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Teaching Competencies of Mathematics Teachers in Inclusive Education at Primary Schools

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Abstract. Inclusive mathematics teaching and learning, which integrates students with special needs and typical students in the same classroom, has long been implemented in Malaysia. However, teaching mathematics in this inclusive environment presents unique challenges to teachers. These competencies are needed to support the diverse needs of students. This study examines the competencies mathematics teachers require to teach inclusively in primary schools. Using a qualitative case study approach, semi-structured interviews were conducted with seven teachers experienced in teaching special education and mathematics in inclusive classrooms. Seven experienced teachers with special education and mathematics teaching backgrounds were purposively selected. Data were analysed using thematic analysis methods. The researcher employed triangulation by involving multiple researchers and member checking to enhance the validity and reliability of the data. The findings identified five required competencies: content mastery skills, flexible strategies and techniques skills, technology utilisation skills, effective classroom management skills, and skills in assessment and monitoring. These findings have implications for enhancing teacher training and professional development programs to equip them with the necessary competencies for effective inclusive mathematics teaching. The research is expected to assist in improving the quality of inclusive mathematics education in Malaysia.

Keywords: teacher competencies; inclusive mathematics teaching; inclusive education; primary schools

1. Introduction

In line with the Malaysia Education Blueprint (2013-2025), which aims to develop scientifically orientated human capital, fostering mathematical knowledge through education is critical. Inclusive teaching plays a vital role in ensuring all students, regardless of background or ability are armed with the readiness and capabilities necessary to successfully learn mathematics. Mathematics plays a

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crucial role across almost all subjects, not limited to a single discipline. Mathematics helps us understand and apply concepts related to science, technology, economics, and more.

However, some students often perceive mathematics learning as difficult and boring. This leads to a high percentage of numeracy dropouts at the primary school level, which needs urgent attention. As indicated by the drop-in Program for International Student Assessment (PISA) 2022 results, Malaysia's mean achievement dropped to a decrease of 31 points for mathematical literacy. This is mirrored in the mathematics subject's poor performance among school students for the Malaysian Certificate of Education (SPM) examination, standing as the second highest failure rate next to Additional Mathematics from all 95 SPM subjects (Ministry of Education, 2022). This issue is not limited to mainstream students but is also experienced by students with special needs in the Inclusive Education Programme.

The Inclusive Education Program is implemented to provide equal educational opportunities to all students regardless of their disabilities and impairments (Saiful Azam, 2017). In mathematics classes, students with special needs and mainstream students are placed together. They use the same curriculum and are taught by mainstream teachers. However, teachers at all levels face various challenges in providing high-quality inclusive mathematics education to enable all students to develop well (Gervasoni & Peter-Koop, 2020). In the context of inclusive education, teachers play a crucial role in ensuring its successful implementation (Wilson et al., 2019). Hence, the teachers must be equipped with different sets of skills to teach in inclusive settings as well.

Mathematics teachers are required to have specific competencies that will enable them to assist students in understanding mathematical concepts and skills (Toom et al., 2021). In inclusive classrooms, the challenge of teaching mathematics becomes more complex as teachers need to consider the diversity of abilities and needs of different students. The competencies of mathematics teachers for inclusive teaching refer to a broad set of competencies required in inclusive classrooms, ranging from the ability to respond to challenges of social and cultural diversity to specific competencies for adapting the curriculum to the individual learning needs of students with special needs (Mihic et al., 2022).

At its most basic level, teachers should be able to respond in socially and culturally sensitive ways when addressing the diversity that exists within a single classroom. This includes understanding and appreciating the different backgrounds of students. More specifically, teachers need to have competencies that allow them to modify the curriculum and teaching practices based on the unique learning needs of students with special needs. This is supported by Pfister et al. (2015), who states that teachers need to have in-depth knowledge of mathematical concepts and skills, as well as appropriate teaching strategies to deliver content to students with diverse needs. Deep knowledge refers to not only a deeper comprehension of theoretical and applied mathematics but also the capacity to connect abstract concepts with real-world phenomena, breaking down

sophisticated mathematical ideas into more digestible parts for students at diverse levels (Ball et al., 2008).

Teacher competencies in inclusive education within the context of mathematics teaching are not solely dependent on mastery of subject knowledge and pedagogical skills but are also grounded in positive attitudes and beliefs. Based on the study by Mihic et al. (2022) also asserts that the inclusive competencies of teachers are derived from having positive attitudes and beliefs toward inclusion, adequate knowledge or understanding of student diversity, as well as mathematical teaching strategies in an inclusive setting. Atoyebi and Atoyebi (2022) state that teachers need to have a positive attitude toward inclusivity and flexibility in adapting teaching to different needs. This attitude not only helps in reducing teaching and learning barriers but is also indicative of a classroom culture that fosters diversity as an invaluable resource.

Tomlinson (2014) also encourages teachers to differentiate teaching methods based on interests and to vary instruction with different levels of complexity and support systems. He states that the best method is to apply differentiated learning in inclusive mathematics classroom teaching to meet the diverse abilities of students. Pfister et al. (2015) suggest that teachers need to have skills in using technology as teaching aids during inclusive mathematics classroom instruction. According to Healy et al. (2010) in their study, digital technologies such as computers are considered key to enabling new pedagogical approaches that align with the philosophy of constructivism. This indicates that teachers need to have the competence to effectively integrate technology in mathematics teaching and learning based on a constructivist approach.

In addition, effective mathematics teaching for inclusive students heavily depends on successful interactions between teachers and students (Gardesten & Palmer, 2023). This competency is an essential tool in helping students acquire mathematical knowledge (Pfister et al., 2005; William & Baxter, 1996;). Mahmud et al. (2021) have identified that the usage of oral questions by mathematics teachers, like prompting, reflective types, and clarification, helped the students augment critical thinking levels and acquire the difficulty of concepts in mathematics, which is especially imperative for unique learning in mathematics. Furthermore, many studies show that inclusive mathematics classrooms can be identified by their ability to work as an integrated team between parents, community and teachers (Vodickova et al., 2023). The Individuals with Disabilities Education Act (IDEA, 1997) recognises that teacher-parent collaboration is more difficult to encourage and maintain if teachers and parents work as separate units (Braley, 2012). Therefore, teacher competency in the ability to cooperate, communicate, and collaborate effectively with parents or the community is crucial for the success of inclusive mathematics teaching.

Ng'andu (2023) explains that continuous professional development also plays an important role in the success of inclusive mathematics teaching. A teacher should have the readiness to learn and continuously improve their competence in inclusive education. This is supported by Shelile and Hlalele (2014) in their study,

which states that teachers should be involved in staff development activities and practice self-reflection.

Several theories and models can be related to studying the competence of inclusive mathematics teaching, namely the Culturally Responsive Teaching Theory and the Differentiated Pedagogy Model. The Culturally Responsive Teaching Theory introduced by Gay (2002) is teaching that considers cultural attributes and characteristics of diverse student ethnogenesis to create an appeal for more effective work on mastering various competencies. In the context of inclusive mathematics teaching, this theory provides a vital framework for understanding and addressing student diversity. Culturally responsive educators make an effort to comprehend each student's cultural background and use that knowledge to design more engaging lesson plans. Teachers may employ problem-solving techniques that are more common in some cultures, or they may offer examples and mathematical problems that are relevant to the everyday lives of their pupils.

In contrast, the Differentiated Pedagogy Model is a teaching strategy created to address the various learning requirements of students in a single classroom. The model of differentiation, as suggested by Tomlinson (2014), is meant to evolve instruction concerning the diverse readiness levels, interests and learning profiles among students. In the context of inclusive mathematics teaching, it allows teachers to tailor instruction to meet the needs of diverse learners. This paradigm contributes to the creation of an inclusive mathematics learning environment where all students have the chance to succeed through differentiation in content, method, product, and learning environment. Although its implementation is challenging, the Differentiated Pedagogy Model has the potential to enhance mathematics learning for all students in an inclusive environment, aligning with the goals of inclusive education itself.

The competencies, models, and theories discussed are important factors in determining the effectiveness of teaching and learning in inclusive mathematics classrooms. This study contributes to the field of mathematics education by identifying essential competencies for inclusive teaching in primary schools. The findings of this study also have significant implications for the formulation of inclusive mathematics teaching policies at the national level. It can be used as a starting point for policymaking in creating even more extensive frameworks that would help better understand how exactly to incorporate inclusiveness into mathematics education. The Ministry of Education, Teacher Education Institutes, and the Teacher Professionalism Division can benefit from such information for better professional development of trainee teachers, developing more robust in-service training modules, and enhancing support structures for teachers in inclusive classrooms. Moreover, the finding of this study, significant instructional implications for the teacher practice guidelines regarding the instructional practices of successful, inclusive mathematics teaching are provided. Thus, the outlined guidelines and practices help educators put inclusive education principles into practice during mathematics teaching.

2. Problem Statement

The implementation of the Inclusive Education Program, which combines students with special needs and typical students in the same class, makes mathematics teaching more challenging for mathematics teachers. The main challenges faced are mastery of content knowledge and specific skills related to inclusive mathematics education, as well as methods of handling students with special needs. Lack of mastery of mathematics content knowledge among teachers in inclusive mathematics teaching can lead to difficulties in adapting curriculum and teaching methods to meet the needs of students with various ability levels. This is supported by Venkat (2019) in his study, which states that most mathematics teachers in South Africa showed weaker mastery of mathematics content, resulting in slower teaching and limited curriculum coverage. Inequality in mathematical education is brought about by this, particularly in inclusive mathematics education.

Many mathematics teachers face the difficulty in implementing methods to their daily teaching with students of different abilities because they are untrained or have no pedagogical knowledge of how to teach inclusive mathematics. This complexity arises in planning and implementing teaching strategies to develop appropriate curriculum resources using flexible delivery approaches that best suit the diverse backgrounds of students, amongst others, within a single classroom. This may be due to teachers not having exposure or formal training in this field during their time at teacher training institutes. Bocket al. (2019) stated in their study that mathematics trainee teachers mostly focus on how students solve mathematical tasks. They also tend to use the same teaching methods without considering the diversity of needs and learning styles in inclusive mathematics classes.

In addition, mathematics teachers feel burdened to complete the syllabus within the prescribed time frame. This makes it difficult for teachers to allocate time to organise teaching and learning as well as design their teaching content to accommodate the diverse abilities of students. Teachers also need to integrate various factors into their teaching, such as the entrepreneurship element enshrined in the primary school mathematics syllabus. However, a study by Mahmud et al. (2022) found that primary school mathematics teachers face many challenges in implementing this entrepreneurship element. When considering inclusive mathematics teaching, which is a concept in its own right, this entrepreneurship element certainly makes the teacher's task more challenging. For example, Mahmud et al. (2022) emphasise that the time constraints to complete the mathematics syllabus become more complicated when teachers also need to integrate the entrepreneurship element into their teaching. This situation illustrates the layered challenges faced by mathematics teachers in meeting the diverse demands of the curriculum. These time constraints and syllabus pressures cause teachers to feel overwhelmed in giving attention to students with special needs. Another factor or barrier related to empowering this group of students is the negative attitudes or stigma held by some teachers towards students' abilities. This is also acknowledged by Saiful Azam (2017) in his study, which states that one of the issues that arises about to inclusive education is the problem of attitudes

among mainstream school teachers who fail to accept students with special needs in their classes

Effective mathematics instruction in inclusive classrooms is further hampered by the lack of particular mathematics teaching resources and materials, such as manipulatives, interactive technology, software, and teaching aids. According to Mohd Rizal and Muallimah (2008), this is because the majority of teachers are not exposed to producing teaching aids that cater to inclusive students. Also, overcrowded classrooms and inappropriate structural arrangements make it difficult for inclusive pupils to engage and be managed. There are also practices where teachers teach subjects outside their area of specialisation, which may impact student achievement and engagement (Faragher et al., 2016).

All these issues and challenges hinder mathematics teachers from providing high-quality inclusive mathematics education as envisioned through the Inclusive Education Program. This study can fill several gaps and address deficiencies in pedagogy, knowledge, attitudes, and skills in inclusive mathematics teaching effectively. First, most of the previous research mainly addressed inclusive education in general and not particularly mathematics teaching within this setting. The absence of studies focusing on inclusive mathematics in Malaysia has created a significant gap in our understanding of the realities and challenges faced by mathematics teachers in inclusive learning environments. Second, there are notable theoretical gaps in understanding how existing frameworks like the Culturally Responsive Teaching Theory and Differentiated Pedagogy Model specifically apply to mathematics instruction in inclusive settings. Although this theory focuses on cultural sensitivity in education, its implementation within the instruction of mathematics for students with inclusion is still ambiguous, given the cultural sensitivity understanding of mathematics and learning disabilities. This is an important gap, especially in terms of identifying how cultural relevance can be integrated into academic content in mathematics education while teaching children with different learning abilities and learning needs in integrated classrooms. Methodologically, previous studies have utilised a quantitative approach, which has left a gap in providing rich and comprehensive qualitative data about teachers. Even though Apoenchir et al. (2023) focused on the teaching of mathematics for inclusive education through quantitative research, several elements of teaching cannot be described numerically. Some of the key components that were identified include teachers' actual operational and teaching experiences which should form a significant part of the data set but are perhaps more suited to and could better be captured by qualitative approaches. Further, there is a lack of studies comparing teaching competencies across demographic factors, settings, teacher experience, and students learning in inclusive mathematics classrooms. This research gap becomes particularly significant when considering the multifaceted nature of teaching in inclusive settings. There also has been little research about the collaboration of mathematics teachers and special education teachers in inclusive classrooms, which creates a knowledge gap concerning effective strategies for supporting all students to learn mathematics within an inclusive context. Even though inclusive education has fundamental rules and standards, how well they are implemented in the classroom—

particularly when it comes to math—depends on a variety of factors, including the facilities, support systems, obstacles that instructors encounter, and the surrounding conditions.

Therefore, this study aims to identify what teaching competencies are required by mathematics teachers in inclusive primary school settings. It is important to better understand this phenomenon as it will give insight into the current and necessary improvements of the state for incorporating inclusive mathematics education successfully. By thoroughly examining these competencies, educators and policymakers can develop targeted improvement measures to overcome existing challenges and strengthen best practices in inclusive mathematics settings..

3. Methodology

3.1 Research Design

This study employs a qualitative approach with a case study design. A case study can be briefly described as an in-depth analysis of one particular subject or situation, obtaining data from a variety of sources: interviews, observations, personal information, records and many more. Stake (2000) asserts that case studies have the limitless capacity to deepen knowledge, broaden experiences, and boost self-assurance in a subject. It is also carried out for events as they occurred in their natural surroundings with no interference from the investigator to describe everything specifically. This research method can answer questions related to why a phenomenon occurs as it does and how it occurs in depth (Tuminah, 2012). Therefore, the researcher conducts a case study aimed at exploring the teaching competencies of mathematics teachers in inclusive settings.

3.2 Sampling Method

This study uses a purposive sampling method involving seven special education and mathematics teachers who have taught students with special needs in the Sentul district. According to Chua (2021), purposive sampling refers to a sampling procedure where a group of subjects with specific characteristics is selected as research respondents. According to the researcher, selecting the purposive sample approach would help identify respondents who are pertinent and particular to the study's goals. The validation of the interview questions involved a thorough peer review process. Initially, the interview protocol was validated by four experienced PhD researchers with expertise in mathematics education and special education. Each reviewer independently assessed the questions for clarity, relevance, and alignment with the research objectives. Their feedback was consolidated, and revisions were made accordingly.

Several researchers are involved in the triangulation process, and each one collects and analyses data independently. To uncover parallels and discrepancies, the results are compared. After that, a consensus-building conversation is held among the researchers. To confirm the validity of the research findings, the researcher also conducts member checking, which involves presenting the findings, interpretations, and conclusions to study participants. Participants have the option to offer feedback or to verify that the information is accurate.

The researcher selects teachers from various teaching backgrounds, namely special education teachers and mainstream mathematics teachers, where this diversity allows for a more comprehensive and balanced perspective to be obtained. The teaching experience of the study participants is also taken into account as a selection criterion, ensuring that the selected teachers have sufficient experience in teaching students with special needs and in inclusive settings, which lends credibility to the information provided and enhances the reliability of the collected data. The teachers involved have teaching experience ranging from 5 to 15 years in the fields of special education and mathematics, with at least 1 year of experience teaching in an inclusive classroom environment.

Furthermore, to reduce the possibility of researcher bias, the interview sessions are conducted by more than one trained interviewer. To ensure this study runs smoothly, the researcher has obtained consent from these seven teachers to provide the necessary information. Before the interview sessions are conducted, the researcher has explained the ethics that need to be adhered to by the study participants. After signing the confidentiality ethics form, all study participants agreed for their interviews to be recorded and the content analysed for research purposes.

3.3 Data Collection Method

Face-to-face semi-structured interviews are used in this qualitative study because they are effective in providing complete and rich data (Merriam & Tisdell, 2016). This method enhances the interaction more naturally so that researchers can change the questions depending on the answers given by the participants. The three sections of the interview protocol—opening, transition, and closing—consist of a total of 21 questions and were created by four specialists in mathematics, special education, and inclusive education.

Several steps were taken to ensure the interview sessions were conducted effectively: finding appropriate participants, selecting a suitable location, recording the interview sessions, making short notes during the sessions, advising participants of the study's purpose and pertinent information, and conducting the interview sessions by a methodical plan. These actions are crucial to validate the accuracy and dependability of the data gathered.

3.4 Data Analysis

In this study, the method used by the researcher to analyse data is thematic analysis. The process of analysing data involves several steps such as data management, filtering and building categories, descriptive coding, thematic coding, and displaying the results of the analysis (Bingham, 2023). In this study, the researcher begins the analysis process by transcribing the audio recordings obtained from the interview sessions. Transcription refers to the transformation of audio recordings into written form that can be used to analyse phenomena (McMullin, 2023). Then, the researcher performs content analysis by examining and filtering each transcript for manual coding. The researcher looks for potential patterns or themes by combining codes that have similarities or relationships; then these themes are reviewed and refined to ensure they accurately and meaningfully reflect the data, after which the themes will be defined through

main themes and sub-themes. These procedures enable the researcher to examine qualitative data methodically and systematically, allowing the researcher to make insightful conclusions from the data that was gathered.

4. Findings

Based on the research findings, five main competencies can be classified:

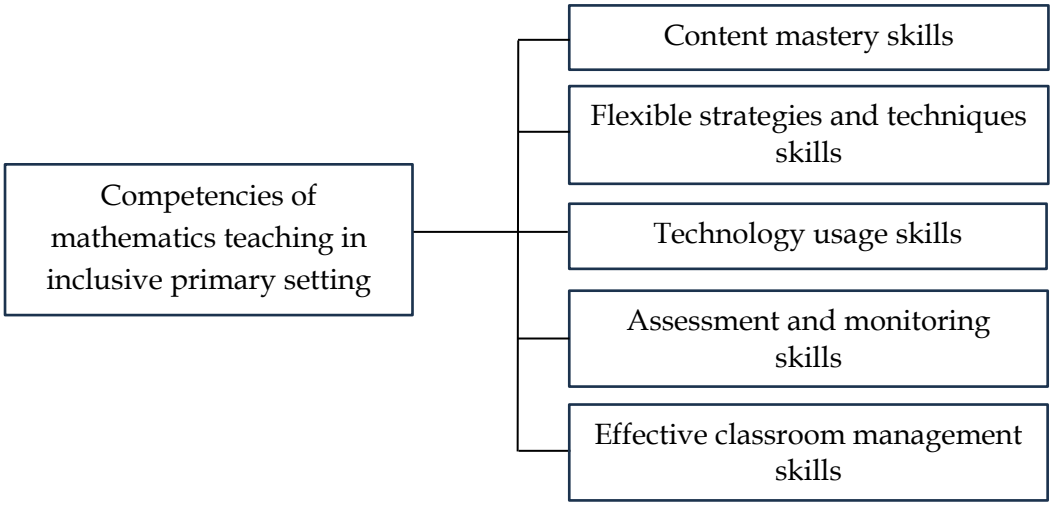

Figure 1: Competencies of Mathematics Teaching in Inclusive Primary Setting

4.1 Content mastery skills

The results of this research suggest that teachers require greater attention to content-specific knowledge in mathematics teaching within both mainstream and inclusive contexts. Teacher B explains this in the following interview excerpt:

> "*We don't have a special syllabus for inclusive education. In my opinion, mainstream teachers should still master both syllabi, mainstream and PPKI (Special Education Integrated Program), so that teachers are skilled in teaching students with special needs.*" [P120-121]

Teacher B highlights the significance of having a strong grasp of both mainstream and PPKI (Special Education Integrated Program) subject matter in the sample above. Teacher E adds that teachers need to know how to differentiate their content instruction because they would be doing content teaching in inclusive settings. The capacity to differentiate skills is key, which enables teachers to teach in a way that suits the different requirements, levels of skill and learning types between students. This is explained by Teacher E in the following excerpt:

Teacher E "*...we indeed create two objectives during teaching. One for mainstream, one for students with special needs. For example, learning the same objective but at two different levels...*" [P115-116]

Teacher D "*...I use different teaching aids to achieve the teaching objectives. The teacher needs to find ways to adapt methods and solve this problem...*" [P123-124]

Teacher B "*...Yes, moreover, now we use differentiated skills.*" [P122]

Additionally, Teacher C states that conceptual and these aspects should be incorporated into teaching mathematics. This is because understanding concepts is the most important for learning as well as mastering mathematical skills. Teacher C goes on to explain in the following excerpt:

> "*I apply conceptual aspects based on my experience. Students will understand better, but if teachers only train them with steps, they will quickly forget.* [P171-172] *If they remember the concept, they won't make mistakes*". [B177]

4.2 Flexible strategies and techniques

The interview findings reveal that teachers need to have competency in using various teaching techniques and strategies according to the different needs and learning styles of students. Six out of seven teachers shared the same opinion that the use of teaching aids is one of the effective strategies in inclusive mathematics teaching. This is explained by Teacher A in the following excerpt;

> "*In my view, when we combine mainstream students and students with special needs, we need to have special techniques that attract students' interest because students with special needs find it difficult to focus. For example, we use interesting teaching aids.*" [P31-33]

Teacher G supports this by saying:

> "*As an inclusive teacher to the visually impaired students, I have created all very engaging teaching aids.*" [P127-129]

> "*We have Braille books ready for the blind students. There are pictures inside. Students have to envision them. Other than that, I offer manipulatives for examples, square models for them to hold and feel.*" [P132-134]

Based on the views of Teachers A and G, teacher competency in inclusive mathematics teaching involves the ability to use various teaching techniques and strategies adapted to the diverse needs and learning styles of students, with particular emphasis on the use of effective and engaging teaching aids. However, in selecting appropriate teaching aids, teachers need to consider factors such as suitability to learning objectives, student abilities, safety, cost, and ease of use. Four out of seven teachers stated that the characteristics of good teaching aids are colourful, large, sturdy durable, and not harmful to students [P149-152]. Teachers are urged to arrange activities and teaching aids that allow pupils to play and move around the classroom since, according to Teacher B, certain students enjoy moving around. Teachers must provide instructional resources that are appropriate for pupils who have physical limitations or who would rather be left alone. The following passage explains this:

> "*For example, autistic students like to play. So, the tools I use are concrete materials, and I place them around the classroom to encourage*

> *movement.*" [P139-141]. "*But for students who don't like to walk, I will give materials that can keep them occupied, such as plasticine.*" [P143-144]

Merging different interactive teaching materials can boost the efficiency of education and provide a supportive environment, helping participants achieve a meaningful learning experience. Teachers must be competent in the identification, integration, and effective use of these various techniques and strategies in classrooms with diverse student abilities.

4.3 Technology Usage Skills

Teacher competency in the skills of integrating technology in inclusive mathematics teaching is very important nowadays. The use of appropriate technology can help create a more engaging, interactive learning environment and accommodate the diverse needs of students. This is explained by several teachers in the following excerpt:

Teacher D "*...I use videos to achieve teaching objectives.*" *[*P123]

Teacher A "*...In my opinion, we need to incorporate games. Students nowadays are skilled in ICT. If possible, the teaching aids should have ICT elements because students now are proficient in ICT and have smartphones.*" [P154-155]

Teacher B also explains that if technology is combined with concrete materials and hands-on activities, it can create a more engaging and interactive learning environment that accommodates the diverse needs of students, especially visually impaired students.

> *"...That's right. For visually impaired students, I help them click answers on the screen. We use various software that is provided.*" [P230-231]

Four out of seven teachers suggest various applications that can be used in teaching, such as Quizizz, video, and audio box [P234-236]. Therefore, teachers need to be smart in choosing applications that are appropriate to the learning objectives, students' ability levels, and individual needs of students in inclusive classrooms. Teacher G also explains that Braille is used for visually impaired students, but there are still teachers who are not proficient in using it. "Teachers should be proficient in Braille. There are even still teachers who can't read Braille well " [P146-147].

Therefore, mastery of Braille for inclusive mathematics teaching requires specific training and exposure for teachers. Courses, workshops, and guidance from experts in the field of education for the visually impaired are very important to help teachers master this skill.

4.4 Effective Classroom Management

Interview results lead to that good classroom management must produce a friendly learning environment to motivate the participation of all students no matter their ground or ability. This involves the ability to control student conduct

to ensure a productive learning environment. The following passage provides clarification on this:

Teacher F "*Mainstream teachers need to find ways to solve issues on their own because all special needs students have different behaviours.*" [P55-56]

Furthermore, Teacher E thinks teachers have to be creative in the seating of students or children with special educational needs, such as behavioural issues. The following extract from several teachers details this:

Teacher E "*...the position for special needs students is good at the back.*" [P160-161]
Teacher G "*...I feel there's no problem if these students sit at the back. Maybe during other times, they can do activities at the back without disturbing other students.*" [P162-164]

Teacher F adds the lighting conditions can also support better learning [P253]. Teacher C also mentions that the class could have fewer students [P252]. This is also supported by several teachers in the following excerpt:

Teacher F "*In my opinion, a class doesn't need to have many students to conduct an inclusive class. Maybe 20 students in total, including both mainstream and special needs students.*" [P102-103]
Teacher A "*Yes, that's right, it must be fewer than 30 students. 20 students is the most recommended number.*" [P104]

This is explained when the number of students is small; teachers have a better opportunity to give individual focus and attention to each student. Teacher G also explains that with fewer students, teachers can monitor students' social interactions more closely and detect any signs of bullying [P105-106]. This creates a safer environment for all students.

4.5 Assessment and Monitoring Skills

Interview results suggest that teachers must be proficient with multiple assessment strategies to monitor student learning and prevent negative anticipation. Oral or written assessments [P239–240] that cover formative, summative, and alternative assessments, such as project-based learning, are included in this. Based on the passage, Teacher E explains:

> "*If games or play activities can be incorporated into project-based learning, it can be done, such as making paper aeroplanes. The product of their work can be played with.*" [P181-183]

Based on the above excerpt, Teacher E explains that project-based learning allows students to work according to their unique learning styles. Most students might be more inclined toward hands-on or kinaesthetic approaches. In addition, 6 out of 7 teachers agree that it is to be a general competence for an educator to give fair and equitable appreciation. Rewards do not have to be in material or gift form. Teachers can utilise a variety of incentives, including verbal compliments, applause, stickers, and certificates. This allows teachers to give rewards that are

appropriate to the needs and preferences of the students. Teacher G and Teacher B add the following, as in the excerpt:

Teacher G "*We also need to encourage other students to support them. Other students should praise them too.*" [P281-282]
Teacher B "*Yes. If they can answer a question, the whole class should applaud them.*" [P283]

Teacher A adds that there are students who have already achieved performance levels (PL) 5 and 6, but teachers need to understand the needs of these students, as in the excerpt below:

> "*...their achievements are not the same and take a long time Some students have reached PL5 and PL6. But when they sit with mainstream students, their emotions are easily disturbed and stressed, and they get angry quickly. They can answer questions, but teachers must be clever in how they handle them.*" [P93-97]

From this extract, it can be inferred that teachers need to have good command over students' emotions, particularly those with special needs, who are easily emotionally disturbed by another student. Thus, teachers need to have a multi-level competency and the ability to create a motivated and interesting learning atmosphere for the students so that their achievement will not be reduced.

5. Discussion

This study aimed to identify the teaching competencies required by mathematics teachers in inclusive primary school settings. The research findings revealed five essential competencies teachers need to create effective, inclusive mathematics teaching. Mastery of mathematics content and special education is an important competency for teachers in inclusive mathematics teaching. Good mastery of content knowledge means that teachers have a deep understanding of concepts, facts, principles, and relationships within the discipline (Shulman, 1992). According to a study by Guven et al. (2021) proficiency in subjectmatter is very important for quality mathematics teaching both in regular and special education. In the absence of proficiency in both the differentiated techniques and the syllabus, educators will be unable to meet the learning objectives for each student group. Teachers who lack topic expertise are also less likely to comprehend the tenets and recommended procedures of inclusive education. Teachers could find it difficult to modify exercises, strategies, and content to fit the various requirements of their pupils. Special needs children could struggle to understand the lesson if teachers just use the chalk-and-talk method. This statement is supported by Mitchell (2015), who suggests that successful inclusive education teachers should be able to modify curriculum for individual needs, establish good communication and classroom management strategies as well as promote their personality development. Interview findings agree that conceptual teaching skills for inclusive classes can explain concepts clearly, make connections between ideas, use multiple representations, and detect and clarify conceptual confusion among different students. This is also acknowledged by Vella (2022), who states

that learning based on understanding is more permanent and psychologically satisfying compared to learning based solely on the memorisation of facts.

Furthermore, teachers need to be competent in using various teaching techniques and strategies according to the diverse needs and learning styles of students. The findings of this study emphasise the importance of using attractive teaching aids as one of the effective techniques in inclusive mathematics teaching. According to Kamarudin et al. (2022), the use of appropriate and engaging teaching aids in the teaching process is crucial for enhancing the success of inclusive teaching. The use of attractive, colourful, 3-dimensional, kinaesthetic, and interactive teaching aids can help maintain students' focus. Besides using teaching aids, skills in effective oral questioning are also one of the significant approaches to inculcating mathematical values in the process of teaching. Mahmud et al. (2020) urged that oral questioning enhances students' thinking and promotes critical thinking in mathematics learning. For hearing-impaired students, teachers need to exert additional effort in interpreting information through verbal, body, and sign language to learn mathematics (Ediyanto & Kawai, 2023). Students with autism, on the other hand, require teachers to use emotional regulation strategies that include situation modification, cognitive transformation, affection distribution, and response modulation (Utomo, 2015). However, there are still teachers who are not skilled in integrating various resources into inclusive teaching. Continuous exposure and training are essential to help teachers master diverse methods so that teaching can be delivered effectively to all students.

The study findings also explain that teachers need to have skills in integrating technology into teaching. Teachers not only need to be proficient in using specialised equipment such as mobile computing, interactive surface boards, braille, graphing calculators, and specific computer software, but they also need to make adjustments according to the needs of students with special needs. Mastery of this equipment enables teachers to deliver mathematical content more effectively and in an organised manner, especially in inclusive classrooms. A study by Mustaffar and Nor 'Azah (2017) found that assistive technology has the potential to empower individuals with disabilities, but its use is less successful because students and teachers fail to integrate these devices into daily life. Therefore, this competency requires continuous training and exposure for teachers. Support in the form of courses, workshops, and professional development is crucial to helping teachers master the combination of technological and hands-on strategies in inclusive mathematics teaching. It can maximise students' learning potential by providing both concrete and digital experiences.

The other finding of the study was that effective classroom management is required by teachers. This involves knowing how to effectively and constructively handle behavioural interruptions from students. This is important because challenging student behaviours can disrupt the learning process and hinder academic achievement (Simonsen et al., 2008). According to Aas et al. (2023), teachers' ability to adapt learning methods and skills in managing student behaviour are closely related and complementary. Teachers with excellent

abilities to adjust their teaching methods for various pupils in an inclusive classroom may reduce problem behaviour and increase student involvement during learning. By using various teaching strategies such as cooperative learning, inquiry-based learning, and the use of engaging technology, teachers can create a learning environment that interests students and maintains their focus. Findings from the study by Aas et al. (2023) advocate that teachers need to use praise and rewards as positive reinforcement and establish relationships with learners based on respect for them to exhibit desirable behaviours. If occur with challenging behaviour use strategies such as verbal reprimands, exclusion from an area and rest time. They also suggest that teachers employ preventive techniques like setting up a tidy and welcoming classroom. This seemed partly in line with interviews, which led to the number of students not exceeding 30 in inclusive classrooms. Meanwhile, Naraian et al. (2012) emphasise emotional support as an important condition for teachers to develop new thinking about student behaviour.

The study elaborates that one of the most important components of inclusive mathematics instruction is teacher competency in monitoring and assessment. Effective assessment and monitoring enable teachers to identify the needs and achievement levels of each student, thereby allowing them to plan and adapt their teaching to meet the needs of diverse students in an inclusive classroom (Wilcox et al., 2021). To obtain a complete picture of students' growth and accomplishment, teachers must be adept at using a variety of assessment techniques, including formative assessment, summative assessment, observation, assignments, and projects. This is supported by Austin and Filderman (2020), who states that effective assessment and monitoring allow teachers to identify students who have not achieved expected progress. This requires that teachers are skilled to adapting assessments for students with special needs, such as allowing extra time or providing alternate formats and accommodations. This high proficiency in evaluation and monitoring leads to a setting that is responsive and inclusive where the requirements of every student are identified as well as addressed efficiently, resulting in students being empowered to succeed towards their maximum potential within mathematics learning.

Therefore, the implications of these findings in the academic context are useful for creating holistic guidelines, instructions, and support frameworks that will help teachers provide inclusive mathematics education to all students. These findings suggest that teacher training programs should incorporate more comprehensive digital skills development. This includes mini amplifiers, assistive listening devices (ALD), head pointers and others as used by students with disabilities (SWD). The study also supports that teacher training institutes should consider making it compulsory to offer a course in special education to all mathematics specialisation teachers. Thus, newly graduated mathematics teachers would be aware of essentials concerning the special education needs of students, various teaching approaches, and management of inclusive classroom settings. Such a policy change would guarantee that

future mathematics teachers will create a favourable learning environment for all learners, with a special focus on learners with learning difficulties.

6. Conclusion

This study has identified important competencies required by mathematics teachers to teacheffectively in inclusive primary school classrooms. Through a qualitative case study approach, several key competencies have been identified, including content mastery, skills in adapting teaching strategies and techniques, technology utilisation skills, effective classroom management skills, and competency in assessment and monitoring

The conclusion of this research has significant theoretical implications for the study of inclusive mathematics education. In this study, it is possible to expand the knowledge about the practical application of Culturally Responsive Teaching Theory and the Differentiated Pedagogy Model in inclusive mathematics lessons. These competencies give a theoretical background for understanding the relationships between the knowledge of mathematics content, teaching skills, and access to quality education for all students in the mathematics classroom. This theoretical contribution assists in escalating the knowledge gap between inclusive education theory and mathematics teaching practice, based on defining a strategy to evaluate teacher competencies in inclusive institutions.

While this study has limited its analysis of student outcomes solely to students in primary school in Malaysia, there are future opportunities in the subsequent levels of education and across different cultures. This is due to the limitations of this research project, which only focused on primary school teachers in Malaysia and among those, only seven of them from the district of Sentul agreed to be participants in this research study. The small sample size and restrictive geographical coverage from which the samples were collected may limit the application of results to a wider setting. These limitations open research possibilities at all levels of education and within other cultures. Future research should include more participants in the research study, including different districts and states, and should use other research methods to gather data.

Therefore, the findings of the present study, though they have limitations serve a noble function in the formulation of the foundation of the growth of teacher competencies to address mathematics education, for learners with learning disability in Malaysia. The implications of these findings in the academic context are useful for creating holistic guidelines, instructions, and support frameworks that would help teachers provide inclusive mathematics education to all learners.

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