

Bridging the Achievement Gap: Insights from PISA on Improving Mathematics Education in the Philippines

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Abstract:

This study examines the performance of Filipino students in mathematics as assessed by the Programme for International Student Assessment (PISA) in 2018 and 2022. Despite educational reforms and the introduction of the K to 12 curriculum, Filipino students have continued to underperform, with only marginal improvements in their PISA scores. The study identifies persistent challenges including socio-economic disparities, inadequate teaching practices, and cultural factors that impact student outcomes. Analysis reveals that socio-economic status significantly influences access to educational resources and support, contributing to achievement gaps. Educational practices, such as an emphasis on rote memorization over critical thinking, have limited the development of higher-order skills. Additionally, gender differences show that female students outperform males in mathematics, suggesting the need for gender-sensitive educational strategies. Recommendations include curriculum and instructional reforms, enhanced teacher professional development, targeted support for disadvantaged students, and a cultural shift towards fostering deep learning. Addressing these issues comprehensively is essential for improving mathematics education and closing the achievement gap in the Philippines. This study underscores the need for systemic change to better align educational practices with international standards and student needs.

Keywords: Philippines, PISA, mathematics education, socio-economic factors, cultural factors, educational reforms

Introduction

The Programme for International Student Assessment (PISA), administered by the Organisation for Economic Co-operation and Development (OECD), serves as a critical benchmark for assessing the educational performance of 15-year-old students worldwide. Conducted every three years since 2000, PISA evaluates competencies in reading, mathematics, and science, providing insights into the effectiveness of educational systems across participating countries (OECD, 2020). The Philippines, having joined PISA in its 2018 cycle, continues to face significant challenges, particularly in mathematics education.

Despite various reforms and initiatives aimed at improving the quality of education, Filipino students' performance in PISA remains notably below the global average. In the 2022 assessment, less than a quarter of Filipino students reached the minimum proficiency level in mathematics, reading, and science, indicating persistent deficiencies in foundational skills (OECD, 2023). This is consistent with findings from the 2018 cycle, where the Philippines ranked among the lowest globally in these domains (World Bank, 2021).

The persistent low performance in mathematics is particularly concerning, given the subject's critical role in developing analytical and problem-solving skills essential for the 21st-century workforce. Studies have shown that students with strong mathematical skills are better equipped to navigate complex real-world problems and contribute effectively to economic development (Hanushek & Woessmann, 2023). Therefore, addressing the gaps in mathematics education is imperative for the Philippines to enhance its educational outcomes and socio-economic prospects.



This paper aims to analyze the factors contributing to the low performance of Filipino students in mathematics as revealed by PISA 2022 and propose effective strategies to bridge the learning gaps. By examining socio-economic, educational system, and cultural factors, this study seeks to provide a comprehensive understanding of the challenges and identify actionable solutions to improve mathematics proficiency among Filipino students.

Literature Review:

The Programme for International Student Assessment (PISA), conducted by the Organisation for Economic Co-operation and Development (OECD), has become a pivotal tool for evaluating educational systems worldwide since its inception in 2000. PISA assesses 15-year-old students' abilities in reading, mathematics, and science every three years, providing comprehensive data on the strengths and weaknesses of education systems across various countries (OECD, 2019). The standardized nature of PISA allows for cross-national comparisons, offering insights into effective educational practices and areas needing improvement (Breakspear, 2012).

The Philippines participated in PISA for the first time in 2018, with results highlighting significant challenges in the educational system. Filipino students scored the lowest in reading and second lowest in both mathematics and science among 79 participating countries (OECD, 2019). The 2022 PISA results showed only marginal improvements, with the Philippines ranking sixth lowest in reading and mathematics and third lowest in science among 81 countries (OECD, 2023). These scores are substantially below the OECD average, indicating persistent deficiencies in basic educational competencies.

Factors Contributing to Low Performance in Mathematics

Socio-economic status (SES) is a well-documented determinant of student performance in international assessments like PISA. Research indicates that students from lower SES backgrounds typically have less access to educational resources, supportive learning environments, and extracurricular learning opportunities, which adversely affect their academic achievements (OECD, 2019). In the Philippines, widespread poverty and socio-economic inequality exacerbate these issues, limiting students' ability to perform well in subjects such as mathematics (Albert, Dumagan, & Martinez, 2015).

The Philippine education system has undergone numerous reforms, most notably the implementation of the K to 12 curriculum, which aims to align the country's educational standards with international benchmarks (DepEd, 2016). However, challenges remain in effectively transitioning from traditional rote learning methods to approaches that foster critical thinking and problem-solving skills (David, Albert, & Monterola, 2019). The 2022 PISA results reflect these ongoing struggles, as many students still lack the fundamental competencies needed to succeed in mathematics (OECD, 2023).

Cultural attitudes towards education also play a significant role in student performance. In the Philippines, educational success is often viewed as a pathway to socio-economic mobility, yet there is a prevalent emphasis on memorization and examination scores rather than deep understanding and application of knowledge (Bernardo, 2008). This cultural perspective may hinder the development of higher-order thinking skills essential for mathematics proficiency.

Strategies to Improve Mathematics Education

Effective teaching is critical to improving student outcomes in mathematics. Studies have shown that professional development programs focusing on innovative teaching methods, classroom management, and continuous assessment can significantly enhance teachers' instructional skills and student learning (Darling-Hammond, Hyler, & Gardner, 2017). In the context of the Philippines, there is a need to invest in comprehensive teacher training programs that emphasize the development of problem-solving and critical thinking skills in mathematics (Gutierrez, 2019).

Curriculum design plays a crucial role in shaping students' learning experiences. The K to 12 curriculum in the Philippines aims to address previous educational shortcomings by integrating higher-order thinking skills and practical applications of mathematical concepts (DepEd, 2016). However, there is room for further improvement in aligning the curriculum with global best practices and ensuring that instructional materials are engaging, culturally relevant, and designed to promote active learning (Nabayra, 2020).

Targeted interventions, such as remedial classes and tutoring programs, have been shown to be effective in addressing specific learning gaps among students (Slavin, Lake, & Groff, 2009). In the Philippines, implementing these interventions can help support students who struggle with foundational mathematics skills. These programs should be tailored to meet the diverse needs of learners and include strategies for continuous assessment and feedback (Vistro-Yu & Verzosa, 2024).



The integration of technology in education offers new opportunities for enhancing mathematics instruction. Digital tools and platforms can provide interactive and personalized learning experiences, supplementing traditional teaching methods (Cheung & Slavin, 2013). In the Philippines, leveraging technology can help overcome resource constraints and provide students with additional practice opportunities and access to high-quality educational content (Limjap, 2005).

Parental and community involvement is crucial in creating a supportive learning environment for students. Research indicates that students perform better academically when their parents and communities are actively engaged in their education (Henderson & Mapp, 2002). In the Philippine context, initiatives to increase parental involvement and community support can help reinforce the importance of education and provide additional resources for learning (Estrada & Gumban, 2024).

Examining successful educational practices in other countries can provide valuable insights for improving mathematics education in the Philippines. For instance, Singapore's mathematics curriculum, which emphasizes problem-solving and conceptual understanding, has been highly effective in achieving top rankings in PISA assessments (Kaur, 2022). Adapting similar strategies to the Philippine context, while considering local cultural and socio-economic factors, could help enhance mathematics proficiency among Filipino students.

Implementing these strategies in the Philippines faces several challenges, including limited resources, resistance to change, and logistical issues. Securing adequate funding, providing incentives for teacher participation, and establishing robust monitoring and evaluation frameworks are essential steps to overcome these obstacles (Symaco, 2013). Collaboration between government agencies, educational institutions, and stakeholders is also critical to ensure the successful implementation of these initiatives (David, Albert, & Monterola, 2019).

The persistent low performance of Filipino students in mathematics as highlighted by the PISA 2022 results underscores the need for targeted and effective strategies to address learning gaps. By strengthening teacher training, enhancing the curriculum, implementing targeted interventions, leveraging technology, and fostering parental and community involvement, the Philippines can make significant strides in improving mathematics education. Continuous monitoring and evaluation will ensure the sustainability and success of these initiatives, ultimately leading to better educational outcomes and socio-economic prospects for Filipino students.

Methodology:

This study employs a systematic literature review (SLR) to identify, evaluate, and synthesize relevant research on the performance of Filipino students in mathematics as assessed by PISA, as well as effective strategies to address the identified learning gaps. A systematic literature review is a rigorous research method designed to provide a comprehensive and unbiased summary of existing evidence on a specific topic (Kitchenham & Charters, 2007).

The review followed a predefined protocol to ensure comprehensive coverage and replicability of the search process. The databases used to identify relevant studies included Google Scholar, PubMed, ERIC (Education Resources Information Center), Web of Science, and Scopus. The search strategy involved a combination of keywords and Boolean operators to capture all relevant literature. The primary keywords were: "PISA," "Philippines," "mathematics performance," "educational strategies," "learning gaps," and "education reform." An example of a search string used in Google Scholar was: `"PISA" AND "Philippines" AND "mathematics performance" AND ("educational strategies" OR "learning gaps" OR "education reform")`.

To ensure the relevance and quality of the selected studies, specific inclusion and exclusion criteria were applied. Inclusion criteria were: studies published in peer-reviewed journals; articles written in English; research focused on the Philippines or relevant international comparisons; studies including data on PISA results or educational interventions in mathematics; and publications from 2000 onwards, aligning with the inception of PISA. Exclusion criteria included: non-peer-reviewed articles, opinion pieces, and grey literature; studies not related to PISA or mathematics education; publications not focused on school-aged students; and articles lacking empirical data or rigorous analysis.

Data extraction was conducted using a standardized form to ensure consistency and comprehensiveness. Information extracted from each included study comprised: author(s) and publication year, study objectives, methodology, sample characteristics, key findings related to PISA performance, factors affecting mathematics performance, proposed or evaluated educational strategies, and limitations and recommendations.

The quality of the included studies was assessed using a modified version of the Critical Appraisal Skills Programme (CASP) checklist (CASP, 2018). Criteria included: clarity of research question and objectives, appropriateness of study design, methodological rigor, relevance and reliability of data, transparency of data analysis, and validity of conclusions drawn. Each study was rated as high, medium, or low quality based on these criteria. Only studies rated as high or medium quality were included in the final synthesis to ensure the reliability of the findings.



Findings and Discussion:

Theme 1: Performance of Filipino Students in PISA Mathematics

The performance of Filipino students in the Programme for International Student Assessment (PISA) has consistently been below the global average, underscoring significant challenges in mathematics education. In the 2018 PISA cycle, Filipino students ranked second to the lowest in mathematics among the 79 participating countries, scoring an average of 353 points (OECD, 2019). This placed the Philippines well below the OECD average of 489 points, highlighting substantial deficiencies in the country's mathematics education system.

Despite efforts to improve, the 2022 PISA results showed only a slight improvement, with the average score increasing to 355 points. This marginal increase still left the Philippines among the lowest performers, ranking sixth from the bottom out of 81 countries (OECD, 2023). Such minimal progress suggests that the educational reforms implemented between 2018 and 2022 have not effectively addressed the core issues hindering student performance in mathematics.

The majority of Filipino students (84%) did not reach the basic level of proficiency in mathematics, indicating a widespread inability to interpret and represent mathematical situations, which are essential skills for problem-solving and practical applications (OECD, 2023). This lack of basic proficiency is concerning as it suggests that a significant proportion of students are not acquiring the necessary mathematical foundations during their schooling years.

Several factors contribute to the poor performance of Filipino students in mathematics. One critical issue is the quality of mathematics instruction. Research has shown that effective teaching practices are essential for student success in mathematics (Hattie, 2009). In the Philippines, however, many teachers lack adequate training and professional development opportunities to implement effective teaching strategies (Tan, 2015). This gap in teacher preparedness affects their ability to deliver high-quality instruction that engages students and promotes deep understanding of mathematical concepts.

Additionally, the curriculum and assessment practices in the Philippines may not be aligned with the competencies measured by PISA. The K to 12 curriculum, introduced to enhance the quality of education, aims to develop critical thinking and problem-solving skills. However, the transition to this new curriculum has faced challenges, including insufficient teacher training and resistance to change (DepEd, 2016). These issues may hinder the effective implementation of the curriculum, limiting its impact on student learning outcomes.

Moreover, the assessment practices in Filipino schools often emphasize rote memorization and procedural tasks rather than higher-order thinking skills and real-world applications (David et al., 2019). This focus on memorization does not prepare students for the type of problem-solving and critical thinking required in PISA assessments. Consequently, students may struggle to apply their mathematical knowledge to unfamiliar contexts, leading to lower performance on international assessments.

The educational environment also plays a significant role in student performance. Overcrowded classrooms, limited resources, and inadequate facilities are common challenges in many Filipino schools, particularly in rural areas (Vistro-Yu & Verzosa, 2024). These conditions can impede effective teaching and learning, contributing to students' difficulties in mastering mathematical concepts. Additionally, the lack of access to educational technology and supplementary learning materials further exacerbates these challenges, as students have fewer opportunities to engage with interactive and individualized learning experiences.

Socio-economic factors also significantly influence student performance in mathematics. Students from lower socio-economic backgrounds often face additional barriers to learning, including limited access to educational resources, lack of parental support, and adverse home environments (Albert, Dumagan, & Martinez, 2015). These factors can negatively affect their academic performance and contribute to the persistent achievement gap between students from different socio-economic groups.

To address these issues, several strategies have been proposed. Improving teacher quality through comprehensive professional development programs is essential. Such programs should focus on enhancing teachers' content knowledge, pedagogical skills, and ability to implement effective instructional strategies (Darling-Hammond, Hyler, & Gardner, 2017). Providing ongoing support and resources for teachers can help them adopt new teaching practices and improve student engagement and learning outcomes.

Revising the curriculum and assessment practices to align more closely with the competencies measured by PISA is also crucial. This involves placing greater emphasis on critical thinking, problem-solving, and real-world applications in mathematics instruction (Reyes, 2019). Integrating technology into the curriculum can provide



students with additional practice opportunities and access to high-quality educational content, helping them develop the skills needed for success in international assessments.

Addressing the socio-economic disparities that affect student performance requires targeted interventions. Providing additional support and resources to schools in low-income areas can help create a more equitable learning environment (David et al., 2019). This includes investing in infrastructure, educational technology, and supplementary learning programs to support students who face additional barriers to learning.

Enhancing parental involvement in education is another key strategy. Schools can engage parents by providing resources and workshops that help them support their children's learning at home (Henderson & Mapp, 2002). Encouraging parental participation in school activities and decision-making processes can also foster a sense of community and shared responsibility for student success.

The performance of Filipino students in PISA mathematics assessments highlights significant challenges in the country's education system. Addressing these challenges requires a comprehensive approach that includes improving teacher quality, revising curriculum and assessment practices, addressing socio-economic disparities, and enhancing parental involvement. By implementing these strategies, the Philippines can work towards improving mathematics education and ensuring that all students have the opportunity to achieve their full potential.

Theme 2: Socio-Economic and Educational System Factors

Socio-economic status (SES) has been identified as a crucial factor affecting the academic performance of Filipino students in mathematics. Students from lower SES backgrounds often lack access to quality educational resources, supportive learning environments, and extracurricular learning opportunities, which hampers their academic achievement (Albert, Dumagan, & Martinez, 2015). The PISA 2018 and 2022 results reflect these disparities, as students from wealthier backgrounds performed significantly better than their less affluent peers (OECD, 2019; OECD, 2023).

The socio-economic divide in education is a global issue, but it is particularly pronounced in developing countries like the Philippines. Research indicates that socio-economic disparities significantly influence student performance in mathematics. Students from lower-income families often attend schools with fewer resources, less experienced teachers, and inadequate learning materials (Reyes, 2019). This environment limits their exposure to quality education and hinders their ability to develop essential mathematical skills.

In the Philippines, educational resources are unevenly distributed, with urban schools typically better equipped than their rural counterparts. Urban schools generally have access to more experienced teachers, better facilities, and additional educational programs, which contribute to higher student performance (David et al., 2019). In contrast, rural schools often struggle with insufficient funding, outdated materials, and a lack of professional development opportunities for teachers. This urban-rural divide exacerbates educational inequities and impacts student outcomes in national and international assessments.

A significant aspect of SES affecting educational outcomes is parental involvement. Parents with higher SES are more likely to engage in their children's education, providing support and resources that can enhance learning (Coley, 2002). They can afford private tutors, educational materials, and extracurricular activities that enrich their children's educational experiences. Conversely, parents from lower SES backgrounds may have limited time and resources to support their children's education due to work commitments and financial constraints. This lack of support can negatively affect students' academic performance and motivation.

The quality of teaching is another critical factor influenced by SES. Schools in affluent areas can attract and retain more qualified teachers by offering competitive salaries and professional development opportunities (Adams & Sperling, 2019). These teachers are better equipped to implement effective teaching strategies and provide individualized support to students. In contrast, schools in low-income areas often face challenges in recruiting and retaining qualified teachers due to lower salaries and limited resources. This disparity in teaching quality contributes to the performance gap between students from different SES backgrounds.

Moreover, the broader educational system in the Philippines faces systemic challenges that impact student performance. The implementation of the K to 12 curriculum, designed to enhance the quality of education and align it with international standards, has faced several obstacles (DepEd, 2016). While the curriculum aims to develop critical thinking and problem-solving skills, its effectiveness has been hindered by inadequate teacher training, limited resources, and resistance to change (Tan, 2015). These issues have prevented the full realization of the curriculum's potential to improve student outcomes in mathematics.



In addition to curriculum challenges, the Philippine education system grapples with high student-to-teacher ratios, particularly in public schools. Large class sizes make it difficult for teachers to provide individualized attention and support to students, which is crucial for effective learning, especially in subjects like mathematics (Vistro-Yu & Verzosa, 2024). The lack of personalized instruction can lead to students falling behind and struggling to grasp fundamental concepts, ultimately affecting their performance in assessments like PISA.

The PISA results also highlight the impact of extracurricular learning opportunities on student performance. Students from higher SES backgrounds often have access to additional learning opportunities outside of school, such as private tutoring, enrichment programs, and educational technology (Cheung & Slavin, 2013). These opportunities provide additional practice, reinforce learning, and help students develop a deeper understanding of mathematical concepts. In contrast, students from lower SES backgrounds may lack access to such opportunities, limiting their ability to enhance their learning and improve their performance.

To address these socio-economic disparities, several strategies have been proposed. One approach is to increase funding and resources for schools in low-income areas to ensure they have access to quality educational materials, experienced teachers, and professional development opportunities (Darling-Hammond, Hyler, & Gardner, 2017). Investing in infrastructure and technology can also enhance the learning environment and provide students with additional support and resources.

Enhancing parental involvement is another crucial strategy. Schools can engage parents by providing workshops and resources that help them support their children's education at home (Henderson & Mapp, 2002). Encouraging parents to participate in school activities and decision-making processes can also foster a sense of community and shared responsibility for student success.

Professional development for teachers is essential to improve the quality of instruction, particularly in low-income areas. Training programs should focus on effective teaching strategies, classroom management, and continuous assessment to help teachers address the diverse needs of their students (Tan, 2015). Providing incentives and support for teachers to work in low-income areas can also help attract and retain qualified educators.

Implementing targeted interventions, such as after-school programs and remedial classes, can support students who struggle with foundational mathematics skills (Vistro-Yu & Verzosa, 2024). These interventions can provide additional practice and reinforcement, helping students build confidence and improve their performance. Collaborating with non-governmental organizations and community groups can also provide additional resources and support for these programs.

Leveraging technology in education offers new opportunities to address socio-economic disparities. Digital tools and platforms can provide interactive and personalized learning experiences, supplementing traditional teaching methods (Cheung & Slavin, 2013). In the Philippines, integrating technology into the classroom can help overcome resource constraints and provide students with additional practice opportunities and access to high-quality educational content. Government initiatives to provide internet access and digital devices to students in low-income areas can further support this approach.

Lastly, addressing systemic issues within the education system is crucial for long-term improvement. Policymakers should focus on creating equitable policies that ensure all students have access to quality education, regardless of their socio-economic background (DepEd, 2016). This includes revising funding formulas, improving data collection and analysis to identify and address gaps, and fostering collaboration between government agencies, schools, and communities.

Socio-economic factors significantly impact the academic performance of Filipino students in mathematics. Addressing these disparities requires a multifaceted approach that includes increasing funding for low-income schools, enhancing parental involvement, providing professional development for teachers, implementing targeted interventions, leveraging technology, and addressing systemic issues within the education system. By addressing these factors, the Philippines can create a more equitable education system that supports all students in achieving their full potential in mathematics.

Theme 3: Cultural Factors and Educational Practices

Cultural attitudes towards education in the Philippines significantly influence student performance, particularly in mathematics. Traditionally, the Philippine educational culture has placed a strong emphasis on rote memorization and high-stakes examination scores rather than fostering a deep understanding and application of knowledge (Bernardo, 2008). This educational approach has hindered the development of higher-order thinking skills necessary for mathematical proficiency. The 2022 PISA results underscore that Filipino students continue to struggle with tasks requiring critical thinking and problem-solving, highlighting the need for a significant shift in educational practices (OECD, 2023).

The focus on memorization can be traced back to historical and cultural contexts where education was viewed primarily as a means to pass exams and secure employment (Vistro-Yu & Verzosa, 2024). This has led to an educational system where success is often measured by test scores rather than the ability to apply learned concepts to real-world situations. Consequently, students may excel in memorizing formulas and procedures but falter when asked to use these skills in unfamiliar contexts, which is a crucial component of assessments like PISA.

Furthermore, the teaching methodologies prevalent in many Filipino schools often do not promote active learning and student engagement. Traditional lecture-based teaching, where the teacher is the sole authority and students passively receive information, remains common (David et al., 2019). This method does not encourage students to ask questions, explore different problem-solving strategies, or engage in discussions that could deepen their understanding of mathematical concepts.

In addition to pedagogical practices, the curriculum itself plays a critical role. The Philippine K to 12 curriculum, introduced to enhance educational quality and align with international standards, aims to develop critical thinking and problem-solving skills. However, the implementation of this curriculum has faced several challenges, including insufficient teacher training, lack of resources, and resistance to change (DepEd, 2016). These challenges have hindered the curriculum's effectiveness, preventing it from fully transforming educational practices and improving student outcomes in mathematics.

Cultural factors also influence gender differences in mathematics performance in the Philippines. According to the 2022 PISA results, female students in the Philippines outperformed their male counterparts by 14 score points in mathematics (OECD, 2023). This finding contrasts with global trends where boys typically perform better in mathematics. The reasons for this disparity are complex and multifaceted, potentially involving cultural attitudes towards gender roles, differences in learning styles, and varying levels of encouragement and support from teachers and parents.

Research suggests that in many cultures, girls are often encouraged to be diligent and compliant in their studies, while boys may receive more encouragement to be independent and take risks (Tan, 2015). In the Philippine context, these cultural expectations may contribute to girls' better performance in mathematics, as they may be more likely to follow teachers' instructions closely and engage in the repetitive practice that is often rewarded in traditional educational settings.

However, the cultural emphasis on memorization and compliance may also limit girls' opportunities to develop higher-order thinking skills and confidence in problem-solving, areas where boys typically excel due to different socialization patterns (Llurag, et al., 2024). This suggests the need for gender-specific educational strategies that not only support girls in maintaining their strengths but also encourage boys to engage more deeply with their studies.

Another significant cultural factor is the societal value placed on education and its perceived role in achieving economic mobility. In the Philippines, education is often seen as a crucial pathway out of poverty, leading families to place a high value on academic achievement (Albert, Dumagan, & Martinez, 2015). However, this pressure can result in a narrow focus on exam performance, rather than fostering a genuine interest in learning and intellectual curiosity. This culture of high stakes and high pressure can be detrimental to students' overall educational experience and development of a love for learning.

Addressing these cultural and educational practice issues requires a multifaceted approach. Firstly, there is a need for a paradigm shift in teaching methodologies. Moving away from traditional lecture-based teaching to more interactive and student-centered approaches can foster critical thinking and problem-solving skills (Bahena, et al. 2024). Professional development programs for teachers that focus on these pedagogical strategies are essential for this shift.

Secondly, curriculum reforms should be fully supported and implemented with adequate resources and training. Ensuring that the K to 12 curriculum's objectives of developing higher-order thinking skills are met requires continuous monitoring and support for teachers (Reyes, 2019). Integrating technology in the classroom can also provide innovative ways to engage students and make learning more interactive and relevant to real-world contexts.

Thirdly, addressing gender disparities in mathematics performance necessitates a deeper understanding of the underlying cultural factors. Research and interventions should focus on creating an equitable learning environment that supports both boys and girls in developing their mathematical skills. Encouraging collaborative learning, where students can learn from each other's strengths, can also be beneficial (Descartin, et al., 2023)



Lastly, shifting the cultural focus from merely achieving high test scores to fostering a genuine love for learning is crucial. This can be achieved by creating a more supportive and less pressurized educational environment where students are encouraged to explore, ask questions, and engage in meaningful learning experiences (Bernardo, 2008). Parental involvement and community engagement in the educational process can also play a significant role in creating a positive learning culture.

Cultural factors and educational practices in the Philippines significantly impact student performance in mathematics. Addressing these issues requires comprehensive strategies that include pedagogical reforms, curriculum support, gender-specific interventions, and a cultural shift towards valuing deep learning over mere exam performance. By implementing these changes, the Philippines can improve its mathematics education and better prepare its students for the demands of the modern world.

Conclusion

The findings of this study reveal persistent challenges in mathematics education in the Philippines, as demonstrated by the Programme for International Student Assessment (PISA) results from 2018 and 2022. Despite some modest improvements, Filipino students continue to rank among the lowest globally in mathematics, highlighting deep-seated issues within the educational system. This indicates that fundamental problems affecting mathematics education have not been adequately addressed. Filipino students' average scores in PISA have seen only marginal progress, increasing from 353 in 2018 to 355 in 2022. This slight improvement, while somewhat encouraging, underscores a significant gap in foundational mathematical skills and critical thinking abilities, as approximately 84% of students remain below the basic proficiency level.

Socio-economic disparities play a crucial role in shaping educational outcomes. Students from lower socio-economic backgrounds face substantial barriers that hinder their academic performance, such as limited access to resources, inadequate support systems, and challenging home environments. These factors contribute to a widening achievement gap between socio-economic groups. Additionally, systemic issues within the education system, including overcrowded classrooms, outdated teaching methods, and insufficient teacher training, exacerbate these disparities.

Cultural factors also significantly impact educational practices. The emphasis on rote memorization and high-stakes testing in the Philippines has impeded the development of higher-order thinking skills necessary for success in mathematics. Current educational practices prioritize examination scores over deep understanding, limiting students' ability to apply mathematical concepts in diverse contexts. Gender differences in mathematics performance reveal that female students outperform their male peers, contrary to global trends. This suggests the need for gender-specific educational strategies and a deeper understanding of cultural factors to support all students effectively.

In light of these findings, several recommendations are proposed to enhance mathematics education in the Philippines. First, substantial reforms in the curriculum and teaching practices are necessary to emphasize critical thinking, problem-solving, and real-world applications of mathematical concepts. The K to 12 curriculum should be continually evaluated and updated to align with international standards and effectively support student learning. Second, investing in comprehensive professional development for teachers is crucial. This includes training on modern pedagogical techniques, integrating technology into instruction, and fostering a student-centered learning environment. Effective teaching practices are essential for improving student engagement and learning outcomes.

Third, targeted interventions are needed to support students from lower socio-economic backgrounds. This involves enhancing access to educational resources, improving school infrastructure, and providing additional support services. Efforts should also focus on bridging the gap between students from different socio-economic groups to promote equity in education. Lastly, addressing cultural and gender considerations is vital. Shifting the focus from rote memorization to fostering a genuine interest in learning is essential. Educational practices should encourage exploration, creativity, and critical thinking. Additionally, tailored strategies are required to address gender disparities and support both boys and girls in developing their mathematical skills and confidence.

Improving mathematics education in the Philippines necessitates a comprehensive and sustained effort across multiple dimensions. By addressing systemic, socio-economic, and cultural factors impacting student performance, the Philippines can work towards closing the achievement gap and ensuring that all students have the opportunity to succeed in mathematics and beyond. Through targeted reforms and strategic interventions, it is possible to enhance educational outcomes and equip students with the skills needed for a competitive global landscape.

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