

Leadership Strategies for Numeracy Development in Educational Settings

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Abstract

This study delves into the imperative role of school leaders in advancing numeracy education, culminating in the development of a comprehensive Numeracy Improvement Guide. Drawing insights from extensive literature, the research identifies key findings that underscore the transformative potential of effective leadership in numeracy education. The study highlights the significance of adopting a holistic approach to numeracy education, emphasizing the integration

of numeracy skills across the curriculum. Informed by successful programs like the Australian Numeracy Educators Partnership, the Numeracy Improvement Guide recommends a paradigm shift towards interdisciplinary collaboration to foster a deeper understanding of numeracy in real-world contexts. Professional development emerges as a critical aspect, with effective school leaders prioritizing ongoing training for educators. Aligned with existing literature on educational leadership, the guide underscores the importance of enhancing both teachers' content knowledge and pedagogical skills to positively influence the quality of numeracy instruction. The creation of a positive numerate school culture is pivotal, as school leaders play a central role in shaping attitudes towards numeracy. The guide advocates for strategies that communicate the broader significance of numeracy skills and engage the community in initiatives promoting numeracy awareness. Lastly, the study emphasizes the need for balanced assessment practices, moving beyond standardized testing to encompass diverse methods. By integrating these findings, the Numeracy Improvement Guide positions school leaders as catalysts for change, empowering them to foster a learning environment where numeracy is celebrated and students are equipped for success in a numerically intensive world.

Keywords: Numeracy Education, School Leadership, Holistic Approach, Professional Development, School Culture

Introduction

Numeracy skills are crucial for academic success and lifelong learning, playing a pivotal role in empowering individuals to navigate the complexities of the modern world. As schools strive to equip students with essential competencies, numeracy education remains a cornerstone in shaping well-rounded and capable individuals (Kolar-Begovic, et al., 2017). School leaders, as key influencers in the educational landscape, play a vital role in fostering an environment conducive to numeracy improvement.

This research endeavors to provide a comprehensive Numeracy Improvement Guide tailored specifically for school leaders. The significance of this guide lies in its potential to offer school leaders practical strategies, evidence-based insights, and best practices to enhance numeracy education within their institutions.

Numeracy, encompassing mathematical literacy and problem-solving skills, is essential not only for success in science, technology, engineering, and mathematics (STEM) fields but also for effective participation in a rapidly evolving global society. The ability to comprehend, interpret, and critically analyze numerical information is a fundamental skill that transcends academic disciplines and is increasingly demanded in various professional and everyday contexts (Sellars, et al., 2018).

Despite the recognized importance of numeracy, there are challenges and gaps in its effective integration into school curricula. School leaders, as educational stewards, are positioned to address these challenges and lead initiatives that promote numeracy proficiency among students (Hilton, et al., 2015). By understanding the nuances of numeracy education and leveraging evidence-based strategies, school leaders can play a pivotal role in fostering a numerate school culture.

This research draws on a comprehensive review of existing literature, including seminal works in numeracy education, leadership in education, and effective teaching practices. Additionally, insights from successful numeracy improvement programs implemented in various educational settings will be examined. The integration of findings from diverse sources will contribute to the development of a practical and actionable Numeracy Improvement Guide for School Leaders.

The overarching goal of this research is to empower school leaders with the knowledge and tools necessary to spearhead numeracy initiatives within their schools, fostering a learning environment that not only meets academic standards but also prepares students for the numerically intensive challenges they may encounter in their future academic and professional pursuits.

Literature Review

Numeracy, the ability to understand and use mathematical concepts effectively, is a foundational skill crucial for success in various academic and professional domains. The importance of numeracy is underscored by its role in equipping individuals with the necessary tools to navigate an increasingly complex and data-driven world (Manire, et al., 2023). Within the educational context, numeracy education is a key component of fostering well-rounded and capable individuals. This literature review explores existing research on numeracy education, leadership in education, and effective teaching practices to inform the development of a Numeracy Improvement Guide for School Leaders.

The seminal work "Adding it up: Helping children learn mathematics" by Kilpatrick, Swafford, and Findell (2001) provides a comprehensive framework for understanding the essential components of numeracy education. The authors highlight five strands of mathematical proficiency, namely understanding, problem-solving, reasoning, representation, and fluency. This foundational work serves as a basis for recognizing the multifaceted nature of numeracy and underscores the need for a holistic approach to its development in educational settings.

The National Council of Teachers of Mathematics (NCTM) has been instrumental in shaping the landscape of numeracy education with its publication of "Principles and Standards for School Mathematics" (2000). This document outlines the principles that guide mathematics education, emphasizing the importance of a balanced curriculum that includes both conceptual understanding and procedural fluency. The NCTM's standards advocate for an approach that goes beyond rote memorization, encouraging educators to foster deep mathematical understanding and application.

Leadership in Education and Numeracy

Effective leadership is a critical factor in the success of any educational initiative, including numeracy improvement programs. Leithwood et al. (2008) conducted a comprehensive study on successful school leadership, identifying key practices and behaviors that contribute to improved student learning outcomes. The findings emphasize the importance of leaders who create a

positive and supportive school culture, set high expectations for student achievement, and provide professional development opportunities for teachers.

In the context of numeracy improvement, effective school leaders are those who recognize the significance of numeracy skills and actively work to integrate them into the school's curriculum and culture. Leadership in numeracy education involves fostering a collaborative and supportive environment, where teachers are equipped with the tools and knowledge to implement effective numeracy teaching strategies.

Despite the acknowledged importance of numeracy, there are persistent challenges in its effective integration into school curricula. Research indicates that numeracy education often faces issues such as a lack of teacher preparedness, insufficient resources, and a narrow focus on procedural knowledge at the expense of conceptual understanding (Diano Jr, et al., 2023). Addressing these challenges requires leadership that is proactive in identifying and overcoming barriers to effective numeracy education.

Furthermore, the standardized testing culture in many educational systems tends to prioritize the assessment of procedural skills over conceptual understanding. This emphasis can lead to a narrow interpretation of numeracy, where students may excel in routine procedures but struggle with real-world problem-solving and critical thinking (National Research Council, 2014). Effective school leaders must navigate this landscape, advocating for a balanced approach that encompasses both procedural fluency and conceptual understanding.

To inform the development of a Numeracy Improvement Guide for School Leaders, it is crucial to examine successful numeracy improvement programs. The Australian Numeracy Educators Partnership (ANEP) is an exemplary initiative that focuses on improving the numeracy skills of students and enhancing the professional development of educators (Anderson, 2014). ANEP emphasizes the importance of ongoing professional learning for teachers, collaborative planning, and the integration of numeracy across the curriculum.

Another noteworthy program is the Numeracy Improvement Project (NIP) in the United Kingdom, which aims to raise standards in mathematics and numeracy for primary school students (Worth, et al., 2015). The NIP focuses on enhancing teacher subject knowledge, providing targeted support for struggling students, and fostering a positive attitude towards mathematics. Insights from these programs underscore the importance of professional development, collaboration, and a holistic approach to numeracy improvement.

Drawing from the rich tapestry of existing literature, the development of a Numeracy Improvement Guide for School Leaders involves synthesizing key principles and strategies. School leaders need to recognize the interconnectedness of numeracy education with other academic disciplines, promoting an interdisciplinary approach that reflects the real-world applications of numeracy skills.

Professional development emerges as a critical aspect of effective leadership in numeracy improvement. School leaders must prioritize ongoing training for teachers, focusing on both content knowledge and pedagogical strategies. This aligns with the findings of ANEP and the

NIP, which highlight the importance of teacher expertise in shaping successful numeracy initiatives.

Additionally, the guide should emphasize the creation of a positive school culture that values numeracy and recognizes its relevance in students' lives beyond the classroom. Leaders can play a pivotal role in communicating the importance of numeracy to students, parents, and the broader community, fostering a collective commitment to numeracy improvement.

The literature review highlights the foundational principles of numeracy education, the role of effective leadership in education, challenges in numeracy education, and insights from successful numeracy improvement programs. The synthesis of these diverse perspectives informs the development of a Numeracy Improvement Guide for School Leaders. By empowering school leaders with evidence-based strategies and practical insights, this guide aims to catalyze positive changes in numeracy education, ultimately equipping students with the essential skills for success in the 21st century.

Methodology

The research focused on developing a Numeracy Improvement Guide for School Leaders, with the aim of providing practical strategies and evidence-based insights to enhance numeracy education within educational institutions. The study sought to synthesize existing literature on numeracy education, leadership in education, and effective teaching practices to inform the creation of a comprehensive guide tailored for school leaders.

The research methodology involved a systematic and comprehensive approach to identify, review, and synthesize relevant literature. The process began with defining the key terms related to numeracy, leadership, and effective teaching practices. Boolean operators were employed to refine search queries, ensuring the inclusion of pertinent studies in the areas of numeracy education and leadership.

The search spanned electronic databases, scholarly journals, and educational repositories to retrieve peer-reviewed articles, books, reports, and research papers. The inclusion criteria were set to encompass studies published between 2000 and 2023, ensuring a contemporary and relevant overview of the literature. The focus was on publications in English, with an emphasis on works from diverse geographical regions to capture global perspectives on numeracy education and leadership.

Each selected source underwent a rigorous review process to extract key findings, methodologies employed, and implications for numeracy improvement. Data were organized and synthesized thematically, drawing connections between numeracy education, leadership practices, and successful numeracy improvement programs. The synthesis process allowed for the identification of recurring themes and patterns within the literature.

The synthesized information from the literature review formed the basis for the development of the Numeracy Improvement Guide for School Leaders. The data were analyzed to extract key principles, strategies, and best practices that could inform the guide's content. Emphasis was

placed on identifying actionable insights that school leaders could implement to foster a numerate school culture and enhance numeracy education outcomes.

Findings and Discussion

Holistic Approach to Numeracy Education:

One pivotal discovery arising from the study underscores the significance of embracing a holistic approach to numeracy education. Informed by insights gleaned from successful numeracy improvement programs, such as the Australian Numeracy Educators Partnership (ANEP), the research highlights the critical importance of integrating numeracy across the entire curriculum (Goos, et al., 2012).

ANEP's emphasis on interdisciplinary collaboration provides a noteworthy example of effective numeracy education strategies. The study found that a holistic approach not only enhances students' mathematical proficiency but also promotes a deeper understanding of numeracy in real-world contexts. In light of this finding, the Numeracy Improvement Guide for School Leaders proposes a transformative shift in curriculum design (Groenewald, et al., 2023). Rather than treating numeracy as confined to standalone math courses, the guide recommends an integrated approach where numeracy skills are seamlessly woven into various academic disciplines.

This recommendation aligns with the broader call for a well-rounded education that prepares students for the challenges of the modern world. By infusing numeracy into subjects beyond mathematics, school leaders can foster a more comprehensive skill set in students, allowing them to apply mathematical concepts in diverse scenarios (Greenhill, 2010). This holistic approach mirrors the demands of an increasingly interconnected society where numerical literacy is a valuable asset in fields ranging from science and technology to social sciences and humanities.

The integration of numeracy across disciplines not only enriches students' learning experiences but also addresses the artificial boundaries that often exist between subjects. School leaders are encouraged to facilitate collaborative initiatives among teachers from different departments, promoting a shared responsibility for numeracy development (Ondog, et al., 2023). Through this interdisciplinary collaboration, students can witness the practical applications of numeracy skills in contexts beyond traditional math problems.

Incorporating findings from ANEP and similar successful programs, the Numeracy Improvement Guide for School Leaders serves as a practical resource for implementing a holistic numeracy approach. It recognizes that a well-rounded education not only equips students with essential life skills but also contributes to their success in an increasingly complex and dynamic world (Jain & Rogers, 2019). By integrating numeracy skills across the curriculum, school leaders can create a learning environment that not only enhances mathematical proficiency but also cultivates students' abilities to apply numeracy in diverse and meaningful ways (Valle, et al., 2023). This approach aligns with the evolving needs of society, where numeracy is a cornerstone for success across various academic and professional domains.

Professional Development for Teachers:

The research underscores the indispensable role of professional development for educators in advancing numeracy education. Cognizant of the significance of ongoing teacher training, the study aligns with existing literature emphasizing the criticality of professional development in educational leadership (Leithwood et al., 2006).

Effective school leaders, as identified in the literature, are those who prioritize and invest in the continuous professional growth of their teaching staff. Leithwood et al. (2006) highlight that successful leaders create a supportive environment that fosters a culture of learning among educators. This resonates with the findings of the current study, affirming the pivotal role of school leaders in nurturing a cadre of proficient teachers equipped to deliver high-quality numeracy instruction.

The Numeracy Improvement Guide for School Leaders, shaped by these insights, places a strong emphasis on the need for targeted professional development programs. This guide recognizes that enhancing numeracy education necessitates a dual focus: bolstering educators' content knowledge in mathematics and refining their pedagogical skills. By doing so, the guide aligns with the literature's recognition that effective teaching goes beyond subject expertise to encompass instructional strategies that cater to diverse learning styles (Leithwood et al., 2006).

Investing in the continuous learning of educators not only addresses the dynamic nature of the educational landscape but also directly influences the quality of numeracy instruction in schools. The guide recommends personalized professional development plans that consider the unique needs and challenges faced by teachers in their pursuit of elevating numeracy education (Kilg, et al., 2023). Through targeted training initiatives, educators can enhance their ability to engage students effectively, employ innovative teaching methodologies, and adapt to evolving educational standards.

School leaders, by prioritizing ongoing training and adopting the recommendations outlined in the Numeracy Improvement Guide, can cultivate a cadre of empowered educators. In doing so, they contribute significantly to the enhancement of numeracy instruction, fostering a learning environment where students are better equipped to navigate the complexities of mathematical concepts and applications.

Creation of a Positive Numerate School Culture:

The study emphasizes the paramount importance of cultivating a positive school culture that values numeracy, as corroborated by insights derived from the literature (Clark, 2019). School leaders emerge as central figures in shaping the collective attitudes of students, parents, and the broader community towards numeracy education.

Leithwood et al. (2006) assert that effective school leaders are instrumental in creating a positive and supportive school culture. This aligns with the research findings, which stress the pivotal role of school leaders in shaping attitudes toward numeracy. The Numeracy Improvement Guide for School Leaders builds on this, offering practical strategies to instill a positive perception of numeracy skills.

The guide recommends that school leaders actively communicate the broader significance of numeracy in everyday life and future career opportunities. By articulating the real-world applications of numeracy, leaders can effectively convey its relevance beyond the confines of the classroom. This strategic communication addresses a critical aspect identified in the literature – the need for students to understand the practical utility of numeracy in various contexts (Leithwood et al., 2006).

Moreover, the guide advocates for community engagement initiatives that promote numeracy awareness. By involving parents, community leaders, and local stakeholders, school leaders can garner support for numeracy education. This aligns with the literature's recognition of the broader community's influence on students' educational experiences and outcomes (Kilag, et al., 2023). By implementing strategies from the Numeracy Improvement Guide, leaders can effectively communicate the value of numeracy skills, engage the community in numeracy initiatives, and contribute to a learning environment where numeracy is celebrated as a vital life skill.

Balanced Assessment Practices:

The research findings accentuate the necessity for a balanced approach to assessment practices in numeracy education, aligning with the broader call to move beyond the constraints of standardized testing (National Research Council, 2014). The study underscores the critical balance required between assessing procedural fluency and nurturing critical thinking and problem-solving skills.

The National Research Council (2014) highlights concerns regarding the limitations of relying solely on standardized testing to evaluate students' mathematical proficiency. The research findings echo this sentiment, emphasizing that while procedural fluency is indispensable, an excessive focus on rote memorization can impede the development of higher-order cognitive skills. The Numeracy Improvement Guide for School Leaders, shaped by these insights, advocates for a shift toward more diversified assessment methods.

The guide recommends the incorporation of formative assessments, which provide ongoing feedback to both educators and students, fostering a dynamic learning process (Black & Wiliam, 1998). Real-world applications are suggested as a means of assessing numeracy skills in authentic contexts, promoting a deeper understanding of mathematical concepts (Hall, 2014). Additionally, project-based assessments are highlighted for their capacity to evaluate students' ability to apply numeracy skills to complex, real-world problems (Barron & Darling-Hammond, 2008).

By embracing these diverse assessment methods, school leaders can ensure a more comprehensive evaluation of students' numeracy skills. This approach aligns with the evolving understanding of assessment as a multifaceted tool that goes beyond measuring procedural knowledge to encompass the application of numeracy in practical and authentic situations.

Conclusion

This study has undertaken a comprehensive exploration of key insights from the literature to inform the development of a Numeracy Improvement Guide for School Leaders. The findings underscore the transformative potential that effective leadership holds in advancing numeracy education within educational institutions.

The first key finding emphasizes the importance of adopting a holistic approach to numeracy education. By integrating numeracy skills across the curriculum, school leaders can contribute to a more well-rounded and interconnected educational experience for students. The guidance drawn from successful programs like the Australian Numeracy Educators Partnership exemplifies the impact of such an approach in fostering a deeper understanding of numeracy in real-world contexts.

Professional development emerges as a critical element in the study's second finding. Acknowledging the dynamic nature of education, effective school leaders prioritize ongoing training for educators. This aligns with existing literature on educational leadership, emphasizing the need for school leaders to create a supportive environment that fosters continuous learning among teachers. The Numeracy Improvement Guide underscores the dual focus on enhancing teachers' content knowledge in mathematics and refining their pedagogical skills to positively influence the quality of numeracy instruction.

The creation of a positive numerate school culture, as highlighted in the third finding, is essential for shaping the attitudes of students, parents, and the broader community towards numeracy. School leaders play a pivotal role in communicating the broader significance of numeracy skills in everyday life and future career opportunities. Community engagement initiatives, as recommended in the Numeracy Improvement Guide, further contribute to fostering a positive perception of numeracy within the school community.

Lastly, the study advocates for balanced assessment practices as a crucial aspect of effective numeracy education. By moving beyond standardized testing and incorporating diverse assessment methods, school leaders can ensure a more comprehensive evaluation of students' numeracy skills. This aligns with the evolving understanding of assessment as a multifaceted tool that goes beyond measuring procedural knowledge to encompass the practical application of numeracy skills.

The Numeracy Improvement Guide for School Leaders is positioned as a valuable resource, providing practical strategies and evidence-based insights to empower leaders in advancing numeracy education. By incorporating these recommendations into their leadership practices, school leaders can contribute to a learning environment where numeracy is celebrated, educators are equipped, and students are prepared with essential skills for success in a numerically intensive world. Through informed leadership, the transformative potential of numeracy education can be realized, ensuring that students are not only proficient in mathematical concepts but also adept at applying them in various meaningful contexts.

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