddressed (Akther et al., 2025; Geary et al., 2012). Ongoing, low-stakes assessment allows teachers to adjust instruction, much like a GPS recalibrating a route (Black & Wiliam, 1998). Combining formal tests, classroom observation, and dynamic assessment gives a fuller understanding of pupil needs (Buli-Holmberg et al., 2015;

Vygotsky, 1978). Even simple teacher-led strategies, such as focused counting practice, can make a meaningful difference (Chin & Fu, 2021).

Research consistently stresses the need to address maths difficulties early (Nelson et al., 2022). Early intervention is often more effective than later remediation (Dowker, 2005; Hamukwaya & Haser, 2021). Gersten et al. (2005) note that pupils with difficulties in number sense, estimation, and working memory are especially at risk. Early, systematic monitoring and tailored instruction can improve outcomes. Effective interventions emphasise conceptual understanding over rote learning and use visual, interactive tasks (Aunio & Niemivirta, 2010; Jordan et al., 2006).

2.2. Adapted Education and Differentiated Teaching

This paper is concerned with what happens within the so-called mainstream classroom. In this respect, Norwegian educational legislation requires that instruction be adapted to ensure all pupils receive meaningful learning opportunities (Opplæringslova, 2023). National policy further highlights that special education should be considered only after reasonable efforts have been made to adapt instruction within the general classroom (Kunnskapsdepartementet, 2017). This reflects the overarching principle of *tilpasset opplæring* (adapted education), a cornerstone of Norwegian education policy. In practice, adapted education is often implemented through *differensiering* (differentiation) and *differensiert undervisning* (differentiated instruction), pedagogical strategies aimed at meeting pupils' diverse needs (Klette, 2007). The combined influence of legal mandates, inclusive policies, and classroom practices illustrates how adapted education in Norway operates as both a statutory obligation and a pedagogical commitment.

Beyond the Norwegian context, Tomlinson (2014) offers a widely used framework that conceptualises it across four dimensions: content, process, product, and learning environment. Content differentiation involves adjusting what is taught to match pupils' current understanding and developmental levels (Buli-Holmberg et al., 2015). Pupils with MLDs benefit from scaffolded materials, visual supports, and tasks tailored to their conceptual stage (Akther et al., 2025; Herner-Patnode & Lee, 2021). Process differentiation focuses on how pupils engage with content. This may involve varied groupings, additional guidance, or alternative activities to support comprehension and participation (Smale-Jacobse et al., 2019). Product differentiation allows pupils to demonstrate their learning in multiple formats (e.g., oral presentations, written responses, or creative projects) supporting diverse learning preferences and reducing barriers to achievement (Tomlinson, 2014). Differentiation of the learning environment entails creating inclusive, supportive classroom climates. Predictable routines and strong teacher-pupil relationships are especially beneficial for pupils with MLDs (Stronge et al., 2011).

Effective teaching for pupils with MLDs in the mainstream classroom requires more than teachers' content knowledge. Building on Shulman (1986), Ball et al. (2008) distinguish between different types of teacher knowledge for teaching, including specialised mathematical knowledge and knowledge of pupils' thinking patterns. Teachers who possess deep understanding of common misconceptions, flexible problem-solving strategies, and the capacity to scaffold learning can better support pupils with diverse needs. Conversely, insufficient training can lead to reduced expectations and reliance on procedural rather than conceptual instruction (Beswick, 2008; Solomon, 2008). Teachers' beliefs about their pupils' potential have a significant impact on instructional quality. Studies have shown that when teachers hold low expectations for pupils with MLDs, they often reduce task complexity and limit opportunities for meaningful engagement (Woodcock, 2021; Yakut, 2021). Targeted professional development can empower teachers to implement inclusive, high-quality instruction (Stigberg & Stigberg, 2020).

2.3. Theoretical/Analytical Framework

To analyse teachers' experiences and self-reported practices, we employ Molbaek's (2018) framework of inclusive teaching, which consists of four interrelated dimensions: framing, relational, didactic, and organisational. The framing dimension involves classroom routines, rules, and expectations. Clear structure promotes predictability and supports pupils with MLDs in

navigating learning activities (Skaalvik & Skaalvik, 2015; Stronge et al., 2011). Teachers can enhance accessibility by linking mathematics to real-life contexts and emphasising relevance (Xenofontos et al., 2024). The relational dimension emphasises the importance of trust and positive teacher-pupil relationships. Such relationships increase engagement, reduce anxiety, and create a foundation for learning (Stronge et al., 2011). Inclusive classrooms avoid fixed groupings and encourage collaborative dialogue and peer discussion (Xenofontos et al., 2024). The didactic dimension addresses the teacher's instructional decisions. Teachers must adapt tasks to match pupils' current developmental levels, provide formative feedback, and incorporate visual representations to enhance understanding (Ball et al., 2008; Gersten et al., 2009). The organisational dimension focuses on school-level factors such as leadership support, collaboration structures, and access to resources. Inclusive teaching is more feasible when teachers have time for planning and opportunities for interdisciplinary collaboration (Hansen et al., 2020; Molbaek, 2018). Voluntary participation in support groups and flexible grouping strategies also contribute to motivation and inclusion (Xenofontos et al., 2024).

3. Methodology

3.1. Research Design

A qualitative methodology was chosen for its suitability in exploring complex educational practices and the lived experiences of teachers. Such an approach facilitates a deep understanding of subjective meanings, which cannot be captured through quantitative methods (Postholm & Jacobsen, 2018). Semi-structured interviews allowed participants to articulate their instructional decisions, challenges, and reasoning processes in their own terms.

3.2. Participants

Seven teachers from three different Norwegian primary and lower-secondary schools participated in the study. Participants were recruited using a combination of purposive and snowball sampling to ensure a range of experience levels and perspectives. The varied geographical and institutional contexts helped illuminate both commonalities and differences in how mathematics instruction is adapted. For a brief overview of participants and their background, see Table 1.

Table 1
Background information of the participants

Participants	*Experience (years)*	*Education*	*Further education (accredited courses)*
Maya	3 years as teacher	Integrated five-year master's degree in primary education	No further education
Ina	18 years as teacher	Four-year general teacher education	No further education
Stian	19 years as teacher	Four-year general teacher education	Further education in mathematics
Nora	25 years as teacher	Four-year general teacher education	No further education
Hanne	27 years as teacher	Four-year general teacher education	One additional year in special education and social education
Elin	32 years as teacher	Four-year general teacher education	No further education
Martin	33 years as teacher	Arts and crafts education with special education	Reading and writing difficulties, mathematics

3.3. Data Collection and Analysis

Data were collected through individual, semi-structured interviews with seven primary and lower-secondary school teachers. This method enabled the researcher to follow a consistent thematic structure while remaining flexible enough to pursue emerging topics and participant-led insights (Brinkmann & Kvale, 2014). The interview guide was designed to cover five main topic areas:

- Background and experience (e.g., "Can you tell me a bit about your teaching background?")
- Understanding of mathematical difficulties (e.g., "What do you associate with the term *mathematical difficulties*?", "How do you recognise these in your pupils?")
- Instructional adaptations (e.g., "How do you typically adjust your teaching for pupils struggling with mathematics?", "Can you give an example of a situation where you adapted your teaching successfully?")
- Collaboration and support systems (e.g., "Who do you collaborate with when supporting pupils with mathematical difficulties?")
- Challenges and reflections (e.g., "What do you find most challenging in adapting your teaching for these pupils?", "What would help you do this work more effectively?")

The questions were deliberately open-ended and designed to encourage rich, detailed responses. Follow-up questions were asked based on each participant's replies to explore specific experiences or clarify statements. Most interviews were held in-person at the participants' respective schools to ensure comfort and familiarity. One interview was conducted online due to illness, with no notable impact on the depth or flow of the conversation. Each interview lasted between 30 and 45 minutes. Participants received detailed information in advance about the study's purpose, voluntary participation, data use, and their right to withdraw at any stage. Written consent was obtained, and all sessions were audio-recorded using secure digital tools. The interviews were later transcribed and anonymised for analysis.

Data were analysed using thematic analysis, following the six-phase approach outlined by Braun and Clarke (2021).

- Familiarisation – The researcher read all transcripts multiple times to gain a comprehensive understanding of the content.
- Coding – Initial codes were generated to capture relevant data segments, particularly those reflecting instructional practices, beliefs, and institutional constraints.
- Generating themes – Codes were grouped into broader categories (sub-themes) that reflected recurring ideas. These were cross-checked with the four analytical dimensions of Molbaek's framework.
- Reviewing themes – Themes were reviewed for coherence and clarity. Redundant or weakly supported themes were merged or removed.
- Defining and naming themes – Final themes were clearly defined and given descriptive names that reflected their analytical essence.
- Writing the report – The findings were synthesised in the results section, accompanied by illustrative quotations that grounded the analysis in the teachers' own voices.

The analysis was both theory-driven and open to emergent patterns, guided by Molbaek's (2018) four dimensions of inclusive teaching as the broad themes, under which sub-themes specific to the data were identified. Table 2 illustrates an example of how specific quotes were coded, and how the codes were grouped into sub-themes under the theme "The framing dimension".

3.4. Ethical Considerations

Ethical approval for the study was granted by Sikt, the Norwegian Agency for Shared Services in Education and Research. All participants received an information letter explaining the voluntary nature of participation and signed a written consent form before the interview. Confidentiality was upheld throughout, with data stored securely and identifying details removed during

transcription. Participants were informed of their right to withdraw at any stage without penalty. Ethical awareness also extended to the interview setting, where efforts were made to create a respectful and open atmosphere.

The study was conducted by the first author as part of her master's thesis, supervised by the second author. Trustworthiness was guided by the criteria of Guba (1981) and Shenton (2004). Credibility was supported through semi-structured interviews, allowing teachers to reflect in depth on their practices. Rich, illustrative quotes anchored findings in lived experience. Theoretical and analytical frameworks, including Molbaek's (2018) inclusive teaching dimensions and Braun and Clarke's (2021) thematic analysis, added methodological rigour. The research process was systematically documented, detailing the interview guide, transcription, coding, and theme development. Peer debriefing with the supervisor throughout the analysis contributed to reflexivity and interpretive consistency. While not statistically generalisable, the study's transferability is enhanced by rich contextual detail. Participating teachers came from three schools with varied demographics and professional backgrounds. Their strategies offer insights that may be applicable elsewhere.

Table 2
An example of interview codes combined to form a theme

Sample quotes	*Code*	*Sub-theme*	*Theme*
Hanne: "But some pupils, and maybe especially the pupils we're talking about, need a bit more stability".	Stability for the pupils	Structure and predictability	Framing
Elin: "When the stress was reduced, there were fewer behavioural challenges, also because they were prepared [...] we reduced the number of assignments, and they knew that too".	The pupil receives support and feels safe		
Nora: "Next week, and they know it well, they have an art assignment [...] they are to use rulers. They are also to use the figures. And they get it almost every time".	Prepared pupils know what is expected		
Maya: "Very good. There is room to make mistakes, and to be wrong, and guess and be uncertain [...] they are very tolerant, I can't remember them ever laughing at each other".	Safe classroom	Learning environment and belonging	
Hanne: "You have to create a culture to be in the classroom".	Create a culture of collaboration		
Nora: "Because it's something they care about. They want to be part of the community".	Belong to the community		
Stian: "Lots of games. We get the drilling done. She thinks it's fun because she forgets a bit – it's also pleasant	Participation through play activities	Motivation and joy	
Nora: "We could have had a test. They'll make an artwork with specific criteria. The weaker pupils will do brilliantly and enjoy it. A lot of them are that type. So, create joy in the lesson. Let them succeed. Let them smile".	Assessment that engages more pupils		

4. Findings

This section presents the results from the thematic analysis of teacher interviews, offering a systematic and structured account of the participants' experiences. As this is an exploratory study, the intention is not to quantify how many participants mentioned each topic, but rather to identify variation and common patterns in their responses. The themes are organised according to Molbaek's (2018) four dimensions of inclusive education: the framing, relational, didactic, and organisational dimensions. These provided a guiding structure for both coding and presentation of the data. Direct quotes from the interviews are used to illustrate key points and to maintain the authenticity of the participants' voices. As outlined in Table 1, the participants represented a diverse range of professional backgrounds, with varying levels of teaching experience and

education. This diversity provides a rich foundation for examining how teachers approach the challenges of supporting pupils with MLDs.

4.1. The Framing Dimension

4.1.1. Structure and predictability

Many teachers spoke about the importance of structure and predictability, especially for pupils who struggle with mathematics. They felt that having routines in place helped these pupils feel more secure and supported. As Hanne put it, "But some pupils, and perhaps especially the ones we're talking about now, really need a bit more stability". This sense of stability often translated into more positive classroom experiences. Ina shared how her pupils benefitted from knowing what to expect and from receiving consistent help. She described how a familiar routine made a difference: "They get a real boost. And we see that with those girls too. When they see her and know it's Wednesday, they say, 'You're going to join us in maths today'. They're eight years old and ask so directly. They know they need help, and I think it's a lovely feeling to get that help". For Ina's pupils, the predictability of weekly support gave them not only reassurance but also the confidence to ask for what they needed. Predictability also played a role in reducing stress during assessments. Elin explained how she made adjustments to her testing approach to help pupils feel more at ease: "That reduced stress, so there were fewer behavioural challenges, and they were prepared. I also reduced the number of tasks, and they knew that too". By letting the pupils know what to expect and easing the demands slightly, Elin noticed a clear improvement in both behaviour and readiness. Nora also emphasised the value of preparing pupils ahead of time, especially when they would need to apply specific skills. She made a point of giving them early notice: "Next week, and they know this well, they have an art task. They'll need to use vocabulary. And they'll use shapes. I tell them that almost immediately". Like the others, she saw how being prepared helped pupils feel more capable and less anxious.

4.1.2. Learning environment, belonging and wellbeing

All the teachers emphasised the importance of creating a supportive and inclusive learning environment, particularly for pupils who experience difficulties in mathematics. This kind of environment was seen as the foundation for meaningful engagement and learning. As Elin explained, "But you need to have a good learning environment as a foundation, one that makes even the insecure pupils dare to use the understanding and competence they have". For Elin, this meant cultivating what she referred to as a "generous learning environment", a term inspired by a former pupil. She recalled the pupil's words: "It means to be generous with your heart". Reflecting on that definition, she added, "I thought it was such a beautiful explanation, so I've kind of adopted it. [...] That's how it needs to be when you're working with maths". Maya echoed the importance of classroom atmosphere. She described how openness and tolerance helped her pupils feel safe to take risks: "Very good. There's room to make mistakes, and to say the wrong thing, and to guess and be unsure [...] they're very tolerant, I can't remember them ever laughing at each other". This kind of emotional safety was seen as essential for encouraging participation. Martin pointed out that the classroom climate could also influence whether pupils felt comfortable using tools that might signal they were struggling. He noted, "It depends a bit on the class environment and the child. [...] They'll gladly use them outside the classroom, but not inside, because then someone will see them". His observation highlighted how subtle forms of judgment or self-consciousness could impact pupils' choices. In addition to emotional safety, teachers also focused on fostering a sense of belonging. Hanne spoke to this directly: "You need to create a culture for being in the classroom". She found that her support strategies were most effective when delivered within the shared classroom space: "Most pupils want a sense of belonging in the class. So, my teaching for those pupils who struggle a bit works best in the classroom". Her approach included working with pupils at a central table – visible and accessible – while still part of the class community: "Pupils can come to me there if they have questions. [...] I can also sit with those

pupils at the flower table, work on simpler tasks, but still be part of the class community. Because that community is very important". Nora also recognised how strongly pupils valued inclusion. She noted, "They're very sensitive to that. They want to be part of the community". To prevent any sense of stigmatisation, she offered differentiated tasks in a discreet and inclusive way: "I brought a sheet [...] to colour obtuse, right, and acute angles [...] for one pupil. But it was also offered to others [...] Most don't choose it, because they know it's not meant for them". This strategy gave support without singling anyone out. Stian focused on how to ensure inclusion during whole-class activities. He described being intentional in his questioning: "Make sure to call on them when they raise their hands. [...] Make sure the simple questions I ask, they get to answer". He also made small but deliberate adjustments in follow-up interactions to support pupils without drawing unwanted attention: "I often say, 'Was that what you were going to say too?' [...] so he kind of leans on someone else". For Stian, inclusion wasn't just about participation; it was about shared achievement: "We did it. The class managed. The group did it. We as a group got it done".

4.1.3. Motivation and joy

Creating enjoyment and meaning in mathematics was a key priority for the teachers, especially for pupils who struggled with the subject. Stian found that games were particularly effective in engaging one of his pupils: "Lots of games. We get the drilling done. She thinks it's fun because she forgets a bit – it's also pleasant". He recalled her making a connection between fun and progress: "I can also play this game once I know the multiplication table". Elin supported this approach, highlighting the value of playful repetition: "Activities with lots of games and fun things help practise multiplication. It's repetitive practice, but when you add a bit of motivation, they don't even realise they're practising". At the same time, she pointed out a common pitfall, that the weakest pupils often missed out on the enjoyable parts of lessons: "The weakest pupils never reach the fun tasks. If you must finish page 58 before moving on, you never get there". To address this, she shifted her focus from task completion to time-based goals: "If you say, let's work for 15 minutes and then move on, everyone reaches the goal because it's time-based". Nora emphasised the teacher's role in making mathematics enjoyable. For her, creating joy in the subject was a conscious and ongoing effort: "The most important thing is to help them enjoy the subject. I've worked a lot on that. You have to set aside the difficult and boring bits. You have to play lots of games and use dice and cards. You have to sneak in maths. You have to make it fun. They need to leave the lesson smiling. You have to create joy for the subject, when they don't master it, it becomes the subject they dislike. But that can be changed. We're the ones who make maths a good place to be". Teachers also made deliberate efforts to connect mathematics to real-life contexts in order to make it more relatable. Stian explained, "I try to start with something from real life, something they can relate to". He elaborated on how this might look in practice: "Almost always a conversation, and usually something to show. A tape measure, if that's the topic. Or we start by dividing pupils into groups if we're doing even and odd numbers or primes. They have to do something active. Or a story from real life – going to the shop, sharing sweets – something they've definitely done". Nora also described how integrating mathematics with art helped motivate and support her pupils: "They'll make an artwork with specific criteria. The weaker pupils will do brilliantly and enjoy it. A lot of them are that type. So, create joy in the lesson. Let them succeed. Let them smile".

4.2. The Relational Dimension

4.2.1. Self-perception in mathematics

Teachers consistently observed that pupils with mathematical difficulties often internalised their struggles, linking their performance in maths to their overall sense of self-worth. Elin reflected on how pupils expressed this: "Often, describing difficulties in maths comes down to 'I'm stupid.' 'I'm stupid, yes. I don't understand. I can't.' And I usually say: I don't have any stupid pupils, so that can't be right". She went on to describe how these beliefs are formed: "It's so easy to define

yourself when you look at and compare yourself to others. And there's something about not understanding. I think their self-esteem becomes very low when they struggle in maths". Ina offered a similar view, suggesting that pupils tend to adopt broad negative identities: "I think it's easier for them to think of themselves as stupid, rather than just not being good at maths". Nora also recognised the deep link between mathematics and personal identity: "It's often said that maths is tied to self-esteem – that it's a subject that matters for so many things". Elin added a cultural dimension, recalling earlier classroom attitudes: "Traditionally – and I'm old enough to remember – maths was the subject that proved you were smart. If you were a clever pupil, you had good marks in maths". These longstanding expectations, she suggested, may still reinforce the idea that difficulty in maths reflects a lack of intelligence. This stigma led many pupils to hide their struggles. Nora remarked: "Many try to hide that they struggle with maths. I think that's quite common, unfortunately". Stian provided a concrete example: "I always try to pair her with someone, and give her slightly different tasks. But she's shy, she doesn't want it to be noticeable. She feels shame quickly. That blocks her too". That sense of shame could result in passivity or withdrawal. Maya described one pupil's reaction: "I'm thinking particularly of a pupil who struggles to take initiative, who becomes uncertain, almost paralysed by that uncertainty". Martin observed a similar pattern: "They don't believe they can do it, and they've put up a barrier". To respond to this, teachers focused deliberately on highlighting pupils' strengths. Ina noted: "They're not always good at thinking, 'I can do this.' Instead, it's more like, 'I can't do what I should be able to'". Nora described how she shifted the emphasis: "I focus much more on what they can do than what they can't. Because they already know that. So, I try to place a lot of emphasis on what they're succeeding at".

4.2.2. Peer relationships and collaboration

Relationships between pupils were viewed as both a valuable resource and a potential challenge in supporting learning. Martin noted that collaborative work didn't suit every child: "Some children accept input from others more easily. If we're making a poster about geometric shapes, one can cut a triangle, another a square, then we glue it together and they explain what they've done. But the children I work with now, it's better if they all make their own". In contrast, Stian saw peer collaboration as something that could be nurtured over time: "It's not that he can never work with her because they don't get along. You have to build relationships through that too. So I started early on, saying, now we're going to practise working together". For him, social development and mathematical progress were closely connected. Several teachers actively used peer support as a teaching strategy. Ina described how well-established class dynamics could be leveraged: "You usually know your class well and who can help. They're almost like little unpaid teachers". Still, she stressed that such support needed to be grounded in mutual trust. Stian echoed this view: "You have to trust that a strong pupil won't mind explaining to a weaker pupil. Trust that it's not dangerous to show you don't get it". Maya spoke about the importance of choosing the right pupils to support others: "Pupils who aren't necessarily strong, but who are respectful and good at explaining. You've got those mid-level pupils who love helping others. I think that's a bigger resource than the top pupils, who often just keep going and don't want to help". Nora emphasised the need for meaningful roles in group work, especially for pupils with mathematical difficulties: "What should the pupil with maths difficulties do in this group? There has to be a task they can manage. It's really important that there's a role for everyone". Ensuring that every pupil felt they had something valuable to contribute was central to her approach.

4.2.3. Teacher-pupil relationships

All participants emphasised that strong, trusting relationships between teachers and pupils were essential for providing effective support. These connections made it easier to recognise individual needs and adapt instruction accordingly. Nora explained how one-on-one conversations opened up communication: "If you sit down one-on-one to talk to just that child and reflect a bit, they're better at expressing things". Stian found that small-group settings also created space for more

meaningful interaction: "In station work, you often have four or five pupils. Then you can have a deeper conversation". Martin pointed out that building trust took time and consistent effort: "You don't always connect with them straight away, so it's important that they have trust in us teachers". He described how acknowledging progress could strengthen this trust: "It's through conversation – acknowledging them. If they managed something today that they didn't get yesterday or last week, you can remind them: remember when you thought this was difficult? And now you did it. They get really proud". Hanne highlighted the importance of seeing each child as more than just a maths learner: "Talk to them. You can often push them forward just by saying, you're not alone in finding this hard. Maths is a difficult subject. But he also has lots of other qualities. Use those – other subjects, other strengths – to build confidence in maths too. No one can be a master of everything, but everyone is good at something. We need to use each other".

4.3. The Didactic Dimension

4.3.1. Assessment through dialogue and observation

To effectively adapt instruction, many teachers relied on formative and observational assessment methods. Tools such as Alle Teller[2] (meaning, Everyone Counts) were widely used to assess pupils' understanding of foundational number concepts. Ina explained: "It focuses entirely on number sense, but also tests whether pupils need to count again when more is added – do they trust that the amount is the same? We check their counting strategies – do they still use their fingers, do they count from the larger number?" Maya and Nora also used Alle Teller as a diagnostic tool. Nora highlighted its role in shaping instruction: "It's a number sense assessment, and number sense is the foundation. I use it as a starting point, for what I see and how I'll work going forward". However, she noted that the most meaningful insights often emerged during lessons: "What shows me the most, and helps me identify pupils, are the lessons. Being an active teacher, designing tasks in different ways and at different levels, lets them show what they can actually do". Elin emphasised the value of interactive assessment: "If you use it dynamically, sit with the pupil, you can note where they need help and how they think". Martin and Stian echoed this view, underlining the importance of continuous, informal assessment. Martin remarked: "It never really works otherwise. It's continuous, dynamic assessment". Stian added: "I make sure to have tasks that are really assessments in disguise, where they have to show what they do. Using manipulatives, getting them to explain – it reveals whether they understand".

4.3.2. Professional competence through experience

Much of the teachers' professional development in supporting pupils with mathematical difficulties came through hands-on experience in the classroom. Stian reflected: "I've learned most after finishing my studies, through experience, absolutely. I've realised it's much more important to use manipulatives and work physically. I've understood the importance of working for understanding. I didn't learn that at university; we did pretty difficult maths there". Nora also attributed her growth to working alongside more experienced colleagues: "Now I feel prepared. That's mainly due to experience. But it was also about the teachers I met early on. I was lucky; I worked with someone with great experience and a fantastic view of pupils. I copied that, I realise. I liked how she thought about children. So, I think most of what I've learned, I've learned from others". While some developed their skills on the job, others actively pursued formal opportunities to build their competence. Hanne described how further education made a difference: "What made me more competent was taking continuing education during Covid – getting deeper and broader insight into the topics I teach". Ina, meanwhile, expressed a need for stronger foundations in initial teacher education: "It's great to master what comes later, but we also need control of what comes before, and enough knowledge about maths difficulties, and what to look for. What do you need to be sure they can do before you move on too quickly?"

[2] https://www.alleteller.no/

4.3.3. Deep learning and differentiation

Across the board, teachers emphasised the need to ensure deep understanding and secure foundational skills. Elin put it clearly: "You have to go down to the level where they can achieve mastery. Work on basic arithmetic – number bonds to ten and so on. That has to be in place. If you don't know your number bonds or times tables, you lose your grip quickly". To support this, topics were often introduced gradually, allowing all pupils to find their footing. Nora described her approach: "I'm very thorough when I start a new topic, because of the weaker ones. I build it up step by step". She continued: "Some pupils will go far, others not. What matters is that they learn the basics. They need that foundation, those building blocks; otherwise, there'll be a lot of gaps". Maya echoed these concerns: "My worry is that they don't always learn deeply enough to build on what they've learned". Elin reinforced the importance of understanding over rote work: "A pupil with difficulties won't necessarily gain understanding just by doing 118 problems correctly using an algorithm; if they don't know why or what they're doing, it doesn't help". She added: "You have to spend enough time on it to ensure understanding". For newer teachers, pacing could be a challenge. Ina recalled her early experiences: "That wasn't easy when I was newly qualified. I looked at the textbook and thought: oh no, we have nine chapters and it's February and we're not even close to book B. I thought: doesn't everyone do this? But you have to be patient, and hopefully have experienced colleagues who say: it's okay to slow down". Martin shared a similar mindset when simplifying content: "We were working on geometry, and I thought: they don't need to learn everything. We can just cover squares and rectangles; maybe not parallelograms". Differentiation emerged as a key strategy in supporting all learners. Nora described how she structured her lessons: "I often divide my maths lessons into three parts. One part we do together – activities everyone can access, regardless of level: games, escape rooms, puzzles. Then a practice session with tasks at their level. And I believe in whole-class teaching too, it's important". Teachers adapted their methods based on pupils' stamina and individual needs. Hanne noted: "Some can work for 40–45 minutes. Some need breaks or more practical activities". Ina stressed the value of accessibility: "Tasks should have low thresholds—they need to work for everyone". Digital tools played a vital role in enabling flexibility and differentiation. Ina described them as indispensable: "Digital tools are great for adapting. Everyone can be told to use Campus, but you assign specific tasks to each pupil". Stian agreed: "There are lots of differentiation options on the iPad; most programmes have different tracks". Elin saw the value in repetition: "Programmes like GraphoGame[3] offer a lot of practice". For Hanne, technology had transformed her teaching: "I'd never go back to 1998, when we had no digital tools. Especially in maths, they really help visualise and concretise. I use maths books and paper too, but combined with loads of digital resources".

4.4. The Organisational Dimension

4.4.1. Resources and support structures

Several teachers expressed concern that mathematical difficulties often receive less attention than reading challenges. Ina observed: "I actually think maths difficulties are a bit forgotten because we're looking for so many other things. I find that there's much more focus on identifying dyslexia". She suggested this may reflect broader societal attitudes: "Maybe it's more socially acceptable not to like maths than it is to struggle with reading". Hanne echoed this point, noting how parental attitudes can contribute to downplaying maths struggles: "Some parents respond to their child struggling in maths by saying, 'Well, I did too.' So, it's like, okey – if mum or dad struggled, then it's fine if I do too". She went on to contrast the support available for different subjects: "When it comes to reading and writing difficulties, the municipality is well prepared. We've got good support. But in maths, I feel we still have a long way to go. Outside of the schools,

[3] https://www.barnevakten.no/app/graphogame-norsk/

there's no real expertise. Even the Educational and Psychological Counselling Service admits that maths isn't their strong suit". Elin also pointed to this gap: "In terms of writing and reading, we have solid competence in diagnosing dyslexia. But with dyscalculia or similar issues, the competence is sorely lacking". This lack of systemic support left teachers feeling under-equipped to meet the needs of pupils with mathematical difficulties. Beyond specialist knowledge, teachers highlighted a shortage of concrete teaching materials as another barrier. Martin emphasised the need for consistency: "If there were manipulatives in every classroom from Year 1 to Year 7, and that was the norm... It should be as common as having your workbook. Not just for those who need extra help". Hanne agreed and expressed frustration over the lack of investment in practical tools: "One set of manipulatives that could be used across subjects would be great. If you're working with decimetres, metres, centimetres, or volume, you need things pupils can pick up and examine. That would make a big difference". She added that the current situation was inefficient: "Instead of having to chase around to see if Year 6 or Year 5 has the calculators or number rods, we should have shared resources available to everyone".

4.4.2. Time and staffing

All teachers underlined the importance of having more adults in the classroom, particularly to support academic learning. However, this need was often overshadowed by behavioural priorities. Maya observed: "I would love to have more adults, because you're not always prepared for how difficult it can be. I think leadership is very good at responding to social challenges with adult support, and while they agree academic support is important, it's often what's missing". In some cases, additional staffing allowed for more flexible and effective instruction. Stian, who worked with a class requiring high levels of support, shared: "We always have two teachers in the room". He noted the academic benefit of this arrangement: "Then I can divide the class into two groups. And they're more likely to explain their thinking when they're in smaller groups". Ina described how having more adults could transform the learning environment: "Wednesdays are like a luxury – we have two or three teachers in the classroom the whole day. It's the ultimate setup". Nora agreed, expressing a wish for more consistent access to this kind of support: "What we really need is the opportunity to take out small groups. And we don't have that". A lack of time was frequently cited as a major obstacle to adaptation. Ina put it simply: "If we had more of that famous thing – time – we could do more adaptation. The time you have for each pupil is very, very short". Maya added: "Time and structure are the issue. It's not about what to do or how to help; it's about actually getting them one-on-one or in a small group. Finding time for that". Time constraints also limited collaboration among staff. Maya commented: "I think we teachers have a lot to learn from each other, but little time to do it. Yes, we collaborate in year-level teams, but that often falls away".

4.4.3. Professional community and collaboration

Despite these challenges, teachers expressed a strong desire for more professional dialogue and sharing of practice. Maya reflected on the value of learning from peers: "I know I'm not the most experienced teacher. So, getting tips from others, concrete ideas about what they do, would help a lot. That kind of support could make a big difference without needing more adults in the classroom. Just a strong culture of sharing". She also noted that stronger collaboration could support earlier identification of pupils with difficulties: "If we were all on the same page, if we could discuss and compare what we've observed, what challenges we've seen, that would help". Ina echoed this aspiration, while acknowledging the practical constraints that often got in the way: "It should happen in team meetings, but often those meetings get eaten up by discussions about behaviour, absences, or planning the next topic. It's a shame".

5. Discussion

A central theme in our findings was the importance of structure and predictability. Teachers reported that clear routines and consistent expectations reduced anxiety and fostered a greater

sense of safety in mathematics lessons, echoing Molbaek's (2018) framing dimension. This also aligns with Stronge et al. (2011), who show that structured settings benefit concentration and learning, especially for pupils prone to stress. For those with MLDs, unfamiliar or disorganised situations often triggered frustration or disengagement. Teachers such as Elin and Nora responded by clearly outlining assessment expectations and preparing pupils for upcoming tasks, reflecting Tomlinson's (2014) concept of process differentiation through intentional design. Predictability was seen as key to easing cognitive load and supporting working memory, both known difficulties among pupils with MLDs (Gersten et al., 2005; Holm, 2012). Teachers demonstrated a nuanced understanding of pupils' emotional and cognitive needs, revealing strong pedagogical content knowledge (Ball et al., 2008; Shulman, 1986). Their approaches suggest that inclusive teaching involves not only practical strategies but also the creation of a classroom culture where all learners feel secure and included.

Teachers also stressed the value of emotional safety in fostering engagement. They sought to normalise mistakes and help-seeking, highlighting the need for a learning environment that tolerates risk. Holm (2012) similarly noted that low self-efficacy and mathematics anxiety often hinder learning more than the subject itself. Elin's reference to a 'generous learning environment' encapsulates this ethos. Still, as Martin observed, emotional safety can be fragile, particularly when pupils risk standing out by using support tools. These insights point to the need for learning spaces that are not only cognitively accessible but socially welcoming.

The affective dimensions of mathematical identity were also prominent. Pupils frequently internalised difficulty as a sign of low intelligence, echoing findings by Skaalvik and Skaalvik (2015) on how self-concept influences motivation and persistence. Teachers like Elin challenged these beliefs, reinforcing that mathematical struggle does not equate to lower ability. This kind of relational support is central to Beswick's (2008) argument that teacher beliefs significantly influence pupil outcomes. Building confidence was seen not as peripheral but integral to inclusive practice.

Peer relationships were described as both beneficial and complex. While some pupils thrived through collaboration, others required individualised support. Teachers navigated this by strategically pairing pupils or assigning roles, allowing those with MLDs to contribute meaningfully. This approach illustrates Vygotsky's (1978) theory of learning within the zone of proximal development, where social interaction supports growth. The success of such arrangements depended on more than academic ability. Emotional readiness and the quality of interaction were just as important, emphasising the relational aspects of learning (Tomlinson, 2014).

Assessment was widely viewed as vital for responsive teaching. Teachers relied on observation, dialogue, and informal methods to uncover how pupils approached tasks, methods recommended by Black and Wiliam (1998) and Holm (2012) for making thinking processes visible. While tools like Alle Teller offered structure, teachers emphasised that such data must be interpreted alongside professional judgement. Descriptions of assessment as "ongoing and dynamic" demonstrated how instruction was continually adjusted in real time, echoing formative assessment principles and Gersten et al.'s (2005) call for adaptive teaching.

Professional growth was described as largely experiential. Teachers like Stian and Nora credited their development to learning from colleagues rather than formal training, a trend echoed in Hanssen et al.'s (2025) national survey, which reported that nearly a quarter of teachers in dyslexia-friendly Norwegian schools rated their competence in supporting MLDs as low. These findings suggest that initial teacher education often lacks sufficient focus on the pedagogical and psychological aspects of MLD support. Some participants had sought continuing education, but others called for more targeted preparation in early identification and evidence-based strategies. This adds weight to calls by Xenofontos et al. (2024) and by Stigberg and Stigberg (2020) for specialised training in inclusive mathematics. Teachers with formal qualifications in special education (e.g., Hanne, Martin) described more structured approaches to planning and support.

Others, without such training, relied on informal reflection and peer dialogue, suggesting that professional background shapes confidence in inclusive practices.

Conceptual understanding and deep learning were prioritised, particularly for core skills such as number bonds and multiplication. Teachers slowed lesson pace to ensure mastery rather than rushing through content, in keeping with Norwegian LK20 curriculum aims (Kunnskapsdepartementet, 2017) and research by Dowker (2005) and Aunio and Niemivirta (2010) on the importance of sustained early support for number sense. This focus on securing understanding before progression reflected a broader commitment to equity, affirming that mathematical access should not hinge on speed or prior attainment. A didactic interpretation of these practices can be further enriched by considering Sfard's (1991) account of the dual nature of mathematical conceptions. Sfard distinguishes between operational understandings of mathematics – as sequences of actions or processes – and structural understandings, in which concepts are seen as abstract objects. She argues that learning involves a gradual transformation from process to object, through interiorisation, condensation, and reification, a transition that many learners find inherently difficult. Pupils with MLDs often remain at the operational level, relying on procedural fluency without achieving conceptual reification. From this perspective, the teachers' emphasis on concrete materials, visual representations, and contextualised examples can be interpreted as didactic strategies that scaffold pupils' movement from action to abstraction, helping them build the structural understandings required for deeper mathematical reasoning.

Differentiation featured prominently in lesson planning. Tasks were varied to offer multiple entry points and challenge levels. Nora's sessions combined shared activities, tiered tasks, and whole-class discussion, demonstrating Tomlinson's (2014) multidimensional model. Digital tools like Campus discreetly offered personalisation, supporting the inclusive use of educational technology as explored by Mahoney and Hall (2017) and Sandberg (2022).

Despite strong individual practice, systemic challenges were evident. Teachers noted that mathematical difficulties often attracted less institutional focus than reading, consistent with Fuchs et al. (2005) and Gifford and Rockliffe (2012), who point to limited screening tools and specialist knowledge in mathematics. Resource shortages (including time, support staff, and manipulatives) further constrained practice. These concerns mirror findings by Molbaek (2018) and Hansen et al. (2020), who argue that organisational conditions can limit inclusive teaching, even where teacher commitment is high. Collegial collaboration was valued, though often hindered by time pressures. Teachers expressed a strong desire for more opportunities to share strategies, noting that professional discussions were often sidelined by logistical or behavioural concerns. This reinforces the case for structured professional communities focused on inclusive pedagogy (Beswick, 2008; Stigberg & Stigberg, 2020).

6. Concluding Thoughts

This study offers valuable insight into how teachers adapt mathematics instruction to support pupils with MLDs. The findings highlight the relational, cognitive and organisational complexities of inclusive teaching, emphasising the essential role of teacher agency, professional judgement and classroom culture.

6.1. Implications

An important implication of this work is the centrality of teachers' relational competence in fostering inclusive learning. Trust, predictability and emotional support were found to be foundational for pupils with low self-efficacy in mathematics (Holm, 2012; Skaalvik & Skaalvik, 2015). Teachers promoted a sense of belonging and reframed failure, helping pupils engage despite previous negative experiences. These findings support the view that teacher beliefs and expectations influence pupil outcomes (Beswick, 2008). Pedagogically, differentiation in process and product (Tomlinson, 2014) allowed meaningful participation without stigma. Teachers designed open-ended tasks, used digital tools for personalisation and employed formative

assessment to inform real-time adjustments. These practices reflect research on early, targeted intervention (Aunio & Niemivirta, 2010; Gersten et al., 2005). Organisationally, the study draws attention to inequalities in resources and access to professional learning. Unlike reading difficulties, mathematics challenges often go unnoticed, raising concerns about under-identification and limited institutional support (Fuchs et al., 2005). Teachers highlighted the need for more time, materials and staff to sustain inclusive practice.

6.2. Limitations and Avenues for Future Research

This study has certain limitations. The small and geographically limited sample of seven teachers from three Norwegian schools restricts broader applicability. Although the interviews provided rich detail, they may not fully reflect actual practice or unconscious aspects of teaching. Observational data or input from pupils would have enhanced the findings. The absence of longitudinal data also limits understanding of the long-term impact of adaptive practices. Future research should consider the perspectives of pupils with MLDs, including how they experience adaptations, peer relationships and their own mathematical identity (Skaalvik & Skaalvik, 2015). Further studies might explore specific strategies such as digital tools or formative assessment through mixed-methods or intervention-based designs to build evidence for effective practice. Comparative studies of teacher education could identify gaps in training, particularly as many participants said they developed inclusive skills mainly through experience (Stigberg & Stigberg, 2020; Xenofontos et al., 2024). Finally, more attention should be given to organisational and leadership factors such as planning time, staffing and collaboration structures, which influence teachers' capacity to address diverse pupil needs (Hansen et al., 2020; Molbaek, 2018).

AI Usage and Assistance: The authors confirm that no text, data, analyses, or findings were generated using AI tools. AI assistance was limited to language editing and proofreading, with the aim of enhancing clarity, coherence, and readability.

Author Contributions: This study was conducted during the 2024–2025 academic year, when the first author (*Anne Marit Eriksen Bergstrand*) was pursuing a master's degree in mathematics education at Oslo Metropolitan University, Norway. At the time, the second author (*Constantinos Xenofontos*) was a professor at the same university and supervised this master's project. Both authors contributed equally and approved the final version of the article for publication.

Declaration of Interest: The authors declare no potential conflicts of interest.

Data Availability: The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

Ethical Statement: Ethical approval for this study was granted by *Sikt – Norwegian Agency for Shared Services in Education and Research*. Informed consent was obtained from all participants, and confidentiality and anonymity were maintained.

Funding: This study did not receive any external funding.

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