

Equipping Pre-service Mathematics Teachers for Diverse Classrooms: Best Practices and Innovations

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Abstract: This chapter explores innovative approaches and best practices in preparing mathematics teachers for diverse classrooms by employing four key theoretical frameworks: Culturally Relevant Pedagogy, Culturally Responsive Teaching, Differentiated Instruction, and Universal Design for Learning. These frameworks serve as guiding principles for equipping pre-service educators to effectively address the diverse cultural, academic, and learning needs in today's classrooms. The study employed a comprehensive review of literature, focusing on empirical studies and practical implementations of these inclusive pedagogies in mathematics education. The analysis examined how teacher preparation programmes integrate these frameworks into their curricula to foster equity, inclusivity, and academic excellence. The chapter also discusses challenges encountered in the implementation of inclusive pedagogies, such as resistance to pedagogical shifts and limitations in teacher training programmes. To address these challenges, recommendations are provided for enhancing teacher preparation, including the incorporation of cultural competence training, differentiated instructional strategies, and universally designed learning environments. The find-

ings suggest that these pedagogical frameworks, when implemented effectively, lead to improved student engagement, achievement, and a greater sense of belonging among learners from diverse backgrounds. By aligning teacher preparation programmes with CRP, CRT, DI, and UDL, this chapter emphasises the need for mathematics educators to adopt flexible, responsive teaching practices that cater to the needs of all students, ultimately fostering a more equitable learning environment in diverse classrooms.

Keywords: Cultural competence, diversity in education, inclusive pedagogy, mathematics teacher preparation, teacher training innovations.

1. Introduction

Classroom diversity has become a central issue in today's rapidly evolving educational landscape, particularly in mathematics education. Increasingly, classrooms comprise students from various cultural, linguistic, and socioeconomic backgrounds. This diversity poses challenges and opportunities for mathematics teachers, who must be equipped with the skills to meet the needs of all learners (Mahlambi, 2023). In such environments, the success of mathematics education mainly rests on how well programmes for preparing teachers address concerns of inclusion, equity, and diversity (Faragher et al., 2016). However, despite ongoing reforms in education, significant gaps remain in how preservice teachers are trained to handle the demands of diverse classrooms (Weiss et al., 2024).

Teacher preparation programmes provide prospective mathematics educators with content knowledge and the pedagogical skills to deliver that knowledge in ways that resonate with diverse learners. However, many programmes still focus on traditional approaches, with insufficient emphasis on cultural competence and inclusive pedagogies (Eden et al., 2024; Olawale, 2022). Cultural competence is crucial for ensuring that teachers are aware of their students' varied cultural contexts and are prepared to adjust their instructional strategies accordingly (Karatas, 2020). Inclusive pedagogy, which seeks to accommodate all learners, especially those from marginalised communities, is vital for effective teaching in diverse classrooms (Sanger, 2020).

An increasing amount of scholarly literature indicates that creative and comprehensive methods of preparing mathematics teachers are required (Cochran-Smith & Reagan, 2021). Some promising developments include integrating culturally responsive teaching practices into the curriculum and providing preservice teachers with opportunities to engage in reflective practice and real-world classroom experiences (Anyichie, 2024). Additionally, emerging technologies and collaborative models are beginning to reshape teacher training, creating more dynamic and interactive learning environments (Haleem et al., 2022; Olawale, 2024; Olawale & Hendricks, 2024). Despite these advances, many challenges persist. For instance, research indicates that teacher preparation programmes often fail to offer adequate mentorship and field experiences that reflect the diversity of modern classrooms (Olawale, 2024; Mbhiza et al., 2024). Moreover, implicit biases and systemic barriers can limit the effectiveness of even the most well-intentioned training initiatives (FitzGerald et al., 2019).

This chapter addresses these gaps by exploring best practices and innovative approaches to equipping preservice mathematics teachers for diverse classrooms. It will examine how teacher preparation programmes can be restructured to better integrate cultural competence, inclusive pedagogies, and differentiated instruction, thus fostering teacher effectiveness and improving student outcomes in diverse educational settings. Through theoretical insights and practical examples, this chapter aims to provide educators, researchers, and policymakers with valuable strategies for enhancing mathematics teacher education in an increasingly multicultural world.

2. Theoretical Insights

This section draws on four vital theoretical frameworks to explore best practices and innovations in preparing mathematics teachers for diverse classrooms: Culturally Relevant Pedagogy (Ladson-Billings, 1995), Culturally Responsive Teaching (Gay, 2000), Differentiated Instruction (Tomlinson, 2001), and Universal Design for Learning (CAST, 2008). Each framework contributes to understanding how teacher preparation programmes can equip educators with the tools to address the cultural, academic, and learning diversity present in today's classrooms.

2.1 Culturally relevant pedagogy and culturally responsive teaching

Culturally Relevant Pedagogy (CRP), introduced by Gloria Ladson-Billings in 1995, and Culturally Responsive Teaching (CRT), developed by Geneva Gay in 2000, provide foundational frameworks for addressing the diverse needs of students in mathematics education. CRP emphasises leveraging students' cultural backgrounds to enhance academic success, while CRT builds on this by focusing on practical teaching strategies that integrate students' cultural identities into classroom practices and learning environments. Both CRP and CRT share three core principles: (1) Promoting academic success while valuing students' cultural assets – recognising students' cultural identities as a resource to support their academic growth; (2) Developing cultural competence – encouraging teachers and students to learn about and appreciate each other's cultural experiences; (3) Fostering critical consciousness – empowering students to understand and challenge social inequalities within and beyond the classroom. In the context of mathematics teacher preparation, CRP and CRT highlight the importance of equipping educators with the skills to acknowledge and incorporate students' cultural experiences into the teaching process. Mathematics is often perceived as abstract and culturally neutral; however, culturally responsive teaching counters this notion by using culturally relevant examples, connecting mathematical content to real-world contexts, and promoting collaborative learning strategies reflective of diverse cultural norms (Gay, 2022). Effective teacher preparation programmes must incorporate training on cultural competence, which includes understanding students' cultural backgrounds and applying this knowledge to develop lesson plans, manage classrooms, and design assessments. Such training helps educators create learning environments that foster inclusivity and engagement. Evidence suggests that implementing CRP and CRT improves student achievement and engagement in mathematics, making these frameworks essential components of mathematics teacher preparation programmes.

2.2 Differentiated Instruction

Differentiated Instruction (DI), developed by Carol Ann Tomlinson (2001), is a pedagogical approach designed to address the diverse needs, abilities, and learning preferences of students within a single classroom. It is grounded in the principle that effective teaching requires adjustments to the content (what students learn), process (how students learn), and product (how students demonstrate their learning). These adjustments enable teachers to meet the unique learning profiles of individual students while maintaining high academic expectations for all. DI emphasises the importance of ongoing assessment, which allows teachers to identify and respond to variations in students' readiness, interests, and learning styles. For instance, in mathematics education, teachers can use pre-assessments to gauge students' proficiency levels and then tailor lessons to provide appropriate levels of challenge. Strategies may include offering tiered assignments, flexible grouping, and scaffolding to ensure students receive the support they need to grasp mathematical concepts.

This framework aligns with the principles of Culturally Relevant Pedagogy (CRP) by fostering inclusivity and equity. It enables teachers to integrate students' cultural and linguistic backgrounds into differentiated tasks, making learning experiences both accessible and meaningful. For example, incorporating real-world problems that reflect students' lived experiences can make abstract mathematical concepts more relatable. Teacher preparation programmes play a critical role in equipping educators with the knowledge and skills needed to implement DI effectively. Coursework should emphasise the principles of differentiation, including strategies for modifying instruction and managing diverse classrooms. Field experiences should provide preservice teachers with opportunities to practise these techniques under the guidance of experienced mentors (Olawale, 2024). Additionally, professional development workshops focused on DI can further support teachers in refining their practices. By integrating Differentiated Instruction into teacher preparation programmes, educators are better equipped to navigate the complexities of diverse classrooms. This approach ensures that all students, regardless of their background or starting point, have the opportunity to succeed in mathematics.

2.3 Universal design for learning

Universal Design for Learning (UDL), developed by the Centre for Applied Special Technology (CAST, 2008), is a framework designed to ensure that all students have equitable access to learning opportunities. UDL emphasises the proactive design of curriculum, instruction, and assessments to address the diverse needs of learners. Its foundation rests on three guiding principles: multiple means of engagement, multiple means of representation, and multiple means of action and expression (Meyer et al., 2014). These principles collectively support the creation of inclusive learning environments.

Multiple Means of Engagement: This principle focuses on stimulating students' interest and motivation to learn by offering options for how they interact with the material. In mathematics education, this might include real-world problem-solving scenarios that relate to students' cultural and social contexts or gamified learning experiences that maintain student engagement. Teachers can use tools such as interactive platforms or culturally relevant examples to cater to diverse student interests and sustain attention.

Multiple Means of Representation: Recognising that students process information in different ways, this principle encourages the use of varied methods to present mathematical concepts. Visual aids, hands-on manipulatives, and digital simulations can help demystify abstract ideas for students who struggle with traditional instructional approaches. For instance, using graphs, videos, or multilingual resources ensures that learners with linguistic or cognitive differences can access and comprehend mathematical content.

Multiple Means of Action and Expression: This principle emphasises providing students with diverse ways to demonstrate their understanding. In mathematics, this might involve allowing students

to solve problems through oral explanations, written solutions, or visual representations, such as diagrams or charts. Offering flexibility in assessments ensures that all students, including those with disabilities or language barriers, can showcase their learning effectively.

Integrating UDL into mathematics teacher preparation is essential for fostering inclusive practices. Teacher preparation programmes must include courses and field experiences that train educators to design flexible lesson plans, use adaptive technologies, and implement varied instructional strategies. For example, prospective teachers might practice creating lesson plans that incorporate visual aids for geometry lessons or digital tools for data analysis, ensuring they address the needs of diverse learners.

UDL complements frameworks such as Culturally Relevant Pedagogy (CRP) and Differentiated Instruction (DI) by encouraging teachers to anticipate and remove barriers to learning from the outset. This proactive approach is particularly crucial in mathematics education, where abstract concepts and traditional instructional methods often create challenges for diverse learners. By adopting UDL principles, mathematics teachers can create equitable and accessible learning environments that empower all students to succeed. This framework underscores the importance of flexibility and innovation in addressing the diverse needs of today's classrooms, making it an indispensable component of teacher preparation programmes.

These theoretical frameworks—Culturally Relevant Pedagogy, Differentiated Instruction, and Universal Design for Learning—collectively provide a comprehensive foundation for equipping mathematics teachers to thrive in diverse classrooms. Together, they guide the development of inclusive and responsive teaching practices that can be embedded in teacher preparation programmes. By integrating these frameworks, this chapter seeks to demonstrate how innovative approaches to teacher preparation can foster equity and excellence in mathematics education, ensuring that all students, regardless of their backgrounds, can succeed.

3. Methodology: Reviewing Best Practices and Case Studies

In this chapter, we employed a meta-analysis approach to synthesise and evaluate the effectiveness of best practices and innovations in equipping mathematics teachers for diverse classrooms. Meta-analysis is a systematic method used to aggregate and statistically analyse findings from multiple studies to assess the overall effectiveness of interventions and strategies. This approach enables us to draw more robust conclusions by combining results across studies, identifying trends, and exploring variations in outcomes.

3.1 Study selection criteria

A comprehensive search was conducted using electronic databases, including Web of Science, Scopus, and Education Research Complete. Web of Science and Scopus were chosen for their extensive coverage of peer-reviewed literature, including the social sciences, while Education Research Complete focuses exclusively on leading educational research. The keywords used in

the search were: “mathematics teacher preparation,” “diverse classrooms,” “culturally relevant pedagogy,” “inclusive pedagogy,” “differentiated instruction,” and “Universal Design for Learning.” The inclusion criteria were: studies focused on mathematics teacher preparation for diverse classrooms; peer-reviewed empirical studies published in English between 2015 and 2024; studies that evaluated the effectiveness of interventions or strategies used to prepare mathematics teachers; and studies that reported quantitative, qualitative, or mixed-methods data on outcomes such as student achievement, teacher effectiveness, or cultural competence.

3.2 Data extraction and coding

For each study that met the inclusion criteria, the following data were extracted: author(s) and year of publication, title of the study, focus or objective of the study, research design and data analysis methods used, tools or instruments employed to collect data, key findings regarding the impact of the intervention on mathematics teachers or students, challenges reported in the implementation of the strategies, and recommendations for future practice or research.

The search terms yielded twenty-eight journal articles from three databases published between 2015 and 2024. Following PRISMA guidelines (Moher et al., 2009), thirty-eight articles were screened by titles and abstracts. Twenty-three articles were excluded for not meeting the criteria, often due to irrelevance or non-secondary or primary school contexts. Fifteen full-text articles were then assessed, with three more excluded for lacking clear details on the implementation of inclusive pedagogy. Ultimately, twelve articles were reviewed. Figure 1 below shows the overall selection process for the review.

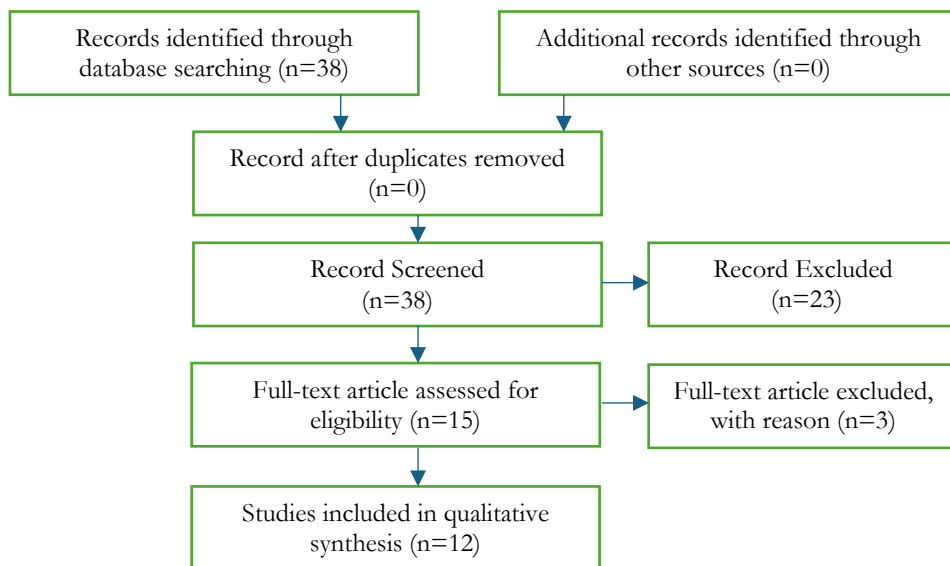


Figure 1: Meta-Analysis Approach Diagram

Table: Summary of Reviewed Studies on Inclusive Pedagogy Implementation

Name of Author(s)	Title	Focus/ Objectives	Design/ Data Analysis	Tools Used	Findings	Challenges and Recommendation(s)
Byrd, C. M. (2016)	Does Culturally Relevant Teaching Work? An Examination From Student Perspectives	To examine how students perceive culturally relevant teaching and its effectiveness in the classroom	Qualitative study using student interviews and surveys	Student interviews, surveys	Students responded positively to culturally relevant teaching, reporting increased engagement and belonging.	Teachers need better training on cultural relevance, and some resist changing traditional methods.
Mburu, J. M. (2022)	“All Children Matter”: A Preservice Teacher’s Understanding and Practice of Culturally Responsive Teaching in a Third-Grade Mathematics Classroom	To explore a preservice teacher’s understanding and application of culturally responsive teaching in math	Case study, qualitative interviews, and classroom observations	Classroom observations, interviews	The preservice teacher successfully incorporated culturally responsive teaching, increasing student participation.	Further professional development is needed to help preservice teachers refine their skills in culturally responsive education.
Shultz, M., et al. (2024)	Enacting Culturally Relevant Pedagogy when “Mathematics Has No Color”: Epistemological Contradictions	To explore the contradictions faced by teachers implementing culturally relevant pedagogy in mathematics	Qualitative study, teacher reflections	Teacher interviews, classroom observations	Teachers struggled to reconcile culturally relevant pedagogy with traditional epistemologies in math.	Recommends more consistent integration of culturally relevant pedagogy in mathematics teacher preparation programs
Almeqdad , Q. I., et al. (2023)	The effectiveness of universal design for learning: A systematic review of the literature and meta-analysis	To systematically review the effectiveness of UDL on academic achievement	Systematic review and meta-analysis	Meta-analysis of multiple studies	UDL significantly improved academic outcomes across diverse learner populations	Challenges in teacher implementation due to lack of training and resources; recommends extensive professional development.
Kusumaha, I. P., & Ani, Y. (2021)	Universal design learning approach to overcome	To investigate how UDL can help overcome barriers in mathematics learning	Qualitative study, case studies	Classroom observations, teacher reflections	UDL strategies improved student participation and comprehension in mathematics	Teachers faced challenges adapting UDL in traditional classroom settings; more

Name of Author(s)	Title	Focus/ Objectives	Design/ Data Analysis	Tools Used	Findings	Challenges and Recommendation(s)
	mathematics learning					teacher training and collaboration are recommended.
Root, J. R., et al. (2020)	Applying the Universal Design for Learning Framework to Mathematics Instruction for Learners With Extensive Support Needs	To assess how UDL can be applied to math instruction for students with extensive support needs	Qualitative study, case studies	Classroom observations, interviews	UDL improved math learning for students with disabilities by providing multiple means of engagement	Difficulty in adapting UDL materials for learners with varied needs. The study suggests collaboration between special educators and math teachers
Bal, A. P. (2016)	The Effect of the Differentiated Teaching Approach in the Algebraic Learning Field on Students' Academic Achievements	To investigate the effects of differentiated teaching on students' academic performance in algebra	Quasi-experimental design, pretest-posttest analysis	Algebraic achievement tests	Differentiated teaching led to significant improvements in students' algebraic achievements.	Teachers face difficulties managing diverse student needs; they recommend more teacher training in differentiation.
Bal, A. P. (2023)	Assessing the impact of differentiated Instruction on mathematics achievement and attitudes of secondary school learners	To explore how differentiated Instruction impacts mathematics achievement and student attitudes	Quasi-experimental design, pretest-posttest, attitude scale	Mathematics achievement tests, attitude questionnaires	Differentiated Instruction improved both achievement and positive attitudes toward math	The lack of resources and teacher knowledge remains challenging, so further professional development is recommended.
Kamarulzaman, M. H., et al. (2022)	Impact of Differentiated Instruction on the Mathematical Thinking Processes of Gifted and Talented Students	To evaluate the effect of differentiated Instruction on the mathematical thinking of gifted students	Mixed-methods approach using quantitative and qualitative data	Observations, interviews, mathematical thinking assessments	Differentiated Instruction enhanced mathematical thinking processes among gifted students	Limited teacher experience with differentiated Instruction; suggests providing more targeted training for teachers

Name of Author(s)	Title	Focus/ Objectives	Design/ Data Analysis	Tools Used	Findings	Challenges and Recommendation(s)
Mićanović, V., et al. (2023)	Effects and challenges to implement differentiated mathematics teaching among fourth graders in Montenegro	To assess the effectiveness and challenges of implementing differentiated Instruction in mathematics	Qualitative study, interviews with teachers and students	Classroom observations, interviews	Differentiated Instruction improved student engagement, but lacking instructional materials and time posed challenges.	Recommends additional resources and time allocations for effective implementation
Nurasiah, L., et al. (2020)	The effect of differentiated Instruction on student mathematical communication ability	To determine how differentiated Instruction influences students' mathematical communication skills	Quasi-experimental design, pretest-posttest	Mathematical communication tests, classroom observations	Differentiated Instruction positively impacted students' mathematical communication abilities	Teachers struggled with time management when implementing DI; recommends further research on DI in standard curricula
Prast, E. J., et al. (2018)	Differentiated Instruction in primary mathematics : Effects of teacher professional development on student achievement	To examine how teacher professional development on differentiation impacts student math achievement	Randomised controlled trial, pretest-posttest	Student achievement tests, teacher PD workshops	Students of teachers who received PD on differentiated Instruction performed significantly better in mathematics.	Long-term PD programs remain challenging; continuous support is recommended for teachers implementing DI.

3.3 General description of reviewed studies

The reviewed studies on inclusive pedagogies (CRT, UDL, and DI) span a variety of contexts and educational levels, primarily focusing on mathematics instruction and its impact on diverse learner populations. For instance, CRT studies, such as Byrd (2016) and Mburu (2022), examine the effectiveness of culturally responsive teaching strategies. Byrd (2016) highlights how these strategies foster academic engagement and a sense of representation among students. Similarly, Mburu (2022) illustrates the successful implementation of CRT in a third-grade mathematics classroom, demonstrating increased student participation and engagement. Additionally, UDL research, including Root et al. (2020), investigates how flexibility in instructional design and the use of multiple means of engagement, representation, and action/expression accommodate students with extensive support needs in mathematics classrooms. Differentiated Instruction, examined by Bal (2023) and others, assesses how tailoring instruction to students' readiness levels, interests, and learning profiles improves student achievement and attitudes toward mathematics. Overall, these studies (Bal, 2023; Byrd, 2016; Mburu, 2022; Root et al., 2020) show

that inclusive pedagogies address a wide range of student needs, from cultural inclusivity (CRT) to instructional flexibility (UDL) and personalisation of learning paths (DI). Each approach seeks to improve equity in education by providing accessible and relevant learning experiences for all students, particularly those from underrepresented or marginalised backgrounds.

3.4 Inclusive pedagogy implementation of reviewed studies

In terms of implementation, the studies highlight various strategies for integrating inclusive pedagogies in the classroom. Culturally Relevant Teaching (CRT) is often implemented through curriculum redesign, where teachers incorporate culturally relevant materials and examples that reflect the backgrounds of their students (Mburu, 2022). Teachers also foster critical thinking and engage in social justice discussions, linking mathematics learning to real-world issues relevant to students' communities. In Universal Design for Learning (UDL), flexible curriculum design is central to its implementation. The study by Kusuma and Ani (2021) highlights how digital tools and adaptive technologies enable teachers to present mathematical concepts in multiple formats, thereby supporting students with diverse learning needs. Differentiated Instruction (DI) emphasises ongoing assessment and flexible groupings based on students' learning requirements. The research conducted by Prast et al. (2018) underscores the importance of professional development in equipping teachers to adapt their instructional strategies effectively, ensuring they can meet the needs of various learning profiles.

3.5 Effectiveness of the inclusive pedagogy approaches of reviewed studies

The reviewed studies consistently find that inclusive pedagogies improve student outcomes when implemented effectively. For instance, Culturally Relevant Teaching has been shown to enhance student engagement and academic performance by fostering a sense of belonging and validation (Byrd, 2016). Students in culturally responsive classrooms are more likely to perceive the relevance of mathematics to their own lives, which boosts motivation and achievement. Universal Design for Learning has been found to improve access to mathematics content for students with learning disabilities or other special needs (Root et al., 2020). The flexibility of UDL allows students to engage with content in ways that suit their strengths, leading to better comprehension and retention. Differentiated Instruction has demonstrated positive effects on student achievement and attitudes toward mathematics. Bal (2023) reports that students in DI classrooms outperform their peers in traditional settings, especially when instruction is tailored to their readiness levels and interests. This approach fosters a positive learning environment in which students feel supported and appropriately challenged.

3.6 Challenges encountered with the inclusive pedagogy of reviewed studies

Despite the promise of these inclusive pedagogies, several challenges have emerged in their implementation. Systemic barriers, such as a lack of institutional support and adequate professional development, prevent teachers from fully adopting inclusive practices. For

example, Byrd (2016) highlights that culturally relevant pedagogy requires teachers to possess a deep knowledge of their students' cultural backgrounds, which many educators lack due to insufficient training. A significant challenge for Universal Design for Learning (UDL) is the resource constraints related to access to technology and specialised teacher training. Almeqdad et al. (2023) note that schools with limited funding face difficulties in implementing UDL effectively due to the high costs of essential digital tools and instructional materials. In the case of Differentiated Instruction, teachers often encounter time constraints, making it difficult to prepare lessons that cater to the diverse needs of students (Bal, 2023). Differentiation demands continuous assessment and adaptation, which can overwhelm teachers who lack sufficient planning time or support.

4. Lessons Learned and Recommendations

The reviewed studies on inclusive pedagogies, namely CRT, UDL, and DI, provide critical perspectives on enhancing educational practices for diverse learners. One significant lesson learned is the importance of professional development. Continuous training equips teachers with the skills and confidence necessary to effectively implement CRT, UDL, and DI. Research has shown that ongoing professional development improves teachers' instructional strategies and positively impacts student engagement and achievement (Almeqdad et al., 2023; Bal, 2023). Another critical recommendation emphasises the need for inclusive leadership and advocacy. School leaders and policymakers play a vital role in promoting inclusive practices within teacher preparation programmes. Their support can create a conducive environment that prioritises inclusivity and provides the necessary resources for successful implementation (Byrd, 2016; Iwuanyanwu, 2023). Additionally, fostering a collaborative classroom culture is essential. Encouraging open communication between teachers and students allows educators to tailor their approaches to meet individual learning needs. Engaging students in discussions about their experiences and preferences can enhance the relevance of their learning (Bal, 2023; Kamarulzaman et al., 2022).

The development of comprehensive assessment tools is also crucial. Schools should focus on creating diverse assessment methods that accurately reflect students' understanding in inclusive settings. Such assessments should account for various learning styles and offer insights into the social-emotional impacts of teaching practices (Prast et al., 2018; Root et al., 2020). Moreover, leveraging technology can significantly enhance UDL implementation. Digital tools that provide adaptive learning experiences can help educators better meet the needs of diverse learners, facilitating greater differentiation in instruction (Kusumaha & Ani, 2021; Nurasiah et al., 2020). It is equally important to ensure equity in resource distribution across schools. Addressing disparities can facilitate the successful implementation of inclusive pedagogies. Targeted funding and interventions should prioritise schools in marginalised communities to ensure equitable access to high-quality education (Almeqdad et al., 2023; Mićanović et al., 2023).

Cultural competency training must also be a priority in teacher education. By understanding their students' cultural backgrounds, teachers can implement CRT more effectively, creating inclusive classroom environments that respect and value diversity (Mburu, 2022; Shultz et al., 2024). Lastly, incorporating peer mentorship and community engagement can bolster the effectiveness of inclusive pedagogy. Developing mentorship programmes and fostering partnerships with community members provide additional resources and perspectives, enriching the educational experience for students (Byrd, 2016; Mićanović et al., 2023). By embracing these lessons and recommendations, educators and institutions can significantly enhance their approaches to inclusive pedagogy, ultimately providing a more equitable and effective mathematics education for diverse learners.

5. Conclusion

This chapter has demonstrated that inclusive pedagogies such as Culturally Responsive Teaching, Universal Design for Learning, and Differentiated Instruction are vital for preparing mathematics teachers to meet the diverse needs of their students. These approaches enhance engagement, support equity, and improve mathematics achievement by valuing students' cultural identities, accommodating varied learning styles, and providing personalized instruction. However, challenges such as resource limitations and inadequate training must be addressed to fully realise their potential. The broader implications are clear: adopting inclusive teaching practices fosters an equitable education system that empowers diverse learners to succeed. Moving forward, teacher training programmes must emphasise cultural competence, hands-on experience, and collaboration between institutions and communities. By championing inclusivity and equity, pre-service mathematics educators can transform classrooms into spaces where every student has the opportunity to thrive.

6. Declarations

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