

# Understanding the Disparities in PISA (Programme for International Student Assessment) Implementation in the Philippines: An Integrative Review in the Mathematics Education Context

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**Abstract:** *The Programme for International Student Assessment (PISA), as a crucial benchmark for evaluating educational systems worldwide, highlights significant disparities in Philippine student performance, particularly in mathematics, revealing deep-rooted issues in the educational system that require thorough investigation and targeted solutions. This study employed an integrative review to assess a range of studies concerning disparities in PISA (Programme for International Student Assessment) within Philippine Mathematics Education. Results revealed eight (8) emerging themes on the disparities in PISA (Programme for International Student Assessment) within Philippine Mathematics Education, namely; (1) Socioeconomic Disparity; (2) Quality of Teaching and Teacher Training; (3) Curriculum and Instructional Materials; (4) Language Barrier; (5) Technological Integration; (6) Assessment and Feedback Mechanisms; (7) Parental Involvement; and (8) Educational Policy and Governance. The disparities in PISA performance in Philippine mathematics education are multifaceted, influenced by socioeconomic factors, teaching quality, curriculum inadequacies, language barriers, technological integration, assessment mechanisms, parental involvement, and governance, necessitating a comprehensive and interconnected approach to improve equity and outcomes for students. To mitigate disparities in PISA performance, targeted interventions may include supporting low-income families, investing in teacher training, aligning the curriculum with international standards, enhancing English instruction, improving technological infrastructure, fostering parental involvement, and implementing evidence-based policies with robust accountability and responsibility.*

**Keywords— Disparities; PISA; Philippine Mathematics Education; Integrative Review**

## 1. INTRODUCTION

The Programme for International Student Assessment (PISA) serves as a crucial benchmark for evaluating educational systems worldwide by assessing 15-year-old students' proficiency in reading, mathematics, and science (Perry & Ercikan, 2015). Despite the Philippines' active participation in PISA, the results have consistently highlighted significant disparities in student performance, particularly in mathematics. These disparities underscore deep-rooted issues within the Philippine educational system, necessitating a thorough investigation to identify and address the underlying causes (Bernardo et al., 2022). Thus, this study bridges the gaps in the existing literature by providing a comprehensive analysis of the multifaceted factors contributing to these disparities.

Current literature predominantly focuses on broad educational challenges in the Philippines, such as insufficient funding, outdated curricula, and teacher quality (Generelao, Ducanes, Yee, & David, 2022). However, there is a notable gap in research specifically targeting the factors affecting mathematics education and how these contribute to the country's PISA performance. While socioeconomic status, language barriers, and technological access are often mentioned, their specific impacts on mathematics learning and achievement remain underexplored (Tourón et al., 2019). This study filled this gap by examining the emerging factors in greater detail, providing a nuanced understanding of their roles in shaping students' mathematical proficiency.

Moreover, previous studies have largely overlooked the interconnectedness of various factors influencing mathematics education (Shin, Lee, & Kim, 2009). For instance, while teacher quality is recognized as crucial, there is limited research on how teacher training programs are aligned with the specific needs of mathematics instruction. Similarly, the role of curriculum design in fostering critical thinking and problem-solving skills necessary for PISA success is insufficiently explored (Zulkardi & Putri, 2020). Integrating different dimensions gives the study a holistic view of the challenges and potential solutions for improving mathematics education in the Philippines.

Another significant gap in the literature is the lack of longitudinal studies tracking changes and developments over time. Most existing research provides a snapshot of the current state of education without considering how historical and policy shifts have impacted mathematics education (Gutiérrez, 2013). This study addresses this gap by examining past and present educational policies, their implementation, and their long-term effects on student outcomes. Understanding these temporal dynamics is crucial for devising

strategies that not only address immediate issues but also ensure sustainable improvements in mathematics education (Tran et al., 2012).

Finally, the role of parental involvement and community support in enhancing mathematics education is often underemphasized in existing research. While some studies acknowledge the importance of a supportive home environment, there is a lack of detailed analysis on how parental and community engagement specifically influences mathematics learning (Cui, Zhang, & Leung, 2021). This study explored the extent and nature of parental involvement in the Philippines, identifying best practices, and suggesting ways to foster a more supportive ecosystem for mathematics education. By addressing aforementioned predicaments, the study hopes to contribute valuable insights that can inform policy and practice, ultimately improving the mathematics proficiency of Filipino students in international assessments like PISA.

## 2. METHODS

This study employed an integrative review to assess a range of studies concerning disparities in PISA (Programme for International Student Assessment) within Philippine Mathematics Education (Kutcher & LeBaron, 2022). An integrative review, recognized for its comprehensive nature, amalgamates diverse forms of evidence, encompassing empirical and theoretical literature, to foster a holistic comprehension of a specific subject. This approach allows for the synthesis of various research methodologies, such as case studies, observational studies, and meta-analyses, to address a clearly outlined issue. Integrative reviews play a crucial role in evidence-based practices within education by pinpointing gaps in existing literature, proposing avenues for future research, and contributing to theory advancement. By combining findings from different types of studies, integrative reviews provide a nuanced understanding of complex educational issues, making them particularly useful for addressing multifaceted topics such as educational disparities.

The process entailed formulating a precise research question focused on understanding the disparities in PISA performance in Philippine mathematics education. A comprehensive literature search was then conducted across multiple databases to gather relevant studies. Selection criteria were established to identify pertinent studies that directly addressed the research question, ensuring a broad yet focused collection of sources. The selected studies underwent critical evaluation to assess the quality and relevance of the evidence. Data from these studies were synthesized through narrative synthesis, a method that allows for the integration of findings from diverse methodologies into a coherent narrative. This approach facilitated the identification of key themes and patterns across the studies. The findings were then presented comprehensively, providing an in-depth analysis of the factors contributing to PISA disparities in the Philippines.

Integrative reviews are particularly beneficial for educational research as they offer a broader overview of the literature, encompassing various perspectives and methodologies. This comprehensive approach provides insights that can inform relevant teaching methodologies and educational policy formulations. By synthesizing diverse forms of evidence, integrative reviews help identify commonalities and discrepancies across studies, offering a more robust understanding of the research topic. This methodology not only highlights existing gaps in the literature but also suggests directions for future research, aiming to enhance educational practices and outcomes. In this study, the integrative review method enabled a thorough exploration of the multifaceted issues contributing to the disparities in PISA performance in Philippine mathematics education, paving the way for more targeted and effective interventions.

## 3. RESULTS AND DISCUSSION

### Disparities in PISA (Programme for International Student Assessment) Implementation in the Philippines

#### *Theme 1: Socioeconomic Disparity*

One of the primary themes emerging from the study is the profound impact of socioeconomic disparity on student performance in PISA assessments. Students from low-income families face significant disadvantages, including limited access to quality educational resources, insufficient learning materials, and a lack of supportive learning environments (Lagravinese, Liberati, & Resce, 2020). These disparities are further exacerbated by financial constraints that prevent many families from affording private tutoring or enrolling their children in higher-quality private schools, which often have better educational outcomes compared to public schools (Enjoo, 2017).

The study reveals that socioeconomic status (SES) is a strong predictor of student performance in mathematics. Higher SES students often benefit from additional educational support at home, such as parental involvement in homework and access to educational technology (Dietrichson, Bøgg, Filges, & Jørgensen, 2017). Conversely, students from lower SES backgrounds may also have to contend with challenges such as malnutrition and lack of sleep, which further hinder their academic performance (Hernandez, Silverman, & Destin, 2021). Addressing these socioeconomic disparities is crucial for improving overall mathematics proficiency and ensuring a more equitable education system.

#### *Theme 2: Quality of Teaching and Teacher Training*

The quality of teaching and the effectiveness of teacher training programs have emerged as critical factors influencing student performance in PISA mathematics assessments (Carnoy et al., 2016). The study highlights that many mathematics teachers in the Philippines lack sufficient subject matter expertise and pedagogical skills, partly due to inadequate teacher education programs (Ragma, 2017). Continuous professional development opportunities for teachers are limited, resulting in outdated teaching methods that fail to engage students or cater to diverse learning needs (Luzano & Ubalde, 2023).

Moreover, the study indicates that teachers often struggle with large class sizes, making individualized instruction challenging (Romorosa et al., 2023). The lack of ongoing professional development exacerbates these issues, as teachers are not equipped with the latest teaching strategies or technological tools that could enhance learning (Dicdiquin, Mobo, & Cutillas, 2023). Improving teacher training programs, providing regular professional development, and reducing class sizes are essential steps toward enhancing the quality of mathematics education in the Philippines.

#### *Theme 3: Curriculum and Instructional Materials*

Another significant theme is the inadequacy of the current curriculum and instructional materials used in Philippine mathematics education. The study finds that the curriculum is often misaligned with international standards, leading to gaps in students' foundational knowledge and skills (Pang-an et al., 2022). Additionally, instructional materials, including textbooks and digital resources, are frequently outdated, culturally irrelevant, or not engaging enough to stimulate student interest and understanding (Luzano, 2024).

The curriculum also tends to emphasize rote memorization over critical thinking and problem-solving skills, which are crucial for success in PISA assessments. To bridge this gap, the study suggests a comprehensive review of the mathematics curriculum to ensure that it is aligned with global best practices. Furthermore, investing in high-quality, culturally relevant instructional materials that promote active learning and critical thinking is vital for improving students' mathematical competencies (Putri et al., 2023).

#### *Theme 4: Language Barrier*

Language proficiency has been identified as a significant barrier to students' performance in mathematics (Prediger et al., 2018). The study shows that many students in the Philippines are not proficient in English, the language of instruction for many mathematical concepts and PISA assessments. This language barrier makes it difficult for students to fully comprehend mathematical problems and instructions, leading to lower performance levels (Bernardo et al., 2022).

Furthermore, the use of multiple languages within the educational system can create additional challenges (Tortola, 2021). While mother tongue-based multilingual education is beneficial in the early years, the transition to English for higher-grade levels without adequate support can hinder students' ability to understand complex mathematical concepts (Piper et al., 2018). To address this issue, the study suggests improving English language instruction from early grades and providing targeted support for students who struggle with language transition, ensuring they can effectively engage with the mathematics curriculum (Sacco, Spies, & Pfannenstiel, 2022).

#### *Theme 5: Technological Integration*

Technological integration in education is another emerging theme, highlighting both its potential benefits and the current challenges in the Philippine context (Tomaro, 2018). The study reveals that many schools lack adequate technological infrastructure, such as computers, internet access, and digital learning platforms, which are essential for modern educational practices and for preparing students for PISA assessments (Srijamdee & Pholphirul, 2020).

Despite the government's efforts to incorporate technology into classrooms, disparities in access between urban and rural schools remain a significant issue (Luzano, 2024). Rural schools often face severe limitations in technological resources, hindering students' ability to engage with digital learning tools that could enhance their understanding of mathematics (Courtney, Miller, & Gisondo, 2022). The study emphasizes the need for substantial investment in technological infrastructure and training for teachers to effectively integrate technology into their teaching practices, ensuring all students have equal opportunities to benefit from digital learning resources (Nallada et al., 2024).

#### *Theme 6: Assessment and Feedback Mechanisms*

Effective assessment and feedback mechanisms are crucial for improving student performance in mathematics, yet they are often lacking in the current educational system (Luzano 2020; Luzano & Ubalde, 2023). The study highlights that traditional assessment methods, which primarily focus on summative evaluations through exams, do not provide timely or actionable feedback to students. This limits students' ability to understand their strengths and weaknesses and hinders their overall learning progression (Alonzo, 2012).

Moreover, the study underscores the importance of formative assessments that provide continuous feedback and opportunities for students to improve their skills (Luzano, 2023). Implementing regular, formative assessments and developing a feedback-rich culture in classrooms can help students identify their learning gaps and receive the necessary support to address them (Aranzo et al., 2023). Additionally, training teachers to use diverse assessment strategies and to provide constructive feedback is essential for fostering a supportive learning environment that promotes continuous improvement in mathematics education (Casanova et al., 2023).

*Theme 7: Parental Involvement*

Parental involvement is a critical factor influencing student achievement in mathematics, as highlighted by the study. It shows that students whose parents are actively involved in their education tend to perform better academically (Fan & Chen, 2001). Parental support can come in various forms, such as helping with homework, encouraging a positive attitude toward learning, and fostering an environment that values education (Luzano, Binayao, & Peligrino, 2024).

However, the study also points out that many parents in the Philippines, particularly those from lower socioeconomic backgrounds, may lack the time, resources, or educational background to effectively support their children's learning (Dulay, Cheung, Reyes, & McBride, 2019). To address this, schools can play a pivotal role by engaging parents through regular communication, workshops, and resources that equip them with the skills and knowledge to support their children's education. By strengthening the home-school connection, students can benefit from a more holistic support system that enhances their learning outcomes in mathematics (Starkey & Klein, 2000).

*Theme 8: Educational Policy and Governance*

Policy and governance issues in education are central to understanding the disparities in PISA performance in Philippine mathematics education (Lewis, 2017). The study identifies several systemic challenges, including inadequate funding, inefficient resource allocation, and lack of coherent policies that address the specific needs of mathematics education (Jacob, 2020). These governance issues result in disparities in educational quality and access, particularly affecting disadvantaged regions and communities (Luzano, 2024).

The study advocates for comprehensive policy reforms that prioritize education funding and ensure resources are distributed equitably. Effective governance also involves accountability mechanisms to monitor and evaluate the implementation of educational policies and programs (BenDavid-Hadar, 2018). By adopting evidence-based policies and fostering collaboration among stakeholders, including government agencies, educators, and communities, the Philippine education system can address the underlying issues contributing to disparities in mathematics education and improve student outcomes on PISA assessments.

#### **4. CONCLUSION AND RECOMMENDATION**

The disparities in PISA performance in the Philippines, particularly in mathematics education, are a multifaceted issue influenced by a range of socioeconomic, instructional, and policy-related factors. This study has highlighted critical themes including socioeconomic disparity, the quality of teaching and teacher training, inadequacies in the curriculum and instructional materials, language barriers, technological integration, assessment and feedback mechanisms, parental involvement, and policy and governance. These factors collectively contribute to the significant performance gaps observed among Filipino students. Addressing these disparities requires a holistic approach that considers the interdependencies of these factors, ensuring that interventions are comprehensive and sustainable. By understanding and addressing these underlying issues, the Philippines can make significant strides toward improving mathematics education and ensuring equitable learning opportunities for all students.

To mitigate the disparities identified in this study, it is crucial to implement targeted and multi-faceted interventions. First, addressing socioeconomic disparities requires policies that provide additional support and resources to low-income families, including nutritional programs, financial aid, and enhanced educational materials. Second, improving the quality of teaching necessitates substantial investment in teacher training programs, ongoing professional development, and strategies to manage large class sizes effectively. Third, a thorough review and alignment of the mathematics curriculum with international standards, along with the provision of high-quality, culturally relevant instructional materials, are essential. Fourth, enhancing English language instruction from early grades and providing robust support for students during language transitions will help overcome language barriers. Additionally, investing in technological infrastructure and training for both urban and rural schools is critical to ensure equitable access to digital learning resources. Finally, fostering stronger parental involvement and implementing evidence-based policies with robust accountability mechanisms will create a more supportive and effective educational environment. By addressing these recommendations, the Philippine education system can work towards closing the performance gap and improving student outcomes in mathematics.

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