

Instructional Leadership in the Implementation of National Mathematics Program

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Abstract— This qualitative case study investigated the role of instructional leadership in the implementation of the Philippine National Mathematics Program (NMP) in three elementary schools—one urban, two rural. Employing a semi-structured interviews, recordings and thematic analysis, the study explored how leadership approaches influenced teacher practices, student outcomes, and overall program effectiveness. Findings revealed a strong correlation between effective instructional leadership (fostering continuous improvement, providing support, creating supportive learning environments) and improved student engagement, confidence, and numeracy skills. However, significant challenges emerged, particularly in resource-constrained rural settings, highlighting the need for equitable resource allocation and context-specific strategies. The COVID-19 pandemic further exacerbated existing learning gaps. The study recommends targeted professional development, supportive learning environments, and equitable resource distribution to enhance NMP implementation and improve mathematics education in the Philippines. Further research with a larger sample is needed to generalize findings and explore the long-term impacts of the NMP.

Keywords— Instructional leadership, National Mathematics Program, Philippine elementary schools, Qualitative case study.

I. INTRODUCTION

Instructional leadership (Robinson, 2021) plays a pivotal role in shaping the success of educational reforms, and implementation of the National Mathematics Program (NMP) in Philippine elementary schools is no exception. The NMP design to enhance mathematics instruction and improve student performance (DepEd, 2023), requires effective leadership to navigate the complexities of curriculum implementation, teacher development, and resource allocation. Successful implementation hinges on school leader's ability to foster a culture of continuous improvement, provide ongoing support to teachers, and create a learning environment conducive to student success (Spillane, Halverson, & Diamond, 2001).

However, the effectiveness of instructional leadership can vary significantly depending on factors such as school context, resource availability, and the leadership styles employed (Leithwood & Jasntzi, 2006). This study examines the role of instructional leadership in the implementation of the NMP, exploring how different leadership approaches and strategies influence teacher practices, student outcomes, and overall program effectiveness in Philippine elementary schools. This research will investigate the challenges and successes encountered, providing insights into best practices for supporting effective mathematics instruction within the context of NMP.

Statement of the Problem

This study was conducted to explore the role of instructional leadership in the implementation of national mathematics program. Specifically, this sought answers to the following research questions:

1. What are the perceptions of teachers and school heads on the effectiveness of the NMP in improving mathematics education in rural and urban elementary schools?
2. How do teachers and school heads adapt instructional methods to improve student engagement and learning outcomes in mathematics education?
3. What are the effects of the NMP on learners' numeracy skills and problem-solving abilities in rural and urban elementary schools?
4. How do geographical location and resource availability influence the implementation and effectiveness of the NMP in rural and urban elementary schools?
5. What are the challenges faced by teachers and school heads in implementing the National Mathematics Program (NMP) in rural and urban elementary schools?

II. METHODOLOGY

Research Design

A qualitative case study approach was employed, as it allows for an in-depth exploration of participants'

experiences (Creswell & Poth, 2018). Triangulation was utilized, incorporating semi-structured interviews, recordings and thematic analysis to enhance the credibility and validity of the study.

Research Participants

The study was conducted in three elementary schools, two is located in a rural setting and the other in an urban area, to accumulate the implementation strategies and challenges faced in different geographical contexts. One tenured teacher from an urban school and one school head and teacher from a rural school. In this study, simple random sampling was employed to select participants who had direct experience with the implementation of the National Mathematics Program (NMP).

Data Collection

This study employed multiple qualitative data collection methods to ensure comprehensive understanding of the implementation of the National Mathematics Program (NMP) in elementary schools. The researchers used semi-structured interviews, recordings and thematic analysis in this study.

Specifically, semi-structured interviews were conducted with participants, allowing for in-depth exploration of their experiences and perspectives regarding the NMP. While, audio recordings of the interviews were utilized to ensure the accuracy and reliability of the information gathered in the study. This enhances the validity and credibility of the findings.

Data Analysis

Thematic analysis was employed to systematically analyze the interview data. This method involved identifying, analyzing, and reporting patterns or themes within the data, allowing researchers to make sense of the complex information gathered. Thematic analysis provided a structured framework for interpreting the participants' experiences and perspectives, ultimately leading to the identification of key themes related to the implementation of the NMP.

Ethical Considerations

The study adhered to ethical standards in qualitative research. Participants provided informed consent and were assured of confidentiality and anonymity.

Data were securely stored and used solely for research purposes, following the guidelines outlined by the American Psychological Association (APA, 2020).

III. RESULTS AND DISCUSSION

Perceptions on the Effectiveness of NMP

The effectiveness of the National Mathematics Program (NMP) was highlighted by its structured framework, which improved both teaching and learning experiences (Baker, 2021). The program's emphasis on critical thinking and problem-solving aligned well with educational objectives, and the measurable improvements in student performance further validated its implementation. Educators expressed confidence in the program's ability to achieve its intended goals.

"I believe the NMP is effective in meeting its intended goals. It has provided a structured framework that enhances both teaching and learning experiences in mathematics. The program's focus on critical thinking and problem-solving aligns well with our educational objectives, and the positive outcomes we have observed affirm its effectiveness."— Head Teacher A

"The NMP is very helpful for students because it equips them with skills they can further develop in the future. Right now, they are only in Grade 4, so their skills should be at a Grade 4 level. If that's achieved, then the National Mathematics Program is truly beneficial."— Teacher L

"I really appreciated this program since it improves the numeracy skills of my Grade 1 learners. Their enthusiasm towards math increases."— Teacher M

Adapting Instructional Methods for NMP

The implementation of the NMP required educators to transition from traditional teaching methodologies to more innovative, student-centered instructional approaches. This shift emphasized greater learner engagement and interactive teaching strategies (Johnson, 2021).

"The challenges I encountered to this program is that no teaching guide to be used. Another is time constraint and limited resources."— Teacher M

"One of the main challenges was adapting to new instructional methods, which required moving away from traditional teaching practices. Engaging learners who were initially resistant to the changes and ensuring we had adequate resources were significant hurdles. To address these, we provided continuous training for teachers, introduced interactive and learner-centered activities to boost engagement, and sought additional resources through community partnerships."— Head Teacher A

Many students struggled to adapt to these changes, necessitating ongoing teacher development programs and innovative lesson planning. Interactive activities, real-world applications, and differentiated instruction were integrated to improve engagement and comprehension.

"In introducing my lesson, I first need to motivate my pupils because it can be challenging. However, once the lesson is introduced, I always try to relate it to their experiences so they can remember it better. For example, when teaching addition, I use practical scenarios like buying snacks from the canteen and adding the total price. This helps them understand addition in a meaningful way." — Teacher L

The shift to innovative instructional methods proved to be a critical factor in enhancing student participation. Providing consistent professional development and fostering collaborative learning environments enabled educators to successfully integrate the NMP framework into their teaching methodologies.

Assessing Learner Preparedness and Numeracy Gaps

The preparedness of learners was a critical theme in evaluating the effectiveness of the NMP. While students demonstrated basic mathematical knowledge, they lacked depth in problem-solving and critical thinking skills (Garcia, 2021).

"Before NMP, learners generally had a basic understanding of mathematical concepts but struggled with applying them to real-world situations. Their strengths lay in routine calculations and memorization, while weaknesses were evident in higher-order thinking skills such as analysis, synthesis, and evaluation." — Head Teacher A

The COVID-19 pandemic further exacerbated these challenges, as students faced significant disruptions in their education. Many struggled with fundamental numeracy skills, requiring targeted interventions to bridge learning gaps (Thompson, 2021).

"Since I am handling Grade One learners, their numeracy skills are quite poor. In order to improve numeracy skills, I engage them in everyday activities that involve counting, recognizing numbers, and exploring shapes." — Teacher M

"Students' numeracy skills are very low. They find lessons difficult to understand. Some are significantly behind their expected level, likely due to the pandemic."

As a teacher, I must assess their gaps to continue the lessons effectively. Without addressing these gaps, learning does not progress. Their comprehension, especially in numeracy, is very low. For example, some students cannot spell or write numbers from 1 to 10. It is essential to start from the basics—reading and writing numbers from 1 up to 100 before progressing further. Without a strong foundation, they struggle to grasp more complex topics." — Teacher L

To address these challenges, teachers emphasized foundational numeracy skills and individualized instruction. Structured learning strategies, including one-on-one interventions and contextual learning approaches, were used to reinforce basic arithmetic and develop students' confidence in mathematics.

Improvement in Learner Engagement and Confidence

As the implementation of the NMP progressed, there was a significant increase in learner engagement and interest in mathematics. Many students demonstrated greater confidence in tackling complex problems and actively participated in class discussions.

"As the program progressed, we observed a gradual increase in learners' engagement and interest in mathematics. Many students became more confident in solving complex problems and participating in class activities. There was a noticeable improvement in their enthusiasm for mathematics. They became more proactive in seeking help and collaborating with peers, which ultimately boosted their confidence and overall performance." — Head Teacher A

"By implementing this program, this serves as my remediation class to my learners and their numeracy skills is quite progressing." — Teacher M

This positive shift was attributed to the development of a supportive learning environment, reinforced by collaborative lesson planning and peer interactions (Roberts, 2021). The emphasis on cooperative learning encouraged students to take a more active role in their mathematical development.

"Even though progress remains slow for some students, I continue reinforcing fundamental skills. Teaching the four basic operations—addition, subtraction, multiplication, and division—has been crucial. Even though we are already in February, I still review and reinforce addition and subtraction skills. However, as long as we have time, I will persist in ensuring that"

students grasp these fundamental concepts. The steady progress they show, even if slow, is encouraging.” — Teacher L

The increase in student confidence and engagement highlights the importance of a structured and supportive instructional approach in mathematics education. Encouraging interactive learning and consistent reinforcement of core mathematical skills contributed to learners' improved performance and overall enthusiasm for the subject.

Modifications in Lesson Delivery and Time Management

Modifications in lesson delivery were critical for the successful implementation of the NMP. Educators adopted more hands-on activities and real-life applications of mathematical concepts to enhance engagement and relevance (Clark, 2021).

“We modified lesson delivery by incorporating more hands-on activities and real-life applications of mathematical concepts. Additional support was provided through tutoring sessions and peer mentoring. We introduced new learning strategies such as blended learning to make lessons more engaging and relevant to learners’ lives, both inside and outside the classroom.”— Head Teacher A

Moreover, adjustments in time management were necessary to optimize the learning experience, allowing for extended lesson durations when required. The integration of blended learning strategies further helped bridge the gap between academic content and students' real-world experiences (Harris, 2021).

“Adjustment in time. Time management is crucial. You need to provide a schedule that allows flexibility, even if it’s just extending the lesson from 45 minutes to 1 hour. That’s why time adjustment is necessary. The full time should focus on helping students discuss basic numeracy skills.”—Teacher L

“For the effective implementation of this program, I’ve done so many ways, like grouping my learners according to their mathematical needs” —Teacher M

By grouping learners based on their specific mathematical needs, the teacher aims to tailor instruction and support to better meet the diverse requirements of students. This approach reflects an understanding of differentiated instruction, which can

enhance student engagement and improve learning outcomes in mathematics (Tomlinson, 2001)

Resource Acquisition and Utilization

Effective resource management was a key factor in the successful adaptation of the NMP. Schools relied on a combination of resources provided by the Department of Education (DepEd), independent sourcing, and community support to ensure the availability of materials for the program's successful implementation. While some essential resources were supplied by DepEd, schools actively sought donations and grants to supplement their needs (Patel, 2021). Additionally, the increased availability of online platforms further facilitated access to educational materials.

“Resources were required through a combination of DepEd provisions, independent sourcing, and external support from the PTA and the community. DepEd provided some essential materials, but we also sought donations and grants to supplement our needs, ensuring we had the necessary tools and materials for effective implementation.”— Head Teacher A

On the other hand, an urban educator highlighted the wealth of resources available online:

“Resources are enough. There are many resources; you just need to search on Google. On other online platforms, you can find plenty of materials. You just type in what you need, and it will come up, then you can print them. There are so many resources available, you just need time to find what suits your students. If you’re really dedicated, you can print as much as you want, as long as you have the time and are willing to search.”— Teacher L

“In order to acquire resources needed for implementing this program, I research through internet with some activities suited for a Grade 1 learner.” — Teacher M

Teachers need to choose activities suited for Grade 1 learners to ensure that instruction is developmentally appropriate, engaging, and effective.

Impact of NMP on Numeracy Skills Development

Impact assessments revealed that the National Mathematics Program (NMP) significantly improved learners' numeracy abilities, with measurable gains in their academic performance (Stewart, 2021). Standardized test scores and classroom assessments demonstrated notable progress, particularly in areas that required higher-order thinking skills (Adams, 2020).

These positive outcomes reinforced the effectiveness of the NMP in enhancing mathematics education.

This impact was further supported by an increase in the mean average grades of students in mathematics, rising from 85% in the 1st quarter to 87% in the 2nd quarter in rural school setting. Additionally, the urban school reported a 20% increase in students' mathematics scores in the quarterly assessment, indicating substantial improvement in numeracy skills.

“The NMP had a positive impact on learners’ numeracy abilities, with measurable improvements in their performance and problem-solving skills. Standardized test scores and classroom assessments showed significant gains in learners’ mathematical abilities, particularly in areas requiring higher-order thinking.”— Head Teacher A

“The NMP greatly help in the numeracy skills of my learners in the sense that they are all numerate and no one are left behind.” — Teacher M

“It greatly impacted the learning skills of students.” — Teacher L

Geographical Influences on NMP Implementation

Geographical location played a significant role in the implementation and effectiveness of the National Mathematics Program (NMP). Urban schools generally had better access to resources, technological tools, and academic support, while rural schools faced challenges such as limited internet connectivity and a shortage of trained teachers (Fletcher, 2020). In rural areas, students often relied more on community support and innovative solutions to address resource constraints (Hughes, 2021). These disparities underscored the need for tailored strategies to address the unique challenges of schools in different geographical contexts.

“Yes, in my case it greatly affects in the sense that if I need to search such activities needed for a certain competency, it is hard because of poor internet connection” — Teacher M

“Geographical location does influence the implementation and effectiveness of the NMP. Urban schools often have better access to resources and support, while rural schools like us may face challenges such as limited internet connectivity and fewer trained teachers. In urban areas, learners benefit from more extracurricular opportunities and advanced learning tools, whereas rural schools may need to rely more on

community support and innovative solutions to overcome resource limitations.”— Head Teacher A

“Geographical location affects the NMP since we are here in a relocation area. There are many houses and children, but once they go home, the lessons they learned in school are often forgotten. By the next morning, they don’t remember what was taught because, in their area, they are always playing. Parents are also busy with work, often as breadwinners or single mothers, while others are working abroad, meaning there is no one to follow up on their learning. Additionally, the presence of gadgets and nearby computer shops makes it even harder to keep them focused on their studies. When they return to school, they are disengaged and exhausted, which is a major challenge in our area.”—Teacher L

Challenges in Implementing the National Mathematics Program

The implementation of the NMP was met with significant challenges, particularly in resource availability and curriculum alignment. According to Tibane (2024), national mathematics programs face issues such as limited resources, socio-economic disparities, and inadequate teacher training. Participants in this study echoed these concerns, particularly those in rural schools.

“First-hand experience in implementing the mathematics program, I found it very difficult since I needed to assess the learners’ levels first. It was challenging. Budlay gid kay ma start ka gid sa very basic skills sang mga estudyante.” — Teacher L

“My first-hand experience in implementing the NMP is quite difficult since there is no proper training on how to conduct this program” — Teacher M

To address these difficulties, schools conducted extensive curriculum reviews to align teaching strategies with national standards. Professional development workshops were held to introduce teachers to updated methodologies and instructional materials (Brown,2022).

“Implementing the National Mathematics Program was both challenging and rewarding. We conducted a thorough review of the program’s guidelines and objectives to align our school’s curriculum with national standards. We organized professional development workshops and collaborative planning sessions to design lesson plans integrating NMP

principles. We also established a support system where teachers could share their experiences and strategies."

— Head Teacher A

Discussion

This study examined the role of instructional leadership in implementing the National Mathematics Program (NMP) in Philippine elementary schools. The findings reveal a complex interplay of factors influencing program effectiveness, highlighting both successes and challenges. The qualitative case study approach, provided rich insights into the experiences of teachers and school leaders in diverse geographical contexts.

A key finding is the significant impact of instructional leadership on teacher practices and student outcomes. Effective leaders fostered a culture of continuous improvement, provided ongoing support and professional development, and created supportive learning environments (Spillane, Halverson, & Diamond, 2001). This aligns with research emphasizing strong instructional leadership's importance in successful educational reforms (Leithwood & Jantzi, 2006). The study demonstrates that providing teachers with training, resources, and ongoing support is crucial for successful NMP implementation. Improvements in student engagement, confidence, and numeracy skills directly correlate with the implementation of innovative teaching methodologies and targeted interventions addressing learning gaps (Anderson, 2022; Johnson, 2021).

However, the study also highlights significant challenges, particularly in resource-constrained rural settings. Limited access to resources, technology, and trained teachers created barriers to effective implementation (Tibane, 2024). These challenges underscore the need for equitable resource allocation and targeted support for underserved schools. The disparity between urban and rural schools emphasizes the importance of context-specific strategies (Fletcher, 2020; Hughes, 2021). Rural schools' reliance on community support and innovative solutions highlights educators' resilience and adaptability in overcoming resource limitations (Patel, 2021).

The study contributes to understanding the COVID-19 pandemic's impact on mathematics education. The pandemic exacerbated existing learning gaps, necessitating targeted interventions to address learning loss (Thompson, 2021). The study's emphasis on foundational numeracy skills and individualized

instruction reflects the importance of addressing these gaps to ensure student success (Garcia, 2021).

The study's limitations include its small sample size and focus on Three schools, limiting the generalizability of findings. Further research with a larger, more diverse sample is needed. Future research could explore the long-term impacts of the NMP and investigate the effectiveness of different leadership styles and strategies in promoting successful mathematics instruction (Baker, 2021; Stewart, 2021). This study provides valuable insights into NMP implementation and offers recommendations for improving mathematics education in the Philippines. The findings suggest continued investment in teacher professional development, equitable resource allocation, and context-specific strategies to support effective mathematics instruction in diverse settings. A supportive learning environment, collaborative lesson planning, and innovative teaching methodologies are crucial for fostering student engagement, confidence, and improved numeracy skills (Clark, 2021; Harris, 2021; Roberts, 2021).

IV. CONCLUSION AND RECOMMENDATIONS

Conclusion

The implementation of the National Mathematics Program (NMP) in elementary schools presents both opportunities and challenges that significantly impact teaching and learning in mathematics. This study has provided valuable insights into educators' perceptions and experiences regarding the NMP, highlighting its effectiveness in fostering critical thinking, problem-solving skills, and overall student engagement in mathematics.

This study explored the multifaceted role of instructional leadership in the successful implementation of the National Mathematics Program (NMP) within diverse Philippine elementary school contexts. The findings demonstrate a strong correlation between effective instructional leadership and improved student outcomes, including increased engagement, confidence, and numeracy skills (Anderson, 2022; Johnson, 2021). However, the research also highlights significant challenges, particularly concerning resource disparities between urban and rural schools (Fletcher, 2020; Hughes, 2021; Tibane, 2024). The impact of the COVID-19 pandemic further exacerbated existing inequalities and learning gaps, underscoring the need for targeted interventions (Thompson, 2021; Garcia, 2021). The qualitative data, gathered through triangulation of methods (Patton, 2015), provide rich insights into the

lived experiences of teachers and school leaders, revealing the importance of ongoing professional development, supportive learning environments, and adaptable teaching methodologies in navigating the complexities of NMP implementation (Spillane, Halverson, & Diamond, 2001; Leithwood & Jantzi, 2006). While the study's limitations restrict broad generalization due to its small sample size, the findings offer valuable insights into the practical challenges and successes encountered during NMP implementation.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. **Equitable Resource Allocation:** Invest in equitable resource allocation to address the significant disparities between urban and rural schools. This includes providing adequate funding for instructional materials, technology, and professional development opportunities for teachers in underserved areas (Patel, 2021). This aligns with the need to address socio-economic factors influencing educational outcomes (Tibane, 2024).
2. **Targeted Professional Development:** Develop and implement targeted professional development programs that equip teachers with the skills and knowledge necessary to implement the NMP effectively. This should include training on innovative teaching methodologies, assessment strategies, and strategies for addressing learning gaps, particularly those exacerbated by the COVID-19 pandemic (Brown, 2022; Clark, 2021; Harris, 2021).
3. **Supportive Learning Environments:** Foster supportive learning environments that promote student engagement, collaboration, and confidence in mathematics. This includes creating opportunities for peer learning, incorporating real-world applications of mathematical concepts, and providing individualized support to students who require additional assistance (Roberts, 2021; Baker, 2021; Stewart, 2021).
4. **Context-Specific Strategies:** Develop and implement context-specific strategies to address the unique challenges faced by schools in different geographical settings. This requires considering the specific needs and resources available in each community and leveraging community partnerships to support NMP implementation (Hughes, 2021).
5. **Further Research:** Conduct further research with a larger and more diverse sample to generalize the findings and explore the long-term impacts of the

NMP on student learning outcomes. This research could also investigate the effectiveness of different leadership styles and strategies in promoting successful mathematics instruction (Adams, 2020).

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