Teachers' Readiness in Teaching Mathematics to Special Educational Needs Students with Learning Disabilities

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ABSTRACT

Teaching mathematics to students with special educational needs (SEN) in the Integrated Special Education Programme (PPKI) requires both strong pedagogical skills and emotional readiness. However, previous studies suggest that teachers often face difficulties in implementing effective mathematics instruction for SEN students due to challenges in adapting teaching strategies, integrating educational technology, and utilising multisensory approaches. This study aims to examine the readiness of special education teachers in teaching mathematics. A semi-structured interview was conducted with special education teachers from selected schools in Sabah, Malaysia. Data were analysed to gather themes related to teacher readiness. The findings reveal that teachers show high levels of commitment, patience, and empathy, yet continue to experience challenges in delivering mathematics instruction tailored to SEN students. Collaboration with parents, school leaders, and the community is identified as a key factor in support. The study recommends targeted professional development programmes in mathematics pedagogy to strengthen teachers' instructional readiness and improve learning outcomes for SEN students.

Keywords: Special Education, Mathematics Instruction, Students with Special Educational Needs, Teacher Readiness, Mathematics Pedagogy, Multisensory Approach, Educational Technology, Community Collaboration.

INTRODUCTION

Mathematics is widely regarded as one of the most important disciplines in education due to its role in developing logical reasoning, analytical thinking, and problem-solving skills. In today's knowledge-driven world, mathematical competence is not only essential for academic success but also for navigating daily life challenges, from financial management to critical decision-making. For students with special educational needs (SEN), mathematics education poses unique challenges and opportunities. Unlike their peers in mainstream education, SEN students often require more tailored approaches that emphasise practical application, flexibility, and support mechanisms to ensure learning is meaningful and accessible (Bakri et al., 2024).

In the Malaysian context, the Ministry of Education has made significant efforts to promote inclusive education, as outlined in the Malaysia Education Blueprint 2013–2025. This blueprint highlights the importance of equitable access to quality education, including specialised interventions for SEN learners. Nevertheless, mathematics remains one of the most challenging subjects for this group of students due to the abstract nature of its concepts and the limited availability of resources and specialist teachers. Studies have shown that SEN learners often perform better when mathematics instruction is aligned with their abilities, delivered using differentiated instruction, and reinforced through multisensory strategies (Rosli & Azmay, 2023). This emphasises the need for teachers to possess not only subject-matter expertise but also specialised pedagogical skills that address the cognitive, emotional, and behavioural dimensions of learning among SEN students.

Teacher knowledge, attitudes, and motivation play central roles in shaping learning outcomes. Research by Bakar and Tahar (2019) has demonstrated that teachers with substantial mathematical content knowledge and an understanding of learning difficulties are more effective in creating supportive and engaging classrooms. Conversely, a lack of specialised training among teachers can hinder the ability of SEN learners to grasp key concepts, leading to frustration and disengagement. Beyond teacher expertise, other critical factors include curriculum adaptation, the availability of teaching aids, infrastructural support, and parental involvement. Each of these elements contributes to the overall learning ecosystem for SEN students.

Furthermore, international studies reinforce the importance of a holistic approach in SEN mathematics education. For example, Dooley and Makasis (2020) emphasised the value of learning analytics in monitoring student behaviour and tailoring instruction, while Hardiningrum and Firdaus (2020) demonstrated the effectiveness of multisensory strategies in enhancing comprehension. Locally, initiatives such as curriculum restructuring (Maidiana, 2021) and visualisation-based learning (Lasiun, 2016) have shown promise in supporting SEN students' mathematics learning. However, gaps remain in teacher preparation, resource allocation, and systemic support. Against this background, this study explores mathematics teachers' perspectives on SEN education, focusing on their knowledge, curriculum delivery, teaching strategies, infrastructural support, attitudes, and collaboration with parents. By examining these dimensions, the study aims to provide insights that can inform policy, professional development, and classroom practices to improve mathematics learning among SEN students in Malaysia.

LITERATURE REVIEW

The role of teachers in SEN mathematics education has been extensively discussed in both local and international research. Teacher knowledge is often identified as a decisive factor in student achievement. According to Shulman's (1986) framework on pedagogical content knowledge (PCK), effective teaching requires a combination of subject matter expertise and pedagogical strategies tailored to learners' needs. This perspective is particularly relevant for SEN mathematics education, where teachers must adapt instruction to suit cognitive and behavioural differences. Bakar and Tahar (2019) stressed that teachers' mastery of both content knowledge and pedagogical strategies is crucial for supporting SEN learners, as inadequate knowledge can exacerbate learning difficulties. Similarly, Dooley and Makasis (2020) found that understanding student learning behaviour through data analytics enables teachers to provide timely interventions that align with individual learning patterns.

Curriculum adaptation is another critical aspect of SEN education. The Malaysian secondary school curriculum for special education has been revised to focus on essential and practical mathematical concepts, such as whole numbers, basic operations, money, and simple fractions (Maidiana, 2021). This simplification acknowledges the diverse cognitive abilities of SEN students and ensures that they are equipped with numeracy skills relevant to daily life. Lasiun (2016) demonstrated that visualisation strategies can significantly improve students' problem-solving abilities in mathematics, reinforcing the importance of curriculum structures that integrate visual and practical learning methods. At the international level, Dubois (2018) noted that modelling and simulation strategies can bridge the gap between abstract mathematics and real-world applications, making mathematics more relatable for learners with varying abilities.

Instructional strategies are equally important. Research highlights the effectiveness of multisensory approaches, which combine visual, auditory, and kinaesthetic elements to enhance comprehension (Hardiningrum & Firdaus, 2020). For example, manipulatives such as counting blocks and grid papers provide tactile experiences that reinforce abstract concepts, while digital tools offer interactive and engaging learning environments (Fitria et al., 2023). In addition, differentiated instruction, where lessons are customised according to students' abilities, has been widely recommended as a best practice in SEN education. This aligns with DeVellis (2012), who highlighted that instructional strategies should not only deliver content but also motivate and sustain student interest.

Beyond curriculum and instruction, systemic support plays a pivotal role. Bryman (2016) observed that organisational support, such as accessible classrooms, resource provision, and teacher training, is essential in enabling effective teaching and learning. Without such support, even highly competent teachers may struggle to meet the needs of SEN students. In Malaysia, challenges such as inadequate infrastructure, limited teaching aids, and insufficient specialist teachers have been documented, highlighting the importance of targeted investment in inclusive education.

Teacher attitudes and motivation have also been shown to impact SEN learning outcomes significantly. DeVellis (2012) argued that teacher attitudes can either encourage or discourage student engagement. Positive traits such as patience, empathy, and perseverance create a supportive environment that enhances learning. Conversely, negative attitudes may reinforce barriers to learning. Research by Sinnasamy and Mahmud (2021) demonstrated that the development of critical thinking skills among SEN learners is closely linked to teacher encouragement and supportive classroom environments.

Finally, parental involvement is a key determinant of academic success for SEN students. Families play a central role in reinforcing learning outside the classroom. Fajriani and Liana (2020) found that parental support not only improves cognitive outcomes but also strengthens emotional and social development. In Malaysia, collaboration between schools and parents is increasingly recognised as vital for the holistic development of SEN learners. Nasir et al. (2023) further emphasised the importance of community engagement in educational initiatives, highlighting the interconnected role of schools, parents, and communities in promoting educational equity. Taken together, the literature reveals that mathematics education for SEN students is shaped by interdependent factors: teacher knowledge, curriculum adaptation, inclusive instructional strategies, infrastructural support, positive teacher attitudes, and active parental involvement. Holistically addressing these elements is essential for ensuring that SEN learners receive meaningful, relevant, and empowering mathematics education.

METHODOLOGY

This qualitative study employed purposive sampling to select three special education teachers as participants. All participants were actively involved in the teaching and learning process within the Integrated Special Education Programme (PPKI) at secondary schools in the Papar district, Sabah, Malaysia. Each participant held either a bachelor's or master's degree in various fields of education and undertook specialised courses in special education to enter the profession. Their teaching experience in special education ranged from five to ten years.

Semi-structured interviews were conducted using a pre-designed interview protocol to explore participants' experiences, perceptions, and practices in teaching mathematics to SEN students with learning disabilities. The interview protocol included guiding questions such as:

1. What is the importance of teaching mathematics to SEN students with learning disabilities?
2. How suitable is the existing mathematics curriculum for SEN students?
3. What teaching methods do you find most effective for SEN students?
4. What forms of support and facilities are currently available, and what challenges remain when teaching SEN students?
5. How do teachers' attitudes and motivation influence SEN students' learning?
6. What role do parents play in supporting their children's mathematics learning?

Interview sessions were scheduled according to the participants' availability and comfort, ensuring a conducive environment for open discussion. Each interview session lasted between 45 and 60 minutes. With the participants' consent, all interviews were audio-recorded to ensure the accuracy and reliability of the data. The recorded interviews were transcribed verbatim using Microsoft Word. Data management and organisation were facilitated using Microsoft Excel, which enabled systematic categorisation of responses according to emerging themes. This process enabled efficient data handling and thematic analysis, aligning with the study's

objectives. To enhance trustworthiness, **member checking** was conducted by sharing preliminary interpretations with participants for validation.

FINDINGS

Six major themes emerged from the interviews: (i) teachers' knowledge, (ii) curriculum content, (iii) teaching methods, (iv) support and facilities, (v) teacher attitudes and motivation, and (vi) parental involvement.

Table 1 summarizes the six key themes, links them to relevant literature, and connects each to specific shifts in the Malaysia Education Blueprint.

Theme	Findings	Supporting Literature	Policy Implications (Malaysia Education Blueprint 2013–2025)
Teachers' Knowledge	Shortage of specialist mathematics teachers; non-specialists teaching SEN mathematics; specialists provide tailored instruction and improved clarity.	Shulman (1986); Bakar & Tahar (2019)	**Shift 4 – Quality Teachers**: Strengthen specialist teacher training and recruitment.
Curriculum Content	The Standard Curriculum and Assessment Document (SCAD) focuses on foundational themes (whole numbers, operations, money, fractions); better alignment post-pandemic for SEN students.	Westwood (2018); Moscardini (2014); Creswell & Creswell (2018)	**Shift 1 – Equity & Inclusivity**: Maintain curricular relevance and alignment with SEN needs.
Teaching Methods	Use of inquiry-based learning, manipulatives, and multisensory strategies enhanced engagement and understanding for SEN learners.	Carbonneau, Marley, & Selig (2013); Hardiningrum & Firdaus (2020); Uttal et al. (2018)	**Shift 4 – Quality Teachers**: Embed inclusive teaching methods in professional development programs.
Support & Facilities	Improvements have been noted (support staff and tailored materials), but infrastructure and emotional support remain insufficient.	Florian & Black-Hawkins (2011); Ainscow (2020); Bryman (2016)	**Shift 1 – Equity & Inclusivity**: Invest in resource access, infrastructure upgrades, and psychosocial support systems.
Teacher Attitudes & Motivation	Negative attitudes hamper learning; empathy, patience, and encouragement promote better outcomes.	Avramidis & Norwich (2002); Sharma & Sokal (2016)	**Shift 4 – Quality Teachers**: Incorporate emotional intelligence and an inclusive mindset into teacher training.
Parental Involvement	Active parental engagement is crucial; a lack of involvement hinders progress; effective communication and parent training are necessary.	Epstein (2011); Hornby & Lafaele (2011); Bakar & Tahar (2019)	**Shift 9 – Parent & Community Partnerships**: Facilitate structured communication and parent support programs.

Knowledge of Mathematics

The teachers interviewed consistently emphasised that teacher knowledge in special education is critical, particularly when teaching mathematics to students with special needs. Teacher Asma and Teacher Ana reported a shortage of mathematics-specialist teachers in their school, which often necessitated non-specialist teachers to teach mathematics to special education students. Teacher Athira argued that the presence of

specialist mathematics teachers provides significant advantages. Such teachers possess strong mathematical content knowledge and pedagogical strategies that can transform mathematics learning into an enjoyable and effective process. Specialist teachers can also tailor instruction to the individual needs of students, thereby supporting comprehension of complex concepts.

This finding aligns with Bakar and Tahar (2019), who emphasised that teachers' competency in both content and pedagogical knowledge is crucial for students with learning disabilities. Similarly, Shulman's (1986) concept of pedagogical content knowledge (PCK) highlights that effective teaching requires not only mastery of subject matter but also the ability to adapt content to students' cognitive levels. In the context of special education, this adaptability is even more critical (Florian & Spratt, 2013). Without specialist teachers, students risk receiving generalised instruction that may not match their diverse needs. The results suggest that schools should prioritise hiring specialist mathematics teachers for special education programmes to enhance the quality of teaching and learning. Investing in specialist teacher training and recruitment could directly improve learning outcomes for students with special needs.

Curriculum Content

Teachers agreed that the current secondary school mathematics curriculum is suitable for students with special educational needs. Teacher Asma highlighted that the Form 1 Standards-Based Curriculum and Assessment Document (DSKP) focuses on four core themes: whole numbers, basic operations, money, and simple fractions. This limited yet essential curriculum enables students to establish a solid foundation in mathematics. Teacher Athira added that these foundational themes are practical and relevant to daily life. At the same time, Teacher Ana noted improvements in the Special Education DSKP after the pandemic in 2020, reflecting better alignment with the specific needs of students. The findings support previous research showing that a simplified, structured curriculum enables students with learning difficulties to grasp fundamental concepts effectively (Creswell & Creswell, 2018). Limiting content to core concepts reduces cognitive overload and allows for more personalised and scaffolded instruction. According to Westwood (2018), carefully sequenced and functional mathematics curricula are essential for learners with additional needs, as they help bridge the gap between classroom learning and everyday application. Research by Moscardini (2014) also highlighted that when special needs students engage with mathematics concepts grounded in real-life contexts, such as money and measurement, they are more likely to build confidence and retain knowledge. Thus, curriculum designers should continue to review and refine special education mathematics curricula to maintain alignment with students' abilities and everyday applicability.

Teaching Methods

Teachers emphasised the importance of inclusive and student-centred teaching strategies. Teacher Asma preferred approaches that encourage active engagement, problem-solving, and inquiry-based learning. Teacher Athira advocated for the use of manipulatives and visual aids, such as counting blocks and grid papers, to support understanding. Meanwhile, Teacher Ana highlighted a multisensory approach that integrates visual, auditory, and tactile stimuli. This corroborates DeVellis (2012), who suggested that diverse instructional strategies improve comprehension and retention, especially for learners with special educational needs. Similarly, Uttal et al. (2018) stressed the importance of concrete manipulatives in helping students with disabilities transition from abstract to conceptual thinking. A study by Carbonneau et al. (2013) also demonstrated that multisensory approaches not only enhance engagement but also increase mathematical achievement in special education settings. By incorporating such techniques, students can approach mathematical concepts through multiple modalities, reinforcing learning and accommodating individual differences. Teachers should therefore be trained in diverse and adaptable instructional strategies to cater to the varying learning styles of students with special educational needs.

Support and Facilities

All participants acknowledged improvements in the support system for special education, including dedicated support teachers and customised learning materials. Nevertheless, gaps remain in terms of physical

accessibility, classroom adaptation, and psychosocial support. Teacher Ana emphasised the need for enhanced teacher training to support students' emotional and social development more effectively. These findings support Bryman's (2016) observations on the significance of organisational support in educational settings. Even with competent teachers, insufficient facilities, and inadequate support systems, students' potential can still be limited. Florian and Black-Hawkins (2011) further argue that inclusion is not only about pedagogy but also about providing accessible and equitable learning environments. Ainscow (2020) similarly highlighted that without strong institutional support and adequate resources, inclusive practices cannot be sustained. Policymakers and school administrators should therefore prioritize accessible infrastructure, comprehensive support services, and professional development to fully support students with special needs.

Teacher Attitudes and Motivation

Teachers recognised that negative attitudes, such as impatience or insensitivity, may hinder students' learning experiences. Conversely, positive attitudes, including empathy, continuous support, and motivation to learn alongside students, significantly enhance the learning environment. Teacher Athira and Teacher Ana both emphasised the importance of emotional support and personalised guidance in promoting academic success. According to DeVellis (2012), teacher motivation and attitudes have a strong influence on student engagement and achievement. This is supported by Avramidis and Norwich (2002), who found that teachers' beliefs and attitudes are critical predictors of successful inclusion practices. Studies by Sharma and Sokal (2016) also show that teachers who receive training in inclusive education demonstrate higher levels of self-efficacy and more positive attitudes towards teaching students with disabilities. The current findings, therefore, indicate that cultivating positive teacher attitudes is as important as providing adequate training and resources. Schools should implement continuous professional development programmes that not only improve pedagogical skills but also enhance teachers' emotional intelligence and awareness of students' needs.

Parental Involvement

Teachers emphasised that active parental involvement is critical in supporting the learning and development of children with special needs. Teacher Asma observed that a lack of parental engagement could result in insufficient support at home. Teacher Ana suggested that improving communication channels between schools and parents, alongside providing guidance and training, could enable parents to support their children's learning better. This finding aligns with Bakar and Tahar (2019), who stressed the integral role of family engagement in the educational success of students with special needs. Epstein (2011) similarly emphasized the importance of family-school partnerships, demonstrating that consistent parental involvement leads to better student outcomes. Research by Hornby and Lafaele (2011) highlights the barriers to parental involvement, such as time constraints and lack of confidence, and argues for systematic support to overcome these challenges. Schools that actively collaborate with parents can foster a more consistent and supportive learning environment. Establishing strong school–parent partnerships and providing parental training can significantly enhance the educational outcomes for students with special needs.

In summary, the findings suggest that the effective teaching of mathematics to special education students relies on a combination of teacher knowledge, an appropriate curriculum, inclusive teaching strategies, supportive infrastructure, positive attitudes, and parental involvement. These factors are interconnected, and deficiencies in any one area may limit a student's potential. A holistic approach that integrates teacher professional development, curriculum adaptation, infrastructural support, and parental engagement is therefore essential for enhancing learning outcomes.

DISCUSSION

Effective SEN mathematics instruction depends on the integration of teacher knowledge, a functional curriculum, inclusive pedagogy, systemic support, positive teacher attitudes, and active parental engagement. These elements are interdependent, and shortcomings in any one area may significantly hinder the educational progress of SEN students. The findings of this study highlight the multidimensional nature of mathematics

education for students with special educational needs (SEN). Several interrelated themes emerged: teacher knowledge, curriculum content, instructional methods, support systems, teacher attitudes, and parental involvement. These themes resonate with the broader literature and reinforce the notion that successful SEN mathematics education requires a holistic and collaborative approach.

First, the knowledge of mathematics and special education among teachers emerged as a central factor in ensuring effective instruction. Teachers in this study emphasised the shortage of mathematics specialists in SEN classrooms, reflecting challenges noted in prior research (Bakar & Tahar, 2019). Shulman's (1986) concept of pedagogical content knowledge (PCK) emphasizes that teachers require both in-depth subject matter expertise and the ability to tailor teaching strategies to learners' needs. In SEN settings, this adaptation is paramount, as students often require alternative entry points to mathematical concepts (Florian & Spratt, 2013). This study suggests that schools should invest in teacher recruitment, targeted professional development, and the creation of professional learning communities to strengthen teacher expertise.

Second, the curriculum was recognised as appropriately simplified and practical yet requiring continuous refinement. Teachers found that focusing on foundational mathematical skills, such as whole numbers, basic operations, money, and fractions, offered SEN students functional and relevant knowledge for everyday life. This aligns with Westwood (2018), who argued that functional mathematics is key to empowering students with learning difficulties. Similarly, Moscardini (2014) highlighted that practical applications of mathematics help to build confidence and autonomy among SEN learners. The findings further support Creswell and Creswell (2018), who noted that structured and limited content allows for more scaffolded learning and reduces cognitive overload. However, ongoing curriculum evaluation remains necessary to ensure it balances foundational knowledge with opportunities for conceptual growth.

Third, teaching methods emerged as a critical factor in enhancing mathematical learning. Teachers highlighted the use of manipulatives, visual aids, and multisensory approaches as highly effective teaching methods. These strategies are consistent with research indicating that hands-on, student-centred, and inquiry-based instruction enhances comprehension and retention for SEN learners (Carbonneau et al., 2013; Uttal et al., 2018). Moreover, inclusive approaches enable students to access multiple entry points to abstract concepts, thus reducing learning barriers (DeVellis, 2012). Literature supports the need for teacher training programmes that explicitly prepare educators to implement a variety of instructional methods tailored to diverse learning profiles.

Fourth, the findings emphasised the importance of support systems and facilities. Although improvements in specialised support were acknowledged, gaps in infrastructure and psychosocial resources persisted. This echoes Florian and Black-Hawkins (2011), who argued that inclusion must extend beyond pedagogy to institutional structures. Ainscow (2020) further contends that systemic barriers, such as inadequate facilities and insufficient teacher training, undermine inclusive education. The present findings reaffirm the need for schools to strengthen both physical accessibility and institutional support mechanisms to enable equitable learning experiences.

Fifth, teacher attitudes and motivation were found to have a significant influence on student engagement and achievement. Teachers highlighted that empathy, patience, and encouragement were crucial in cultivating positive learning environments, a conclusion supported by Avramidis and Norwich (2002) and Sharma and Sokal (2016). These studies demonstrate that teacher beliefs strongly shape inclusion practices and student outcomes. Professional development should not only target pedagogical strategies but also address the cultivation of positive teacher dispositions, emotional intelligence, and resilience.

Finally, parental involvement was highlighted as a cornerstone of successful mathematics learning for SEN students. Teachers observed that insufficient engagement at home impeded learning, while strong collaboration fostered progress. This reflects Epstein’s (2011) framework on family-school partnerships, which underscores the reciprocal benefits of active parental involvement. Hornby and Lafaele (2011) further

caution that systemic and personal barriers often prevent families from engaging fully, highlighting the need for schools to proactively build supportive and inclusive channels of communication.

Taken together, the findings illustrate that effective SEN mathematics education cannot rely on isolated factors. Instead, it requires a comprehensive ecosystem that integrates teacher expertise, relevant curriculum, inclusive pedagogy, supportive infrastructure, positive teacher dispositions, and parental collaboration. Each of these elements reinforces the others, and weaknesses in one area risk undermining student learning.

CONCLUSION

This study demonstrates that effective mathematics education for students with special educational needs depends on the integration of multiple interconnected elements. Teacher knowledge and expertise in both mathematics and special education are critical to delivering accurate, adaptive instruction. A functional and flexible curriculum, particularly the DSKP, must remain aligned with real-life applications while evolving to include higher-order skills at appropriate levels. Inclusive pedagogy, incorporating multisensory and student-centred approaches, is essential to ensure access for diverse learners. Equally important, institutional support, including infrastructure, psychosocial services, and professional development opportunities, must be strengthened to create equitable learning environments. Teacher attitudes, shaped by empathy, patience, and motivation, play a decisive role in fostering student confidence and engagement, and should be cultivated through continuous training and reflective practice. Ultimately, parental involvement remains indispensable; schools must establish systematic mechanisms for parent training, communication, and collaboration to bridge the gap between home and school learning. Aligned with the Malaysia Education Blueprint 2013–2025, the findings highlight three critical shifts for SEN mathematics education: Shift 1 (Equity and Inclusivity), Shift 4 (Quality Teachers), and Shift 9 (Parent–Community Partnerships). By embedding these priorities into practice, schools can create an ecosystem that not only supports but also empowers SEN learners. Ultimately, mathematics education for SEN students in Malaysia must be understood as a collective endeavour that integrates teachers, institutions, families, and policies to ensure meaningful, accessible, and transformative learning outcomes.

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