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Exploring Inclusive Mathematics Pedagogical Practices: A Case Study of Malaysian Primary School Teachers

Norazlina Mohd Radzi^{ID} and Muhammad Sofwan Mahmud*^{ID}
Universiti Kebangsaan Malaysia
Selangor, Malaysia

Abstract. Inclusive education is a national priority in Malaysia; however, empirical research on how primary school teachers implement inclusive pedagogical practices in mathematics classrooms remains limited. This study investigated the instructional strategies employed by mainstream mathematics teachers to support the learning needs of inclusive pupils in inclusive settings. A qualitative case study design was adopted, involving semi-structured interviews with three mathematics teachers from mainstream primary schools implementing inclusive education programmes. Interview data were thematically analysed using ATLAS.ti to develop a nuanced understanding of inclusive pedagogical practices. Five interconnected themes emerged from the analysis: (1) Responsive and Adaptive Mathematics Instruction, (2) Inclusive Classroom Management in Mathematics Approaches, (3) Professional Collaboration in Mathematics Teaching, (4) Teacher Readiness and Understanding of Inclusive Learners, and (5) School Systemic Support for Inclusive Education. The findings indicate that effective inclusive mathematics instruction is supported by collaborative professional practices, adaptive classroom strategies, and effective school-level support systems, rather than depending primarily on individual teacher ability. This study highlights the importance of focused professional development, organized teamwork, and leadership dedication to encourage inclusive mathematics instruction. This study enhances the understanding of inclusive mathematics instruction in Malaysian primary schools by emphasizing the interaction among pedagogy, professional environment, and institutional support. It underscores the fundamental roles of adaptive instruction, collective professional accountability, and systemic coherence in fostering equitable and significant learning opportunities for inclusive pupils.

Keywords: Inclusive pupils; Mathematics; Pedagogy; Teachers and Mainstream classroom

*Corresponding author: Muhammad Sofwan Mahmud; sofwanmahmud@ukm.edu.my

1. Introduction

Inclusive education has gained growing international recognition as education systems strive to ensure equitable and meaningful access to learning for all students, including those with diverse learning needs (Walton, 2023). Global frameworks such as the Salamanca Statement (UNESCO, 1994), the Convention on the Rights of Persons with Disabilities (Nations, 2006) and Sustainable Development Goal 4 (United Nation, 2015) underscore the moral and professional responsibility of educational institutions to enable pupils with disabilities to learn alongside their peers in supportive and inclusive environments (Su et al., 2023). In this context, inclusive pedagogy particularly in high-stakes subjects like mathematics has emerged as a significant area of academic inquiry (Faragher & Clarke, 2019).

In Malaysia, the implementation of inclusive education is guided by the Ministry of Inclusive Education Programme, which seeks to expand the participation of pupils with disabilities in mainstream classrooms (Special Education Department, 2018). However, mathematics instruction poses unique pedagogical challenges due to its abstract concepts, sequential learning structure, and heavy reliance on symbolic reasoning (Radzi & Mahmud, 2025). These features demand that mathematics teachers employ specialised instructional strategies such as scaffolding, multimodal representations, and differentiated tasks to ensure that all learners, including those with diverse cognitive profiles and levels of developmental readiness, can engage meaningfully with mathematical content (Padilla et al., 2024; Vodickova et al., 2023).

Beyond limitations in professional training, resource constraints pose substantial challenges to the effective implementation of inclusive mathematics instruction. These constraints include inadequate access to instructional materials, assistive technologies, and adaptable teaching resources that are essential for supporting differentiated and multimodal learning (Mulovhedzi & Luhalima, 2023; Naftaliev & Barabash, 2024). Such limitations restrict teachers' ability to consistently enact inclusive pedagogical strategies, particularly in classrooms characterised by diverse cognitive, behavioural, and developmental needs (Aktas, 2024). Additionally, opportunities for structured professional collaboration such as co-planning with special education teachers, peer mentoring, and participation in professional learning communities are often limited or unevenly implemented (Chirinda, 2021).

Consequently, mathematics teachers may be required to address inclusive teaching challenges in isolation, which can weaken the coherence and long-term sustainability of inclusive practices (Keppens et al., 2019). Institutional support further plays a decisive role in shaping inclusive mathematics instruction (Buscher & Prediger, 2024). Variations in leadership commitment, ambiguity in implementation guidelines, and competing curriculum and assessment demands can constrain teachers' efforts to enact inclusive pedagogy (Lambrecht et al., 2022). When school-level support systems are fragmented or insufficient, teachers may struggle to align inclusive instructional approaches with prescribed curriculum objectives and high-stakes assessment requirements. As a result, a persistent gap

emerges between inclusive education policies and classroom-level enactment, particularly in subjects such as mathematics where standardisation and performance pressures are prominent (Nanda & Rani, 2025).

Although inclusive education has been extensively discussed in the broader literature, empirical research that specifically examines the pedagogical experiences and instructional decision-making of mathematics teachers in inclusive classrooms remains limited (Mahmud et al., 2023). There is a notable lack of qualitative studies exploring how primary school mathematics teachers plan lessons, adapt instructional materials, and operationalise inclusive strategies in authentic classroom contexts (Nyudule & Possi, 2024).

This gap is especially pronounced within the Malaysian education system, where context-sensitive evidence on inclusive mathematics pedagogy is still developing. Addressing this gap is critical for strengthening inclusive teaching practices, informing targeted professional development, and improving alignment between inclusive education policies and everyday instructional realities (de Souza, 2022). This study aims to address this gap by investigating how primary school mathematics teachers in Malaysia apply inclusive pedagogical approaches when teaching pupils with disabilities (Valdez & Kelp 2023).

Inclusive pedagogy in mathematics classrooms is still complex and unequal, despite the strong policy commitments to inclusive education at both the international and national levels (N. M. Radzi & Mahmud 2025). Mathematics, a subject that is set apart by abstract concepts, hierarchical content progression, and high curricular demands, presents unique instructional challenges for inclusion that surpass the scope of generic inclusive practices. In the Malaysian context, existing studies have documented systemic constraints such as limited resources, collaboration, and leadership support (N. Radzi & Mahmud 2025). However, there is a dearth of qualitative evidence that investigates how mathematics teachers navigate these challenges in their daily instructional practice. There is a lack of understanding regarding the way teachers interpret inclusive principles, adapt mathematics-specific instructional strategies, and make pedagogical decisions to support inclusive learners in mainstream classrooms.

By exploring their lived experiences, instructional adaptations, and the pedagogical reasoning behind their practices, this research provides critical insights into the practical realities of inclusive mathematics instruction (Matiti, 2024; Sebsibe et al., 2023). The findings are expected to contribute to the ongoing discourse on teacher professional development, policy-practice coherence, and innovation in inclusive teaching strategies. Therefore, the objective of this study is to explore the instructional strategies used by primary school mathematics teachers to support the learning needs of inclusive pupils in the classroom.

Guided by this aim, the study addresses the following research question:

1. How do primary school mathematics teachers implement instructional strategies to support the learning needs of inclusive pupils in mathematics classrooms?

2. Literature Review

This section discusses important literature on inclusive mathematics education, emphasizing pedagogical strategies, teacher-related variables, and research limitations. The talk commences with global and Malaysian viewpoints on inclusive mathematics education, then addressing inclusive pedagogical strategies like Universal Design for Learning, differentiated instruction, scaffolding, and the Concrete-Representational-Abstract (CRA). The review subsequently discusses the significance of teachers' professional expertise and reflective practice in inclusive mathematics instruction, concluding in a summary of limitations in current studies, especially with mathematics teachers' experiences in inclusive classroom environments.

2.1 Inclusive Mathematics Education

Inclusive mathematics education encompasses instructional practices designed to ensure that all learners, including pupils with diverse learning needs, can meaningfully engage in mathematical learning experiences (Moodley & Chetty, 2024). International scholarship underscores that inclusive mathematics classrooms not only enhance equitable access to the curriculum but also cultivate positive mathematical identities, learner agency, and a sense of belonging (Beighton, 2024). Research further suggests that, when effectively implemented, inclusive mathematics environments support deeper conceptual understanding, encourage collaborative reasoning, and facilitate the use of multiple representations of mathematical concepts benefiting all pupils (Bessarab et al., 2023; Pokhrel et al., 2024).

In Malaysia, inclusive mathematics instruction is situated within the Ministry of Education Inclusive Programme which advocates for the integration of pupils with disabilities into mainstream classrooms, including mathematics instruction where appropriate (Special Education Department, 2018). However, implementation varies significantly across schools, shaped by differences in teacher preparedness, access to instructional resources, and institutional attitudes toward inclusion (Curriculum Development Department, 2017).

While national policies articulate a clear vision for inclusive education, challenges persist in operationalizing these values within mathematics classrooms (Rosli et al., 2022). The subject's traditional emphasis on standardization, procedural fluency, and rigid curriculum pacing often conflicts with inclusive pedagogical practices (Curriculum Development Department, 2017). These systemic tensions shape both the instructional realities and the pedagogical expectations placed upon mathematics teachers in inclusive educational settings (Lubis et al., 2021).

2.2 Pedagogical Approaches in Inclusive Mathematics Teaching

Effective inclusive mathematics instruction necessitates the use of pedagogical strategies grounded in evidence-based frameworks, such as Universal Design for Learning (UDL) (CAST, 2018), Differentiated Instruction (DI), and instructional scaffolding (Jutte & Luken, 2020). UDL promotes flexible instructional pathways by incorporating multiple means of representation, engagement, and expression, thereby enabling diverse learners to access mathematical content through various

modalities (Stasiunaitiene & Navaitiene, 2021). Differentiated instruction, by contrast, focuses on tailoring tasks, support mechanisms, and pacing to learners' readiness levels, interests, and learning profiles (Rodrigues et al., 2022).

Scaffolding techniques including guided questioning, structured modeling, visual aids, and the Concrete–Representational–Abstract (CRA) instructional sequence have also proven effective in supporting pupils with learning difficulties in mathematics (Cameron, 2025; Yakubova et al., 2020). These approaches help bridge the gap between learners' existing knowledge and abstract reasoning, thereby facilitating conceptual understanding (Purwadi et al., 2019).

Additionally, the use of multimodal instruction, manipulatives, and visual thinking tools enhances cognitive accessibility for pupils who struggle with symbolic representation and linear problem-solving processes (Miyachi, 2020). Nevertheless, implementing these strategies requires careful instructional planning. Mathematics educators must align inclusive teaching practices with curriculum goals, ensuring that necessary adaptations maintain both task rigor and conceptual depth. Striking this balance remains a core pedagogical challenge in inclusive mathematics classrooms (Chuen et al., 2022; Haris & Khairuddin, 2021).

2.3 Teacher Professional Knowledge in Inclusive Mathematics Teaching

Teacher professional knowledge is a critical determinant of effective inclusive mathematics teaching, particularly in classrooms that accommodate inclusive pupils. In inclusive mathematics settings, teachers are required to make informed instructional decisions that ensure accessibility while maintaining conceptual rigour and alignment with curriculum standards (Greenstein & Baglieri, 2018). These instructional demands underscore the importance of specialised professional knowledge that enables teachers to design, adapt, and implement strategies responsive to learner diversity (Barr & Mavropoulou, 2021). A central component of such professional knowledge is Mathematical Pedagogical Content Knowledge (MPCK) (Wright et al., 2021).

MPCK extends beyond subject matter expertise to include an understanding of how pupils construct mathematical understanding, common misconceptions, developmental trajectories in numeracy, and the pedagogical use of representations (Bertrand & Namukasa, 2023). Teachers with well-developed MPCK are better equipped to transform abstract mathematical concepts into accessible learning experiences through strategies such as scaffolding, task differentiation, and the use of concrete, visual, and symbolic representations. This knowledge base enables teachers to anticipate learning barriers and apply instructional approaches that facilitate both engagement and conceptual understanding for inclusive pupils (Camargo et al., 2022).

In addition to MPCK, professional knowledge also encompasses teachers' ability to adapt instruction flexibly in response to pupils' emerging needs. Inclusive mathematics teaching requires continuous monitoring of pupil responses, adjustment of instructional pacing, and modification of tasks or representations

as necessary (Buchanan & Song, 2022). This adaptive expertise is cultivated through sustained professional learning and practical classroom experience, enabling teachers to respond effectively to the wide spectrum of cognitive profiles present in inclusive classrooms (Garrote et al., 2020). Furthermore, professional knowledge in inclusive mathematics teaching is enriched through collaborative and reflective practices. Participation in professional learning communities, joint lesson planning, and reflective dialogue with colleagues especially with special education teachers enhances teachers' capacity to refine instructional strategies and address inclusion-related challenges. These collaborative knowledge-building processes support the translation of inclusive pedagogical principles into practical, context-responsive mathematics instruction (Jutte & Luken 2020).

2.4 Theoretical Framework

This study is guided by two complementary theoretical perspectives that together illuminate how mathematics teachers design and implement instructional strategies to support students' pupils with disabilities in inclusive mainstream classrooms. Universal Design for Learning (UDL) offers a proactive framework for fostering accessibility through multiple means of representation, engagement, and expression, thereby accommodating a wide range of learner needs (CAST, 2018).

Meanwhile, Mathematical Pedagogical Content Knowledge (MPCK) provides insight into the specialized knowledge teachers draw upon to transform mathematical content into accessible and meaningful learning experiences for pupils with diverse cognitive profiles (Friesen & Su, 2023; Moodley & Chetty, 2024). The integration of UDL and MPCK enables a dual focus in this study: UDL informs the design of accessible instructional environments, while MPCK articulates the pedagogical reasoning behind teachers' mathematical decisions. Together, these frameworks support a comprehensive analysis of how inclusive mathematics instruction is conceptualized and enacted.

This study improves existing inclusive mathematics education frameworks by including Universal Design for Learning (UDL) and Mathematical Pedagogical Content Knowledge (MPCK) to elucidate instructional design and pedagogical decision-making in inclusive classrooms (CAST 2018). The results demonstrate how UDL organizes accessible learning settings, while MPCK guides teachers' adaptive reactions to pupils mathematical comprehension, thereby providing a contextualized and practice-oriented contribution to inclusive mathematics pedagogy.

3. Methodology

This section defines the research design, participant selection, data collection methodologies, and data analysis techniques utilized in the study. The technique has been meticulously adjusted to guarantee clarity, specificity, and integration with the study objectives.

3.1 Research Design

This study adopted a qualitative case study design to gain an in-depth understanding of how primary school mathematics teachers implement instructional strategies to support inclusive pupils in the classroom (Creswell & David, 2018; Merriam & Tisdell, 2016). A case study approach was selected because it facilitates the investigation of a phenomenon within its real-life context, particularly when the boundaries between the phenomenon and its context are blurred. In this study, the "case" refers to the instructional experiences and practices of mathematics teachers working within inclusive mainstream classrooms in Malaysian primary schools (Haris & Khairuddin, 2021).

This design enabled a nuanced exploration of pedagogical decision-making, instructional adaptations, and the contextual factors that influence inclusive mathematics teaching. The qualitative case study design aligns with the exploratory nature of the research objectives, enabling the collection of diverse perspectives and the examination of lived experiences. Rather than aiming for statistical generalization, this study seeks to generate rich, contextualized insights that deepen understanding of inclusive mathematics pedagogy and inform future directions in practice, policy implementation, and teacher professional development (Morse, 2020).

3.2 Participants

Three mathematics teachers which are participant A, participant B and participant C participated in this study, each actively teaching inclusive pupils in mainstream mathematics classrooms in Malaysian primary schools participating in the Inclusive Education Programme. A purposive sampling strategy was employed to identify participants who met specific inclusion criteria: (i) current experience teaching inclusive pupils in mainstream mathematics settings; and (ii) at least one year of mathematics teaching experience at the primary school level (Guest et al., 2006).

This approach ensured the selection of educators with the instructional expertise and contextual familiarity necessary to contribute meaningful insights into inclusive mathematics pedagogy. The participants represented a range of teaching experience, training backgrounds, and levels of exposure to inclusive education. This diversity enriched the dataset by offering varied perspectives on inclusive instructional practices and pedagogical reasoning. To protect participant confidentiality, pseudonyms were used, and all identifying information including school names, locations, and personal demographics was excluded from the reporting (Mason, 2010).

This sample size is considered acceptable for a qualitative case study that prioritizes depth of understanding over scope of representation, despite the limited number of participants (Guest et al. 2006). The participants were chosen based on their direct instructional involvement with inclusive pupils, which allowed for the accumulation of significant experiential data that was appropriate to the research objective. Data saturation was achieved through the consistent reporting of contextual challenges, pedagogical reasoning, and instructional strategies in all interviews (Mason 2010). The data were sufficient to meaningfully

address the research question, as no substantively new themes emerged in the later phases of data collection.

3.3 Data Collection and Analysis

This study employed semi-structured interviews as the primary qualitative data collection method (Merriam & Tisdell, 2016). Semi-structured interviews enabled mathematics teachers to articulate their professional reasoning, instructional strategies, and classroom practices related to inclusive mathematics teaching in rich, contextual detail (Mason, 2010). The interview protocol was developed based on existing literature in inclusive pedagogy, mathematics education, and teaching practice. It comprised open-ended questions designed to elicit insights into instructional adaptations, pedagogical challenges, and forms of support encountered in inclusive classroom environments (Bessarab et al., 2023; Chirinda, 2021).

Each interview lasted between 30 and 60 minutes and was conducted face to face, depending on participant availability and the school context. All interviews were audio-recorded with participants' informed consent and transcribed verbatim to preserve the accuracy and depth of the responses (Mason, 2010; Merriam & Tisdell, 2016). The data were analyzed using thematic analysis, which enabled the identification of recurring patterns, meanings, and themes within the dataset (Friese, 2022). Transcribed interviews were imported into Atlas.ti software to facilitate systematic coding and thematic development (ATLAS.ti Scientific Software Development, 2024). Throughout the analysis, memo writing and constant comparison techniques were employed to support reflexivity and analytical rigor (Herbst et al., 2024; Soratto et al., 2020). Therefore, these strategies reinforced the dependability and confirmability of the findings, ensuring that the final thematic structure authentically reflects participants' voices and instructional realities.

3.4 Trustworthiness

A variety of techniques were implemented to assure the study's trustworthiness. Credibility was augmented via member verification, allowing participants to confirm the precision of interview transcripts and interpretations. Peer debriefing occurred via discussions with seasoned qualitative researchers to enhance coding decisions and thematic interpretations (Varpio et al. 2017). Trustworthiness and accuracy were ensured through the maintenance of a transparent audit trail, encompassing interview protocols, coding documentation, and analytical notes. Numerous details were included to enable readers to evaluate the applicability of the findings to parallel educational contexts.

3.5 Ethical Considerations

Ethical approval for this study was granted by the Educational Planning and Policy Research Division (EPRD) of the Ministry of Education Malaysia prior to the commencement of data collection. All research procedures were conducted in accordance with established ethical standards and approved under reference number KPM.600-3/2/3-ERAS (26474). Participants received an information sheet outlining the purpose of the study, their rights, and the intended use of the data. Informed consent was obtained voluntarily before interviews commenced.

Participants were also informed of their right to withdraw from the study at any time without penalty. Confidentiality was maintained throughout the research process. Pseudonyms were assigned to participants, and all identifiable information including school names and locations was removed from transcripts, field notes, and disseminated materials. Audio recordings and transcripts were securely stored in encrypted digital formats and were accessible only to the researcher. The ethical principles of respect for persons, autonomy, and non-maleficence guided all interactions with participants and shaped the overall conduct of the study (Merriam & Tisdell, 2016).

4. Findings

The thematic analysis of interview data revealed five interrelated themes that illuminate how primary school mathematics teachers support the learning needs of inclusive pupils in mainstream classrooms. These themes demonstrate that inclusive mathematics instruction is influenced not only using pedagogical strategies, but also by broader contextual factors, including classroom organisation, professional collaboration, teachers' instructional readiness, and school-level support mechanisms (Garrote et al., 2020).

Within the context of mathematics education, the findings suggest that effective inclusive instruction extends beyond the transmission of mathematical content and requires deliberate, responsive pedagogical decision-making (Wright, 2021). Mathematics teachers must navigate the tension between maintaining conceptual rigour and ensuring accessibility by adjusting instructional pacing, employing multiple representations, and responding to pupils' cognitive, behavioural, and developmental diversity (Moscardini, 2014). Accordingly, the findings highlight the complex and multidimensional nature of inclusive mathematics teaching, where classroom practices are closely interconnected with collaborative and systemic conditions that collectively shape pupils' meaningful engagement with mathematical learning (Duncan et al., 2023).

4.1 Responsive and Adaptive Mathematics Instruction

This theme captures how mathematics teachers actively modify their instructional approaches to address the diverse learning needs of inclusive pupils in mainstream classrooms. Rather than adhering to uniform teaching methods, teachers demonstrate pedagogical flexibility by adjusting content delivery, task complexity, and learning supports to align with pupils' individual abilities, readiness levels, and behavioral profiles. Instruction is dynamic, continuously adapted in real time based on pupils' responses, engagement, and observable progress. Responsive instruction is characterized by differentiated pacing.

Participant A emphasized the importance of using engaging entry routines to capture pupils' attention:

"I always use a unique approach to start my lesson because I need to capture their attention usually through singing. We begin with a song. Sometimes, I also use teaching aids. For example, when teaching a difficult topic like mass or weighing, you know how children can be."

This practice was similarly noted by Participant B, who also highlighted the use of singing as an effective strategy to engage inclusive pupils and create a positive learning atmosphere at the start of mathematics lessons. Participant B noted that incorporating songs helped pupils focus, reduced anxiety and facilitated smoother transitions into mathematical tasks, particularly for pupils who required additional support.

Participant B noted the importance of using digital tools to maintain pupil engagement:

“Most of the time, we use digital TV. The pupils really enjoy watching and engaging with the content shown in the classroom.”

This view was similarly accepted by Participant A, who also emphasized the role of digital resources in sustaining pupils’ attention and enhancing engagement in inclusive mathematics classrooms. Participant A noted that the use of digital tools, such as visual displays and interactive content, helped make abstract mathematical concepts more accessible and supported pupils’ understanding, particularly among those who required additional learning support. Several teachers emphasized the value of using mental arithmetic as a warm-up strategy.

Participant C explained,

“We use mental math. Usually, at the start of every class, we do mental math activities. The pupils enjoy it because they can respond quickly.”

This practice was also accepted by Participant B, who noted that mental arithmetic activities helped to activate pupils’ prior knowledge and prepare them for subsequent mathematical tasks. According to Participant B, incorporating mental math at the beginning of lessons fostered active participation, increased pupils’ confidence, and supported engagement among inclusive pupils.

These statements highlight that teachers intentionally initiate mathematics lessons with engaging and stimulating entry routines such as singing, digital media, or mental arithmetic to capture pupils’ attention and prime their readiness to learn. These practices not only sustain motivation but also promote early participation among inclusive pupils, enabling them to enter the learning process with greater confidence. This underscores that responsive instructional design begins well before the formal introduction of mathematical content, setting the tone for inclusive engagement from the very outset of the lesson.

4.2 Inclusive Classroom Management in Mathematics Approaches

Effective classroom management emerged as a critical component in supporting the participation of inclusive pupils in mathematics lessons. Teachers deliberately structured the physical environment, adjusting seating arrangements and spatial organization to minimize potential behavioural triggers while promoting both comfort and positive peer interactions. These management strategies underscore the importance of emotional safety, consistency, and routine in facilitating sustained engagement with mathematical learning. By fostering a supportive and responsive classroom climate, teachers helped ensure that all pupils including

those with behavioural or sensory needs could participate meaningfully in mathematics instruction.

Participant A described how classroom seating was arranged to support ease of movement and facilitate participation:

“They are in the mainstream class, so we arrange the seating to make it easier for us. It’s also easier for the pupil to come forward when called. So, the pupil sits closer to the front.”

This approach was similarly supported by Participant B and Participant C, who also emphasized the importance of strategic seating arrangements in inclusive mathematics classrooms. Both participants noted that positioning inclusive pupils closer to the front enabled closer teacher monitoring, more immediate instructional support, and increased opportunities for active participation during mathematics activities. Such seating arrangements were perceived as particularly beneficial for maintaining pupils’ focus and facilitating timely teacher–pupil interactions in inclusive classroom settings.

Participant B emphasized the importance of inclusive seating arrangements as a foundation for effective teaching:

“It means we consider diversity and seating arrangements only then can teaching happen. We do not separate inclusive pupils from mainstream pupils in the classroom. We arrange the seating so they can learn together with their peers.”

Participant C highlighted the growing awareness and value shift within the school community:

“We, as a school community, are now more aware of the conditions of these pupils, their physical needs, disabilities, and so on. What we really aim for is to cultivate a caring society.”

These insights show that inclusive classroom management is grounded in thoughtful seating arrangements, social integration, and a growing sense of community awareness. Teachers position pupils strategically to support mobility, focus, and ready access to the teacher, while ensuring that inclusive pupils remain physically and socially embedded among their peers. Beyond structural organisation, schools are increasingly embracing a culture of care that recognises and values learner diversity. This demonstrates that effective classroom management is not merely about regulating behaviour, but about cultivating an environment in which inclusive pupils feel supported, connected, and fully accepted within the mainstream mathematics classroom.

4.3 Professional Collaboration in Mathematics Teaching

This theme highlights that inclusive mathematics instruction is a collaborative endeavour, rather than the sole responsibility of the classroom teacher. Its effective implementation depends on coordinated efforts among various professionals within the school ecosystem. Teachers frequently collaborate with Special Education teachers and administrators to access behavioural strategies, instructional adaptations, and background information about pupils, enabling

them to make informed pedagogical decisions within mainstream classrooms. Collaboration also extends to parents, who provide valuable insights into their children's learning profiles, emotional needs, and home-based support strategies. Engaging parents in ongoing communication fosters consistency between school and home environments and reinforces the inclusive learning process.

Participant A highlighted the strength of collaboration with Special Education teachers, noting both their commitment and the positive working relationship with mainstream teachers:

"The collaboration with the special education teachers is really very good... yes, I think most of the special education teachers and their assistants are very committed."

Participant B emphasized the role of parent-teacher communication in supporting inclusive pupils:

"We communicate with the parents. The parents are aware of their child's situation, and I strongly believe that parents are extremely important in providing support."

Participant C described how collaboration extends beyond the classroom to include subject panel members and school leadership:

"The mathematics panel teachers and the administrators also ask about this pupil. In meetings, we highlight the issues and discuss them together."

This collaborative practice was similarly supported by Participant A and Participant B, who emphasized the importance of collective discussions involving mathematics panel members and school administrators when addressing the learning needs of inclusive pupils. Both participants noted that such collaboration enabled shared decision-making, consistent instructional support, and coordinated responses to challenges encountered in inclusive mathematics classrooms. These collaborative efforts were perceived as essential for sustaining inclusive practices and ensuring that instructional strategies were aligned with broader school-level support structures.

These insights illustrate that collaboration in inclusive mathematics instruction occurs across multiple interconnected levels: between mainstream and special education teachers, between teachers and parents, and within school leadership and curriculum teams. These collaborative efforts ensure that the educational needs of inclusive pupils are addressed through shared responsibility rather than being left to individual teachers alone. The integration of diverse expertise, sustained communication, and joint decision-making enhances instructional coherence and reinforces a consistent, school-wide commitment to supporting the academic and social development of all learners.

4.4 Teacher Readiness and Understanding of Inclusive Pupils

Teacher readiness emerged as a critical factor influencing the success of inclusive mathematics instruction. Although none of the participants had received formal pre-service training in special education, their competence and confidence

developed progressively through classroom experience, reflective practice, and collegial collaboration. Teachers emphasized that understanding each pupil's diagnostic profile including the nature of their disability, functional abilities, behavioral triggers, strengths, and preferred learning styles was essential for planning effective support and adapting instruction.

By gaining insight into pupils' behavioral patterns and cognitive needs, teachers were better positioned to anticipate potential challenges, reduce emotional distress, and provide meaningful learning opportunities aligned with individual capabilities. This sense of readiness was further enhanced by a proactive mindset, a willingness to seek guidance, and a commitment to inclusive values such as patience, empathy, and equity.

Participant highlighted the value of collaborative professional learning in shaping inclusive teaching practices:

"Yes, that's right. Once we have the experience, we always share among ourselves the best ways to manage and support these pupils." (Participant A)

Participant B reflected on the foundational attitudes required for working effectively with inclusive pupils:

"So, we need to understand and be patient in order to know how to handle the situations of these pupils."

This perspective was also supported by Participant A, who similarly highlighted the importance of demonstrating patience and sensitivity when responding to the learning needs and behaviours of inclusive pupils. Both participants indicated that these dispositions enabled teachers to manage classroom situations more effectively, adapt instructional responses appropriately, and maintain a supportive learning environment for inclusive mathematics instruction.

Participant C underscored the ethical and instructional responsibility of the teacher in maintaining equitable participation:

"We need to understand and be prepared with ways to ensure that these pupils are not excluded, considering their different ability levels."

These perspectives illustrate that teacher readiness for inclusive mathematics instruction is grounded not only in pedagogical knowledge, but also in reflective practice, empathy, and a strong sense of professional responsibility. Experience gained through real classroom interactions encourages teachers to exchange strategies and engage in collaborative learning. At the same time, an understanding of each pupil's individual needs fosters patience and informs instructional decision-making. Most importantly, teachers recognize their ethical obligation to prevent exclusion by ensuring that every pupil regardless of ability level has equitable access to meaningful mathematical learning opportunities. Teacher readiness, therefore, is nurtured through a continuous cycle of experiential learning, collegial collaboration, and a deep commitment to inclusive educational values.

4.5 School Systemic Support for Inclusive Education

Beyond individual classroom practices, the findings highlight that systemic, school-level support is essential for sustaining inclusive mathematics education. Schools demonstrated their commitment to inclusion through structured policies and ongoing administrative monitoring, ensuring that interventions were aligned with pupils' specific learning and developmental needs. Inclusive values were actively embedded into the broader school culture through targeted initiatives and professional dialogue. Leadership commitment was also reflected in practical decisions regarding infrastructure and resource allocation—for example, assigning ground-floor classrooms to enhance accessibility. These efforts were supported by strategic planning, effective policy implementation, and a culture of acceptance across the school.

Participant A described how changes in school sports policy reflect broader shifts toward meaningful inclusion across school activities:

"Another school policy is related to sports. Previously, only inclusive pupils contributed points to their own group. But now, inclusive pupils also participate together in the same sports teams. Their points contribute to their house team, which means their participation is valued and not seen as reducing the team's score."

Participant B described a coordinated, school-wide approach to supporting inclusive pupils during mathematics instruction:

"So, during mathematics lessons, the special education teacher will come in. The administrators also come to observe and monitor. They understand the capabilities of these pupils in mathematics, which are quite good. We discuss the pupils' progress with the special education team, and the mathematics teacher must also be aware. We even review the pupils' results together."

This coordinated approach was similarly supported by Participant A and Participant C, who highlighted the importance of shared responsibility and continuous communication among teaching staff and school leadership. Both participants noted that regular classroom observations, joint discussions on pupils' progress, and collaborative review of assessment outcomes contributed to more consistent instructional support for inclusive pupils. Such school-wide collaboration was perceived as instrumental in aligning instructional practices, monitoring pupils' learning progress, and sustaining inclusive mathematics teaching within the broader school support system.

Participant C noted that inclusive education efforts were also financially supported by the Parent-Teacher Association, reinforcing the importance of community engagement:

"As far as I know, the parents' community has provided a lot of funding. There are allocations for the education of these pupils."

Collectively, these insights demonstrate that inclusive mathematics practices are significantly strengthened when schools provide systematic support through well-defined policies, monitoring mechanisms, and targeted resource allocation.

Active leadership involvement, interdepartmental collaboration, and dedicated funding reflect a shared institutional responsibility to ensure equitable learning opportunities. These systemic efforts not only embed inclusive values within the broader school culture but also equip teachers with the structural and material support needed to sustain inclusive pedagogy. Ultimately, such coordinated actions foster an environment in which inclusive pupils can thrive both academically and socially within mainstream mathematics classrooms.

5. Discussion

The findings indicate that inclusive mathematics instruction is fundamentally grounded in responsive and adaptive pedagogical practices. Mathematics teachers consistently modified lesson entry routines, instructional pacing, representations, and learning activities in response to pupils' levels of engagement and understanding (Chia Wei et al., 2023). Such responsiveness is particularly critical in mathematics, where abstract concepts, symbolic representations, and sequential reasoning can present substantial access barriers for inclusive pupils (Arnaiz-Sanchez et al., 2023). Nevertheless, teachers also emphasized the difficulties between implementing flexible instructional practices and adhering to curricular pacing requirements. Adapting abstract mathematical concepts for inclusive pupils frequently necessitated extra time and instructional planning, presenting obstacles within rigid session timetables.

These limits exemplify the practical tensions educators encounter while implementing UDL concepts while adhering to curriculum standards. From a theoretical standpoint, these practices closely align with the principles of Universal Design for Learning (UDL) (CAST, 2018), which advocate the provision of multiple means of engagement and representation to address learner variability. Concurrently, teachers' adaptive instructional decisions reflect the application of Mathematical Pedagogical Content Knowledge (MPCK), as teachers actively transformed mathematical content into accessible forms through scaffolding, mental computation strategies, and digital visualization (Bertram & Rolka 2022a, 2022b).

Teachers recognized that their formal education inclusive mathematics instruction had limitations, even though they had demonstrated adaptive expertise. The necessity of depending on peer assistance and experience learning is a reflection of the continuous conflicts between institutional support for MPCK development in inclusive environments and professional demands. These findings indicate that responsive instruction serves as a fundamental pedagogical strategy enabling inclusive pupils to engage with mathematical topics at suitable cognitive and developmental stages.

Inclusive classroom management also emerged as a foundational condition for effective mathematics learning in diverse classrooms (Solomon et al., 2023; Xenofontos et al., 2024). Teachers deliberately organized seating arrangements and classroom space supported pupil mobility, visibility, and sustained engagement during mathematics lessons (Spyropoulou & Kameas, 2024; Woodcock et al., 2022). In mathematics instruction where attentional focus, task

sequencing numbers (Moscardini, 2014), and sustained cognitive effort are essential for conceptual development such management practices help reduce extraneous cognitive load and promote meaningful participation (Genovesi et al., 2024). These findings align with inclusive pedagogy perspectives that conceptualize classroom management not as behavioral control, but as the intentional design of learning environments that facilitate access and participation. By minimizing physical, sensory, and attentional barriers, teachers created conditions that enabled inclusive pupils to engage more confidently in mathematical tasks, underscoring that classroom management is inseparable from pedagogical intent in inclusive mathematics education (R. Faragher et al., 2016; Zakariya & Adegoke, 2024).

Professional collaboration was identified as a critical enabler of inclusive mathematics instruction (Zakariya & Adegoke, 2024). Ongoing engagement between mainstream mathematics teachers, special education teachers, subject panel members, and school leaders facilitated shared analysis of pupil progress, joint problem-solving, and coordinated instructional adjustments. This collaborative approach reflects sociocultural theories of teaching and learning, which view professional knowledge as socially constructed through dialogue and shared practice (Crisol-Moya et al., 2022; Oskarsdottir et al., 2020). Within mathematics education, such collaboration supports coherence in instructional decisions, particularly when adapting tasks, assessments, and pacing for inclusive pupils. The findings reinforce the view that inclusive mathematics teaching is not an individual effort, but a collective professional responsibility, where shared expertise enhances instructional quality and strengthens alignment between inclusive intentions and classroom enactment (N. Radzi & Mahmud 2025).

Teacher readiness and understanding were also central to the enactment of inclusive mathematics pedagogy (Ramanan & Mohamad, 2022). Participants demonstrated that effective support for inclusive pupils depends not only on instructional skills, but also on empathy, patience, and a nuanced understanding of individual learning profiles (Teo et al., 2024). In mathematics classrooms, such readiness enables teachers to interpret pupils' responses to tasks, identify misconceptions, and adapt explanations and representations in real time. This aligns with conceptualizations of MPCK that emphasize teachers' capacity to anticipate learning difficulties and respond flexibly during instruction. Beyond technical competence, the findings highlight that inclusive mathematics teaching requires an ethical and reflective professional disposition, where teachers remain attentive to both the cognitive and emotional dimensions of learning. This readiness develops through sustained classroom experience, reflective practice, and professional dialogue (Garrote et al., 2020).

Finally, the findings emphasize the importance of systemic school-level support in sustaining inclusive mathematics instruction (Tawa et al., 2024). Coordinated efforts involving school leadership, special education teams, and administrative structures enabled consistent monitoring, shared accountability, and alignment of inclusive practices across classrooms (Zuniga et al., 2025). These results are consistent with whole-school models of inclusive education, which assert that

sustainable inclusion depends on institutional capacity rather than individual teacher effort alone. In the context of mathematics education, systemic supports such as collaborative review of assessment data, instructional observations, and targeted resource allocation strengthen teachers' ability to maintain inclusive practices over time (Mngo & Mngo, 2018). When inclusive values are embedded within school policies, leadership practices, and resourcing decisions, mathematics classrooms become more equitable learning environments where inclusive pupils can participate meaningfully and achieve conceptual understanding (Ghamrawi, 2023).

6. Conclusion, Limitations and Implications

This research demonstrates that inclusive mathematics instruction in Malaysian primary schools is anchored in five interrelated domains: responsive and adaptive teaching, inclusive classroom management, professional collaboration, teacher readiness, and systemic institutional support. Collectively, these domains illustrate that effective inclusion is not solely dependent on individual teacher competence but is sustained through a broader, school-wide commitment (Abdulah, 2025; Abdulah & Mahmud, 2025). Teachers actively differentiate instruction to accommodate diverse learning profiles while fostering structured and emotionally supportive classroom environments (Alfaiz & Low, 2023; Radi & Amran, 2023). Simultaneously, collaboration among mainstream teachers, special education personnel, school leadership, and parents enhances the continuity of support and strengthens instructional decision-making. Teachers' professional dispositions characterised by empathy, reflective judgement, and a strong sense of ethical responsibility further empower inclusive pupils to engage meaningfully with mathematical content (Pedaste et al., 2021; Seitz et al., 2023).

Based on these findings, several strategic recommendations are proposed to enhance inclusive mathematics practices. First, targeted professional development focusing on inclusive pedagogical approaches in mathematics is essential for building teacher confidence and instructional effectiveness in diverse classrooms (Chia Wei et al., 2023). Second, school leaders must adopt a proactive role in sustaining inclusive practices by reinforcing policy clarity, ensuring consistent administrative support, and investing in accessible learning environments and teaching resources (Xue et al., 2023). Third, institutionalised collaboration between mainstream and special education teachers, along with meaningful parental engagement, should be embedded into routine school structures to ensure holistic and coherent learner support (Vodickova et al. 2023).

Additionally, future policy frameworks should move beyond mere access and placement, shifting towards a stronger emphasis on learning quality, equitable outcomes, and sustained support in high-stakes subjects such as mathematics (Hasrin & Maat, 2022). The findings reaffirm that inclusion should be understood as a value-driven transformation in educational philosophy and practice. It must be embraced not as an obligation, but as a foundational mindset, one that recognises diversity as an integral element of contemporary schooling (Mfuthwana & Dreyer, 2018; Moya et al., 2023; Paseka & Schwab, 2019). Advancing this shift requires equipping teachers not only with technical skills but

also with inclusive attitudes, reflective capacities, and alignment within a coherent whole-school approach. When inclusion is implemented in a synchronised manner across classroom practices, institutional leadership, community support, and national policy mathematics education can serve as a powerful vehicle for empowerment, equity, and meaningful participation (Matsha et al., 2024; Sheppard & Wieman, 2020).

This study acknowledges certain limitations. As a small-scale qualitative investigation involving a limited number of teachers from selected Malaysian primary schools, the findings are contextually grounded and not intended to be broadly generalised. Moreover, the research focuses primarily on teacher perspectives and does not incorporate the voices of pupils, parents, or policymakers, whose insights could add further depth and nuance (Abdulah, 2025b; Garcia-Garcia & Cotrina-Garcia, 2023). Future studies would benefit from longitudinal designs that explore the long-term effects of inclusive pedagogies, as well as research centred on the lived experiences and academic outcomes of inclusive pupils. Broadening the range of stakeholder perspectives could further strengthen the empirical basis for informing inclusive education policy and reform in teacher education (Mngo & Mngo, 2018).

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Appendix 1

SEMI STRUCTURED PROTOCOL FOR INTERVIEWING INCLUSIVE EDUCATION MATHEMATICS TEACHERS IN PRIMARY SCHOOLS

Objectives :

To explore the instructional strategies used by primary school mathematics teachers to support the learning needs of inclusive pupils in the classroom

SECTION	INTERVIEW QUESTIONS	REMARKS
OPENING QUESTION	<ol style="list-style-type: none"> 1. Expressions of gratitude for your willingness to participate in this investigation. I am grateful for your willingness to engage in this research. 2. Could you provide us with a brief overview of your educational background and training in the field of education? Would you be able to provide us with a brief overview of your educational background and training in the field of education? 3. Could you provide us with a brief overview of your experience as an inclusive mathematics teacher in primary school? Will you be able to provide us with some information regarding your experience as an inclusive mathematics teacher in primary school? 4. What is your level of experience in teaching inclusive pupils in primary school? What is your background in teaching inclusive students in primary school? 5. Have you ever participated in training or courses that focused on inclusive teaching? 	

<p style="text-align: center;">TRANSITION QUESTION</p>	<ol style="list-style-type: none"> 6. Could you provide a detailed explanation of the strategies or methods you employ to teach mathematics to inclusive students? 7. How do you modify mathematics teaching to accommodate the requirements of inclusive students? 8. In an inclusive classroom, which instructional strategies are implemented to accommodate students' requirements? 9. In your view, what is the extent of the implementation of inclusive pedagogy in the teaching of mathematics in primary schools? 10. How do inclusive students react to your mathematics instruction? 	
<p style="text-align: center;">CLOSING QUESTION</p>	<ol style="list-style-type: none"> 11. What is the your perspective on the importance of inclusive pedagogy in mathematics? What is the teacher's perspective on the significance of inclusive pedagogy in mathematics? 12. In what ways do you work with your colleagues to improve inclusive pedagogy at your institution? In what ways do you work with your colleagues to modify inclusive pedagogy at your institution? 13. What are the main challenges you experience when attempting to implement inclusive pedagogy in mathematics? What are the primary obstacles you encounter when implementing inclusive pedagogy in mathematics? 14. What are your recommendations for enhancing the efficacy of inclusive pedagogy in mathematics? What are the teacher's recommendations for enhancing the efficacy of inclusive pedagogy in mathematics? 15. Are any resources or support anticipated 	

	<p>to be provided to aid in your teaching? Is the instructor anticipated to receive any assistance or resources to facilitate their instruction?</p> <p>16. Is there any additional information? If there is, is there anything else?</p> <p>17. Expressions of gratitude and admiration. Expressions of gratitude and appreciation.</p>	
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