Descriptive Analysis of Knowledge for Teaching Mathematics to Students with Special Education Needs with Learning Disabilities

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.90400478

Received: 17 April 2024; Accepted: 24 April 2025; Published: 23 May 2025

ABSTRACT

Teaching mathematics to students with special educational needs (SEN) requires substantial pedagogical knowledge and appropriate teaching strategies. However, previous studies indicate that special education teachers often face challenges adapting mathematics instruction for SEN students due to a lack of specialized training in mathematics pedagogy. In this study, we assessed teachers' perceptions of the knowledge required for teaching mathematics and examined their level of knowledge and experience in this field. This study adopts a survey research design with a quantitative approach. An online questionnaire was used as the primary instrument, involving 30 Special Education Integration Program (SEIP) teachers from various schools in Sarawak selected through convenience sampling. Data were analyzed using descriptive statistics via SPSS, and the instrument's reliability was assessed using Cronbach's Alpha coefficient. The findings indicate that teachers possess a high level of pedagogical knowledge in special education but still face challenges adapting mathematics instruction for SEN. Experience in special education does not necessarily guarantee confidence in teaching mathematics. Therefore, a more structured professional training program in mathematics pedagogy is essential. This study is expected to guide stakeholders in enhancing the quality of training for special education teachers.

Keywords: Special Education, Mathematics Instruction, Students with Special Educational Needs, Teacher Knowledge, Mathematics Pedagogy

INTRODUCTION

Special education in Malaysia continues to evolve by implementing inclusive policies to ensure that students with SEN have access to high-quality educational opportunities. The special education system in Malaysia has undergone numerous transformations, aligning with global trends in delivering education to SEN students. Despite various initiatives to enhance teacher competency in special education, teaching mathematics to SEN students remains a significant challenge (Mohamad Taha, 2024). Special education teachers must understand mathematical content deeply and adapt their instructional strategies to accommodate individual students' learning needs (Bakar & Tahar, 2019). This challenge becomes more prominent as many special education teachers lack a strong background in mathematics and receive limited specialized training in appropriate pedagogical strategies for SEN students (Mahmud et al., 2023). Teacher knowledge in mathematics instruction for SEN students encompasses understanding suitable pedagogical strategies and adequate content knowledge to ensure students master fundamental mathematical concepts (Sheppard & Wieman, 2020). However, research indicates that teachers' knowledge levels in these areas require further enhancement to ensure instructional effectiveness (Mahmud et al., 2023). Insufficient teacher knowledge of mathematical content and pedagogy would affect SEN students when they experience difficulties grasping basic concepts critical to their cognitive development. Therefore, this study aims to analyze special education teachers' perceptions regarding the necessary knowledge for teaching mathematics to SEN students with learning disabilities and to assess teachers' knowledge and experience levels within this context. The findings of this study are expected to contribute to the development of more effective professional training for special education teachers in mathematics instruction, consequently

improving the quality of learning experiences for SEN students in Malaysia.

LITERATURE REVIEW

This study is founded upon the necessity of understanding the extent to which teachers' knowledge in teaching mathematics to SEN students with learning disabilities influences their instructional effectiveness. Consequently, this section discusses previous research on teacher knowledge, challenges and experiences within special education, and theories underpinning mathematics instruction for SEN students to justify the importance of the current study. Constructivist theories proposed by Piaget and Vygotsky emphasize that learning occurs when students construct knowledge through personal experiences and social interactions (Vygotsky, 1978). In SEN students' context, experience-based learning is critical, as these students often require additional guidance in forming mathematical concepts (Mahmud et al., 2023). Piaget (1970) articulated that students learn progressively through experiential interactions corresponding to their cognitive developmental stages. Thus, mathematics instruction for SEN students should initially emphasize concrete experience by utilizing manipulatives and appropriate teaching aids before gradually progressing to symbolic and abstract representations. Meanwhile, Vygotsky (1978) suggests that SEN students' learning can be significantly enhanced through the Zone of Proximal Development (ZPD) concept, whereby students achieve greater success when provided with appropriate guidance and support from teachers or more capable peers. Hence, this theory forms the theoretical foundation for this study in understanding how teachers can adapt their instructional approaches to enhance mathematical comprehension among SEN students.

The Pedagogical Content Knowledge (PCK) model introduced by Shulman (1987) emphasizes that instructional effectiveness depends on integrating content knowledge and pedagogical understanding. Teachers with comprehensive expertise in both domains can effectively adapt their instructional strategies to meet the needs of students with SEN (Bakar & Tahar, 2019). Content knowledge in mathematics involves a deep understanding of fundamental mathematical concepts, whereas pedagogical knowledge encompasses teaching strategies explicitly tailored to the needs of SEN students. Implementing the PCK model within special education requires teachers to have a solid grasp of mathematical content and to adapt their instructional methods according to students' capabilities. A study by Thai and Yasin (2019) further supports this notion, indicating that teachers who thoroughly understand students' mathematical difficulties are more likely to employ responsive and flexible instructional approaches. Therefore, this study investigates the extent to which special education teachers in Malaysia possess this integrated knowledge to ensure effective mathematics instruction for SEN students.

Special education teachers encounter numerous challenges when teaching mathematics to SEN students with learning disabilities, including inadequate mathematical content knowledge, inappropriate instructional strategies and limited communication with students (Mahmud et al., 2023). Additionally, heavy teacher workloads, attitudinal issues among SEN students, insufficient instructional resources, limitations in professional training opportunities and lack of administrative support significantly influence special education teachers' instructional effectiveness (Seriayuna, 2019). Khalil et al. (2020) indicate that some special education teachers have not achieved the competency standards required for teaching within the SEIP. Furthermore, Lin et al. (2021) highlight that special education teachers often lack fundamental training and experience in special education practices. This aligns with Roos's (2019) findings that many special education teachers do not receive specific training in mathematics pedagogy tailored for SEN students, leading to difficulties in delivering mathematical concepts in more comprehensible ways.

Teacher experience plays a significant role in influencing the effectiveness of mathematics instruction for students with SEN. Teachers with extensive experience are more likely to comprehend suitable instructional strategies for SEN students and their challenges (Abu Bakar & Tahar, 2019). However, experience alone is insufficient without specialized training in mathematics pedagogy, which enables teachers to adapt their instructional approaches more effectively (Mahmud et al., 2023). Previous research has shown that continuous professional development can enhance SEIP teachers' competencies (Sheppard & Wieman, 2020). Within this context, competency encompasses mathematical content knowledge, effective instructional strategies and an understanding of the individual needs of SEN students. Teachers who have undergone training in specialized mathematics pedagogy are better equipped to align their teaching methods with students' cognitive

developmental levels and to utilize suitable teaching aids (Thai & Yasin, 2019).

METHODOLOGY

This section describes the research approach utilized in the study, encompassing the research design, population and sampling, research instrument, and data collection and analysis procedures. The study employed a quantitative approach through questionnaires to gather empirical data, enabling the researcher to understand patterns and trends regarding teachers' perceptions of the mathematical knowledge necessary for teaching SEN students with learning disabilities. The validity and reliability of the instrument were also assessed to ensure the accuracy of the obtained data. This study was conducted as a preliminary survey, employing a quantitative approach with questionnaires as the primary instrument. The descriptive research design was deemed appropriate as it enables researchers to obtain a comprehensive overview of trends and patterns within a population (Creswell & Creswell, 2018).

Population and Sample

The population for this study consisted of SEIP teachers in Sarawak teaching SEN students with learning disabilities. The sample was selected using convenience sampling, where teachers willing to complete an online questionnaire distributed via Google Forms were included as respondents. A total of 30 SEIP teachers constituted the sample for this preliminary survey, which is considered adequate. According to Hill (1998), a minimum sample size of 30 is often employed in social research to provide reliable preliminary insights. Additionally, Roscoe (1975) suggested that a sample size ranging between 30 and 500 respondents is typically sufficient for most research conducted within the social sciences. In this study, 30 SEIP teachers in Sarawak participated as respondents, comprising seven male teachers (23.3%) and 23 female teachers (76.7%). Regarding age distribution, the majority of respondents were between 31–40 years old (40.0%), followed by 41–50 years (26.7%), 51–60 years (20.0%), and 21–30 years (13.3%). Regarding teaching experience, nearly half of the respondents had 11–15 years of experience (46.7%), while 20.0% had 0–5 years, another 20.0% had 6–10 years and 13.3% had 16–20 years. Regarding academic background, most teachers in this study possessed special education qualifications (66.7%), whereas 33.3% did not have specialized qualifications.

Research Instrument

The research instrument used was a questionnaire adapted from the study by Sheppard and Wieman (2020), which was subsequently translated to fit the context of special education in Malaysia. This questionnaire comprises three main sections: section A, which covers demographic data; section B, which covers teachers' perceptions of knowledge requirements in mathematics instruction for SEN students; and section C, which covers teachers' level of knowledge and experience in mathematics instruction.

To ensure content validity, the questionnaire was reviewed by an expert in mathematics and an experienced special education teacher familiar with teaching SEN students. This review aimed to confirm that each questionnaire item accurately measures the intended constructs and is suitable for use within the special education context. According to Polit and Beck (2006), content validity can be established through evaluations conducted by academic experts and practitioners with relevant expertise in the field. The Cronbach's Alpha values for each section of the questionnaire instrument indicate acceptable reliability levels, with each construct falling within the range of 0.70 or higher. This aligns with the findings of Nunnally and Bernstein (1994), who suggest that Cronbach's Alpha values between 0.70 and 0.80 demonstrate sufficient internal stability for exploratory studies. Moreover, according to Fauzi et al. (2014), Cronbach's Alpha values of 0.6 and above are generally acceptable, especially in preliminary research. Therefore, the instrument employed in this study can be considered reliable for measuring SEIP teachers' perceptions and experiences regarding mathematics instruction for SEN students.

Data Collection and Analysis

Data were collected using an online questionnaire distributed to SEIP teachers in Sarawak through Google Forms. Online questionnaires enabled researchers to obtain responses more quickly and efficiently and reduce

data collection costs (Bryman, 2016). The collected data were analyzed using descriptive statistics with SPSS software. Descriptive statistics included frequency, percentage, mean and standard deviation based on five- and six-point Likert scales. These measures were used to identify patterns and trends in teachers' perceptions of necessary knowledge and their experience levels in mathematics instruction for SEN students. According to Pallant (2020), descriptive statistics are suitable for survey research to identify trends and patterns within obtained data.

RESULTS

The following section presents a descriptive analysis of teachers' perceptions regarding the necessity of pedagogical knowledge, alongside the actual levels of knowledge and experience among educators in teaching mathematics to SEN students with learning disabilities, as illustrated in Table 1 and Table 2. Table 1 offers a detailed overview of teachers' perceptions concerning the essential pedagogical competencies required for effective mathematics instruction tailored to SEIP teachers. Table 2 delineates the teachers' knowledge and experience levels as measured through self-assessment. This comparative analysis provides critical insight into the alignment and potential disjunction between the perceived pedagogical imperatives and the realities of classroom practice, thus illuminating key areas for targeted professional development and instructional enhancement.

Teachers' Perceptions of Knowledge Requirements in Mathematics Instruction for SEN Students with Learning Disabilities

Seven items were evaluated by 30 participating teachers using a five-point Likert scale: not important, less important, moderately important, somewhat important and very important. Overall, the findings indicate that teachers hold highly positive perceptions toward the necessity of possessing pedagogical knowledge in mathematics for SEN students, with an overall mean score of 4.45 and a standard deviation of 0.56. This reflects a high agreement and consistency among respondents regarding this construct. Based on Table 1, this section presents an analysis of teachers' perceptions regarding the importance of pedagogical knowledge in the context of mathematics instruction for students with SEN who have learning disabilities.

Table 1: Teachers' Perceptions of Knowledge Requirements in Mathematics Instruction

Item	Not at all important	Less important	Moderately important	Somewhat important	Very important
1. It is important to have strong knowledge in mathematics.	0 (0)	0 (0)	0 (0)	10 (33.3)	20 (66.7)
2. It is important to have general knowledge of how students learn mathematics.	0 (0)	0 (0)	0 (0)	9 (30)	21 (70)
3. It is important to have knowledge about each student individually.	0 (0)	0 (0)	0 (0)	9 (30)	21 (70)
4. It is important to know the specific challenges students face in mathematics.	0 (0)	0 (0)	0 (0)	0 (0)	30 (100)
5. It is important to have teaching experience.	0 (0)	1 (3.0)	2 (6.7)	13 (43.3)	14 (46.7)
6. It is important to have experience teaching mathematics.	0 (0)	0 (0)	5 (16.7)	13 (43.3)	12 (40)
7. It is important to have experience teaching SEN students.	0 (0)	0 (0)	3 (10)	9 (30)	18 (60)

Note: Values are presented in frequency and percentage (in parentheses).

In detail, the first item emphasizing the importance of having strong mathematical knowledge revealed that two-thirds of respondents (20 teachers, 66.7%) rated this aspect as very important. The remaining one-third (10 teachers, 33.3%) rated it as important. This demonstrates a strong awareness among teachers of the need for solid content mastery in mathematics as a foundational element to ensure effective teaching within the special education context. The second item, which pertains to having general knowledge about how SEN students learn mathematics, also showed a high level of agreement, with the majority of respondents (21 teachers, 70%) selecting very important and the remainder (9 teachers, 30%) selecting somewhat important. These findings highlight the necessity of understanding students' learning styles in depth, as this knowledge enables teachers to plan instructional strategies aligned with the diverse needs of SEN learners.

Furthermore, the third item concerning the importance of knowing each student individually also recorded a high level of agreement, with 21 respondents (70%) choosing very important and nine respondents (30%) choosing somewhat important. These figures reflect the recognition among teachers of the importance of an individualized approach in teaching SEN students, as a specific understanding of each student's needs is fundamental to successful learning outcomes. Notably, the fourth item stressing the importance of understanding the specific challenges SEN students face in learning mathematics received unanimous agreement, with all 30 respondents (100%) rating it as very important. This finding is particularly significant, as it demonstrates a comprehensive awareness among teachers of the need to understand the specific mathematical learning difficulties experienced by SEN students, underscoring the critical value placed on this aspect.

The data revealed some variation regarding general teaching experience (item five). Nearly half of the respondents (14 teachers, 46.7%) rated it as very important, followed by 13 teachers (43.3%) who selected it as somewhat important. However, a few respondents viewed it as only moderately important (2 teachers, 6.7%) or less important (1 teacher, 3.3%). This suggests that although most teachers consider general teaching experience highly valuable, a small proportion holds a differing view. In terms of specific experience in teaching mathematics (item six), significant variation was again observed: 12 teachers (40%) rated it as very important, 13 teachers (43.3%) as somewhat important, and five teachers (16.7%) as moderately important. These differences indicate divergent views among teachers regarding the necessity of having specific experience in teaching mathematics, suggesting a need for additional professional development in mathematics pedagogy for certain teachers.

Lastly, concerning experience specifically in teaching SEN students (item seven), the majority of respondents viewed this aspect as very important (18 teachers, 60%), followed by those who rated it as somewhat important (9 teachers, 30%) and moderately important (3 teachers, 10%). This indicates that teachers consider specialized experience in teaching SEN students to be a critical factor in developing practical pedagogical skills and addressing the unique needs of this learner group. In sum, the findings of this study highlight that teachers generally demonstrate a highly positive perception toward the necessity of possessing strong knowledge and experience in teaching mathematics to SEN students. However, the variation observed in teachers' specific experiences in teaching mathematics underscores the need for more structured and systematic professional training in specialized mathematics pedagogy. Such efforts are essential to ensure that all teachers are equipped to meet the specific challenges SEN students face comprehensively and effectively.

Teachers' Level of Knowledge and Experience in Mathematics Instruction for SEN Students with Learning Disabilities

This section presents the analysis of the actual level of teachers' knowledge and experience in teaching mathematics to students with SEN who have learning disabilities based on Table 2 above. The data were obtained through self-assessments using a six-point Likert scale (strongly disagree, disagree, slightly disagree, slightly agree, agree, and strongly agree). Overall, the findings indicate that teachers' level of knowledge and experience in teaching mathematics to SEN students is generally high, with a mean score of 4.79 and a standard deviation of 0.95. This standard deviation suggests a moderate variation in teachers' knowledge and experience, reflecting differences in their confidence across specific measured aspects.

Table 2: Teachers' Level of Knowledge and Experience in Mathematics Instruction

Item	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strogly agree
1. I have strong knowledge in mathematics.	0 (0)	1 (3.3)	6 (20)	3 (10)	17 (56)	3 (10)
2. I have general knowledge about how SEN students learn mathematics.	0 (0)	0 (0)	6 (20)	8 (26.7)	12 (40)	4 (13.3)
3. I have knowledge about each student individually.	0 (0)	0 (0)	4 (13.3)	4 (13.3)	19 (63.3)	3 (10)
4. I am aware of specific challenges faced by SEN students.	0 (0)	0 (0)	4 (13.3)	0 (0)	20 (66.7)	6 (20)
5. I have teaching experience.	0 (0)	0 (0)	3 (10)	0 (0)	19 (63.3)	8 (26.7)
6. I have experience teaching mathematics.	0 (0)	3 (10)	4 (13.3)	3 (10)	15 (50)	5 (16.7)
7. I have experience teaching SEN students.	0 (0)	1 (3.3)	0 (0)	0 (0)	15 (50)	14 (46.7)

Note: Values are presented in frequency and percentage (in parentheses).

In detail, the first item, “I have strong knowledge in mathematics,” shows that the majority of respondents, 17 teachers (56%), selected 'agree,' followed by six teachers (20%) who chose 'slightly disagree.' Additionally, three teachers (10%) selected 'slightly agree' and another 3 (10%) selected 'strongly agree,' while one respondent (3.3%) selected 'disagree.' This distribution reflects that while most teachers are confident in their mathematical content knowledge, a minority still require support in strengthening this area. The second item, "I have general knowledge of how students learn mathematics," shows that 12 respondents (40%) selected 'agree,' while 8 (26.7%) selected 'slightly agree.' Six respondents (20%) selected 'slightly disagree', and four (13.3%) selected 'strongly agree.' These results suggest that although a substantial proportion of teachers expressed moderate confidence in their general knowledge of how SEN students learn mathematics, a portion are less confident, indicating the need for more in-depth training in this area.

For the third item, “I have knowledge about each student individually,” the majority of respondents, 19 teachers (63.3%), agreed, while four teachers (13.3%) each selected 'slightly agree' and 'slightly disagree.' Only three respondents (10%) selected 'strongly agree.' This finding indicates that most teachers acknowledge the importance of understanding students individually; however, a minority are not entirely confident in their knowledge of individual SEN learners under their care. The fourth item, "I am aware of the specific challenges students face in learning mathematics," revealed that a large majority of 20 respondents (66.7%) selected 'agree,' followed by six respondents (20%) who selected 'strongly agree.' However, four respondents (13.3%) selected 'slightly disagree,' indicating a minority who are less sure about SEN students' specific challenges in mathematics learning. This underscores the importance of increasing teacher awareness in this area. For item five, "I have teaching experience," 19 respondents (63.3%) selected 'agree,' while eight respondents (26.7%) selected 'strongly agree.' Only three respondents (10%) selected 'slightly disagree.' This suggests that most teachers in this study possess sufficient and extensive general teaching experience, which is a strong foundation for addressing the challenges of teaching SEN students. In the context of specific experience in teaching mathematics (item six), 15 respondents (50%) selected 'agree,' and five respondents (16.7%) selected 'strongly agree.' However, the findings also reveal notable variation, as four respondents (13.3%) selected 'slightly disagree,' 3 respondents (10%) chose 'slightly agree,' 2 respondents (6.7%) selected 'disagree,' and one respondent (3.3%) selected 'strongly disagree.' This variation illustrates the need for more in-depth training in mathematics pedagogy for those teachers who still require reinforcement in this specific teaching experience.

Lastly, the seventh item, "I have experience teaching SEN students," shows that half of the respondents (15 teachers, 50%) selected 'agree,' followed closely by 14 teachers (46.7%) who selected 'strongly agree.' Only one respondent (3.3%) selected 'disagree.' These findings demonstrate that most teachers have substantial direct experience teaching SEN students. However, a small minority may require further exposure and additional training to enhance their confidence and experience in this context. In conclusion, the study findings reveal that teachers' overall knowledge and experience in teaching SEN students are moderately high. However, particular areas still require improvement, particularly in mathematical content knowledge and experience in teaching mathematics specifically. Therefore, more targeted and structured professional training programmes are essential to ensure that all teachers attain a consistent and balanced level of competency in delivering mathematics instruction to students with special educational needs.

DISCUSSIONS

This section offers an in-depth interpretation of the study's findings by systematically connecting them with relevant theories and previous empirical studies. The current research provides a preliminary insight into the level of knowledge and experience among SEIP teachers in teaching mathematics to students with SEN with learning disabilities. The findings indicate that teachers hold highly positive perceptions regarding the importance of pedagogical knowledge in mathematics instruction. Specifically, they rated awareness of the challenges faced by SEN students, mastery of mathematical content and understanding of individual learning styles as the most important areas requiring attention. This reflects a high level of professional awareness among teachers concerning the pedagogical demands of inclusive classroom environments. The results are consistent with the findings of Lee and Tahar (2023), who emphasized that SEIP teachers must possess both emotional intelligence and pedagogical balance in addressing the complexities of special education.

Nevertheless, the study also reveals a significant gap between teachers' perceptions of mathematics instruction and their actual levels of knowledge and experience. Some teachers admitted a lack of confidence in their mathematical content knowledge, particularly when teaching students with learning disabilities. This suggests that although teachers know the need for specialized pedagogy, they may not yet be fully prepared to apply mathematical content effectively. This aligns with the findings of Sabaruddin et al. (2020), who asserted that teaching mathematics to students with special needs requires flexibility in instructional strategies, appropriate teaching aids and a supportive learning environment. Similarly, Hussin et al. (2020) highlighted infrastructural limitations and the lack of specialized training as persistent barriers to effectively teaching SEN students. Comparisons with earlier studies further reinforce the necessity for targeted professional development. Abu Bakar and Tahar (2019) found that while teachers demonstrated strong knowledge of assessment processes for SEN students, their practical skills remained moderate, particularly in designing instructional tools and adopting focused teaching strategies. This implies that experience alone in special education does not automatically translate into effective mathematics instruction unless it is supported by specialized training in mathematical manipulatives, problem-solving techniques and student-centred learning approaches.

From a theoretical perspective, the findings support key principles of constructivist theory as developed by Piaget and Vygotsky. Both scholars emphasized that learning occurs when students construct meaning through concrete experiences and social interaction. SEN students with learning disabilities, in particular, require structured guidance through approaches such as the ZPD to help them grasp abstract mathematical concepts (Vygotsky, 1978). In this context, the current study reveals that teachers know the importance of experiential learning but lack systematic strategies for implementing it effectively. Furthermore, Shulman's (1987) PCK Model provides another important theoretical foundation supporting these findings. The model asserts that effective teaching occurs when educators master subject content and appropriate instructional methods. This study demonstrates that many SEIP teachers still require reinforcement in mathematical content knowledge, particularly when teaching students who need differentiated instructional approaches. The findings have several important implications for the professional development of special education teachers. Chief among these is the need for more systematic and targeted training in specialized mathematics pedagogy. Such training should include using concrete manipulatives, problem-solving strategies, play-based learning approaches and assistive technologies tailored to the cognitive levels of SEN students. Khalil and Hantira (2022) emphasized that the effective use of assistive technologies depends on teachers' knowledge and positive attitudes, which can only be cultivated

through sustained and focused training. In this regard, the present study supports efforts to expand the scope of current training programs to address these dimensions comprehensively. These efforts align with the aspirations outlined in the Malaysian Education Blueprint (MEB) 2013–2025 and Sustainable Development Goal 4 (SDG 4), stressing the importance of continuous professional development and ensuring equitable access to quality education for all learners. Strengthening these initiatives will be crucial in enhancing the quality and inclusiveness of mathematics education for students with learning disabilities in Malaysia and beyond.

Practical Implications

The findings of this study underscore the urgent need for a more systematic and competency-driven approach to preparing special education teachers for effective mathematics instruction. Stakeholders such as teacher training institutions, policymakers, and school leaders must operationalize these findings by designing targeted professional development modules that integrate adaptive mathematics pedagogy, including manipulatives, visual representations, differentiated instruction, and assistive technologies. Moreover, Initial Teacher Education (ITE) programs should be restructured to embed specialized training in mathematics content knowledge and inclusive pedagogical strategies supported by practicum experiences in real inclusive classroom environments. By systematically addressing both in-service and pre-service teacher development, educational ecosystems can cultivate a confident, highly skilled, and pedagogically responsive teaching force capable of addressing the diverse cognitive and learning needs of students with disabilities. This study, therefore, offers novel insights into bridging the persistent preparation gap in special education mathematics instruction and aligns with broader educational reforms aimed at achieving inclusive and equitable quality education, as envisioned under SDG 4.

Ethical Considerations and Study Limitations

This study obtained formal approval from the Ministry of Education Malaysia (KPM.600-3/2/3-eras (22106)) and the Sarawak State Education Department (JPNSWSPPD.600-11/1/2 Jld.21(20)), in addition to securing consent from the respective school administrations, instructors and students involved. Data was collected via anonymous questionnaires, with strict protocols implemented to safeguard participant confidentiality and privacy throughout the research process. Participants voluntarily provided informed consent after receiving comprehensive information regarding the study's objectives, procedures and potential consequences, ensuring adherence to the highest ethical standards in educational research. Despite these stringent ethical safeguards, several methodological limitations warrant acknowledgement. The reliance on a relatively small convenience sample of 30 SEIP teachers from Sarawak restricts the external validity of the findings, introducing potential sampling bias and limiting the extent to which the results can be generalized to the broader population of special education teachers in Malaysia. Furthermore, dependence on self-reported data introduces susceptibility to systematic response biases, including social desirability distortions and subjective misestimations of pedagogical knowledge and competencies. To address these constraints, future research should adopt more rigorous sampling strategies, incorporate qualitative methodologies such as in-depth interviews and classroom observations and implement longitudinal designs to capture the complex, evolving dynamics of mathematics instruction for students with learning disabilities with greater fidelity and nuance.

CONCLUSIONS

This study has provided a comprehensive overview of the knowledge and experience levels among SEIP teachers in Sarawak in teaching mathematics to SEN students with learning difficulties. The findings revealed that, in general, teachers possess a high level of pedagogical knowledge in special education and demonstrate a commendable awareness of the importance of understanding students' learning styles and individual needs. However, their awareness and confidence in teaching mathematics to SEN students remain insufficient, particularly in addressing the specific challenges of mathematics learning and implementing targeted instructional strategies. This highlights a gap between teachers' general special education experience and their competency in effectively delivering mathematics instruction. Broad teaching experience alone does not guarantee proficiency in special mathematics pedagogy, especially when teachers lack systematic, structured professional training tailored to the real demands of the classroom. Therefore, this study underscores the urgent need to enhance professional development programs that focus specifically on mathematics pedagogy for special

education, incorporating concrete approaches, appropriate teaching aids and student-centred instructional strategies. The implications of this study are particularly significant for stakeholders such as the Ministry of Education Malaysia, teacher training institutions and school administrators, who must plan and implement more targeted and comprehensive training initiatives. This aligns with the MEB 2013–2025 and SDG 4's aspirations, emphasizing inclusive, equitable, and quality education for all learners. With strengthened training and professional support, it is hoped that SEIP teachers across Malaysia, particularly in regions such as Sarawak, will be better equipped to deliver more effective, differentiated and meaningful mathematics instruction to SEN students. This study provides new empirical evidence addressing the critical gap between teachers' theoretical understanding and their applied teaching competencies in special mathematics education, particularly within the Malaysian SEIP context. Ultimately, these efforts will not only advance the academic outcomes of students with learning disabilities but also contribute significantly to the broader goal of enhancing the overall quality and inclusiveness of Malaysia's education system.

ACKNOWLEDGEMENT

This study was conducted under the Fundamental Research Grant Scheme FRGS/1/2023/SSI07/UKM/02/1, funded by the Ministry of Higher Education Malaysia.

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