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ARTICLE

Education in West Kalimantan through the Program of Sekolah Penggerak: Insights into Numeracy Strengthening Practices

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Abstract

Numeracy has become one of the core competencies emphasized in the implementation of the *Merdeka* Curriculum in Indonesia. However, its practical implementation at the school level continues to encounter various challenges. Empirical studies that examine how numeracy strengthening is enacted in authentic classroom contexts, particularly at the junior secondary school level, remain relatively limited. Therefore, this study aims to analyze the implementation of numeracy strengthening at SMPN 10 Pontianak and SMPN 3 Sungai Kakap in supporting the objectives of the *Merdeka* Curriculum. This study employed a descriptive qualitative research design. Data were collected through classroom observations and semi-structured interviews with teachers and students to explore instructional practices, learning environments, and assessment strategies related to numeracy development. The findings indicate that teachers in both schools have made considerable efforts to strengthen numeracy by creating supportive learning environments, integrating numeracy-oriented activities into lesson planning, applying appropriate instructional approaches, and implementing project-based assessment practices. Nevertheless, several challenges remain evident. These include students' difficulties in understanding more advanced numeracy concepts and the relatively limited level of interactivity in the existing assessment practices. In conclusion, while numeracy strengthening has been implemented at a generally satisfactory level, further improvements are still required. Schools are encouraged to enhance student mentoring, strengthen collaboration among teachers, and adopt more flexible and interactive assessment methods to ensure more effective numeracy development in alignment with the goals of the *Merdeka* Curriculum..

Keywords: Learning Process; Numeracy Strengthening; Sekolah Penggerak; West Kalimantan.

1. Introduction

The Merdeka Curriculum began to be implemented in schools at various levels in Indonesia in response to the need for national education reform. This implementation is not carried out simultaneously, but gradually. In the initial stage, the implementation of the Merdeka Curriculum is focused

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on the elementary school level, especially in grades 1 and 4, and will be expanded continuously as the new school year progress [1] [2].

This gradual approach is implemented to ensure the readiness of the educational ecosystem, including teachers, institutional capacity, and supporting facilities [3]. The Merdeka Curriculum is grounded in a philosophy that provides students with greater flexibility in learning, promotes a more enjoyable and less pressurized learning environment, and emphasizes the development of learners' optimal potential and competencies [4] [5]. Furthermore, many scholars and education stakeholders regard the Merdeka Curriculum as a strategic response to the educational challenges arising from the learning crisis that was further intensified by the COVID-19 pandemic [6] [7]. Accordingly, the Merdeka Curriculum is expected not only to function as a curricular reform but also to serve as a comprehensive approach to addressing various fundamental issues within the Indonesian education system [8].

Nevertheless, the implementation of the Merdeka Curriculum is not without challenges. One of the major issues concerns the adjustment process that teachers must undergo to implement the curriculum effectively in classroom practice [9]. The Merdeka Curriculum places significant emphasis on strengthening students' numeracy competencies as an essential component of learning. However, numeracy has often been narrowly interpreted as the ability to perform arithmetic calculations or manipulate numbers on paper. Within this traditional perspective, the use of technological tools such as calculators is sometimes perceived as an indication of weak numeracy ability. Such a limited understanding of "basic skills," however, is increasingly considered inadequate in the context of the twenty-first century, which is characterized by an abundance of data, rapid technological advancement, and the need for complex problem-solving skills [10]. Contemporary perspectives therefore conceptualize numeracy as a broader and more integrated competence that extends beyond basic computation and involves the meaningful use of mathematical thinking in technology-rich environments.

In this broader perspective, numeracy—often referred to as numerical literacy or mathematical literacy—can be understood as the ability to apply mathematical concepts and skills to address practical problems across a range of real-life contexts, including situations encountered at home, in the workplace, and in active participation within society [11] [12]. Furthermore, numeracy involves the capacity to analyze, interpret, and communicate quantitative information presented in multiple forms, such as graphs, tables, and charts. These competencies enable individuals not only to understand quantitative data but also to utilize such information to make predictions and informed decisions in everyday situations [13] [14] [15]. Given these expanded conceptualizations, strengthening numeracy within educational practice becomes an important priority, particularly in the context of curriculum reform aimed at preparing learners to navigate complex social and technological environments.

Based on the conceptual understanding above, numeracy plays a crucial role for students to be able to access and understand the modern world critically. This ability equips them with a deep awareness and understanding of the vital role of mathematics in various aspects of life [16]. The emphasis on real-life relevant mathematical applications allows learners to build capacity and confidence in thinking numerically, spatially, and data-driven. Therefore, they are able to interpret and critically analyze everyday situations and solve complex problems [17] [18].

Despite these developments, schools in West Kalimantan continue to encounter specific challenges in effectively integrating and strengthening numeracy skills through the Sekolah Penggerak Program. Several obstacles have been identified, including disparities in students' initial numeracy abilities, limited teacher capacity to design differentiated numeracy tasks, and the persistence of a subject-centered mindset in which numeracy is often perceived as the sole responsibility of mathematics

teachers. Furthermore, additional constraints—such as limited instructional time, restricted access to diverse learning resources, and teachers' unfamiliarity with more interactive and flexible numeracy assessment models—continue to hinder the optimal implementation of numeracy-oriented learning practices.

Strengthening numeracy is particularly important in the educational context of West Kalimantan, given the region's diverse geographical, social, and economic conditions, as well as the ongoing challenges related to the equitable distribution of educational quality. In response to these conditions, the Sekolah Penggerak Program has been introduced as a national strategic initiative aimed at improving students' logical, analytical, and critical thinking skills, particularly in areas with limited access to educational infrastructure and learning resources. Within the framework of the Merdeka Curriculum, the implementation of the Sekolah Penggerak Program in West Kalimantan seeks to strengthen students' numeracy competencies through contextual, adaptive, and locally responsive learning approaches [19].

The components of the numeracy AKM not only cover content domains (such as numbers, measurement and geometry, data and uncertainty, and algebra), but also involve three main cognitive processes: understanding, application, and reasoning [20]. In this case, students are expected to be able to understand facts, procedures, and mathematical tools that are relevant to problem solving. In addition, they must be able to apply mathematical concepts in real situations both routine and non-routine and conduct reasoning in various contexts, such as personal, socio-cultural, and scientific [21].

To achieve effective numeracy strengthening, innovative learning strategies are needed, and modification of teaching materials is one of the strategies that has proven effective [22]. Teaching materials that are specifically designed with relevant context can increase students' understanding and interest [23]. SMPN 10 Pontianak and SMPN 3 Sungai Kakap Kubu Raya are examples of schools fostered by the Sekolah Penggerak in West Kalimantan, which is actively implementing digitalization strengthening as part of the adoption of the Merdeka Curriculum.

The *Sekolah Penggerak* program itself is a government initiative that aims to accelerate the improvement of the quality of education, with one of its main focuses on strengthening students' numeracy competencies. Given that there are still many students who have difficulty understanding mathematical concepts and applying them in real life, this study aims to analyze the efforts to strengthen numeracy that have been implemented by driving schools and identify numeracy skills that are integrated in the learning process.

2. Methods

This study employed a descriptive qualitative research design to explore in depth the implementation of numeracy strengthening in mathematics learning at schools assisted by the *Sekolah Penggerak*. A qualitative approach was considered appropriate because it allows researchers to understand educational phenomena holistically, particularly classroom interactions, instructional strategies, and participants' perspectives within their natural contexts [24].

Data collection techniques constitute a crucial component of qualitative research because they directly influence the credibility and richness of the findings. Accordingly, this study employed classroom observations and semi-structured interviews as the primary data collection methods. The use of multiple techniques enabled data triangulation, which is widely recommended to enhance the credibility and trustworthiness of qualitative studies [25].

Classroom observations were conducted to obtain direct and factual data regarding the implementation of numeracy strengthening in mathematics instruction. A total of six classroom observations

were carried out, consisting of three observations in each school. Each observation lasted approximately 90 minutes, corresponding to one mathematics lesson. The observations focused on several aspects of numeracy strengthening, including teacher–student interactions, numeracy-oriented learning activities, the types of questions posed by teachers, students' responses during the learning process, and the use of instructional materials. A semi-structured observation protocol was employed to ensure consistency across the observation sessions while still allowing sufficient flexibility to capture emerging and unexpected classroom dynamics [26].

In addition to classroom observations, semi-structured interviews were conducted to gain deeper insights into teachers' and students' experiences related to numeracy learning. The interviews involved four mathematics teachers (two from each school) and four Grade VIII students selected from both schools. Each interview lasted between 30 and 45 minutes. The interview guide was developed based on relevant literature on numeracy and the objectives of the present study. Prior to data collection, the guide was reviewed by experts to ensure its content validity. A semi-structured interview format was consistently applied to allow participants to express their perspectives openly while maintaining alignment with the research focus [27].

The participants were selected using purposive sampling, a technique commonly used in qualitative research to identify information-rich cases that are most relevant to the research objectives [28]. Teachers were selected based on their direct involvement in mathematics instruction and their participation in numeracy-strengthening initiatives. Meanwhile, students were chosen from Grade VII classes that were actively engaged in numeracy-based learning activities. The two schools, SMP Negeri 10 Pontianak and SMP Negeri 3 Sungai Kakap, were selected because they are officially supported by facilitators from the *Sekolah Penggerak* Program and have actively implemented numeracy strengthening initiatives.

Data analysis was conducted using thematic analysis, following the stages proposed by [29]. Observation notes and interview transcripts were analyzed through data familiarization, initial coding, theme identification, theme review, and theme definition. This systematic process enabled the researcher to identify recurring patterns and themes related to numeracy implementation, instructional strategies, challenges, and supporting factors. To enhance analytical rigor, the coding process was carried out iteratively, and emerging themes were constantly compared across data sources [30].

Ethical considerations were carefully addressed throughout the research process. Informed consent was obtained from all participants prior to data collection. For student participants, consent was also obtained from parents or guardians. Participants were informed about the purpose of the study, their voluntary participation, and their right to withdraw at any time. Anonymity and confidentiality were ensured by using pseudonyms and securely storing all data. These procedures align with ethical standards for research involving human subjects [31].

3. Results and Discussion

3.1 Results

Data from classroom observations and semi-structured interviews were analysed using thematic analysis [25] [32]. The analysis followed several stages: data familiarization, initial coding, theme development, theme review, and interpretation. Observation notes and interview transcripts were coded separately at the initial stage and then compared to identify convergent and divergent patterns [33]. Through this process, four major themes emerged consistently across both data sources: (1) learning environment, (2) planning, (3) implementation, and (4) assessment of numeracy strengthening. The presentation of results below is organized by data source to clearly demonstrate how observational and interview data complement and reinforce each other.

3.1.1 Findings from Classroom Observations

Theme 1: Learning Environment for Numeracy Strengthening

Classroom observations at SMPN 10 Pontianak and SMPN 3 Sungai Kakap indicate that teachers have made deliberate efforts to create a learning environment that supports numeracy development. Teachers frequently used contextual and open-ended questions to encourage student participation, such as asking students to estimate household expenses, interpret simple environmental data, or calculate quantities related to daily activities [33]. These practices were observed consistently across subjects, particularly mathematics, science, and social studies.

Teachers were also observed providing positive reinforcement, allowing students to make mistakes and revise their answers. This pedagogical approach reflects an emphasis on the learning process rather than solely on correct answers. In several observed lessons at SMPN 10 Pontianak, teachers explicitly invited students to explain their reasoning, which helped foster numerical confidence and classroom dialogue.

However, observational data also revealed variation in student engagement, particularly at SMPN 3 Sungai Kakap. Several students appeared passive during numeracy-related activities, especially when tasks involved non-routine problems or abstract numerical reasoning. This passivity was often accompanied by hesitation to respond or reliance on peers, indicating underlying difficulties with basic numeracy concepts. These findings suggest that while the learning environment is generally supportive, unequal numeracy readiness among students remains a challenge, particularly for differentiated instruction.

Theme 2: Planning of Numeracy Integration

Observations of lesson plans and classroom enactment show that teachers at both schools attempted to integrate numeracy across subjects. At SMPN 10 Pontianak, this integration was more systematic. For example, science lessons regularly incorporated tables and numerical data from experiments, while social studies lessons involved reading graphs and interpreting statistical information related to population or environmental issues.

At SMPN 3 Sungai Kakap, numeracy integration was also observed but appeared less consistent. In some lessons, numeracy activities were introduced spontaneously rather than as part of structured lesson planning. This suggests that while teachers recognize the importance of numeracy, not all have fully internalized numeracy as a shared responsibility across disciplines, with some still perceiving it primarily as a mathematics domain [34].

Theme 3: Implementation of Numeracy Learning

During the implementation of the lessons, teachers adopted a range of instructional strategies to contextualize numeracy within mathematics learning. The observations indicated the use of concrete learning media, including measuring instruments, charts, and visual diagrams at SMPN 10 Pontianak, as well as the integration of simple digital tools such as calculators and graphing applications at SMPN 3 Sungai Kakap. The incorporation of these instructional resources facilitated student engagement and reflected the student-centered learning orientation promoted in the Merdeka Curriculum.

However, the classroom observations also revealed a persistent challenge. Students with limited foundational numeracy skills encountered difficulties in actively participating in learning activities, particularly during group discussions that required numerical calculations or data interpretation. This finding suggests that, despite the implementation of contextual and student-centered strategies, disparities in students' numeracy competencies remain evident. Therefore, the adoption of more differentiated instructional approaches—such as tiered assignments, scaffolded questioning,

and targeted support—is necessary to accommodate diverse learning needs and to ensure more inclusive classroom participation [35].

Theme 4: Assessment Practices

Observed assessment practices indicated that teachers employed a variety of assessment approaches, including project-based tasks, quizzes, and authentic assessments. Through these activities, students were required to perform calculations related to vehicle speed, construct graphical representations, and analyze numerical data derived from local contexts such as agriculture and transportation. These contextualized assessment tasks were designed to connect mathematical concepts with real-life situations, thereby supporting the development of students' applied numeracy skills.

Despite these constructive practices, classroom observations revealed that assessment interactions were frequently one-directional, with limited opportunities for reflective dialogue or peer feedback among students. In several instances, students appeared to experience anxiety or reduced confidence when confronted with unfamiliar numeracy problems. This suggests that, although assessment strategies were diverse in form, they still lacked sufficient interactivity and formative feedback mechanisms. Therefore, more dialogic and formative-oriented assessment practices are needed to foster students' confidence, encourage collaborative learning, and support deeper conceptual understanding of numeracy.

3.1.2 Findings from Interviews

Theme 1: Students' and Teachers' Perceptions of the Learning Environment

Interview data strongly support the observational findings regarding a supportive learning environment. Most students reported that numeracy learning felt more engaging when connected to everyday life, while teachers emphasized building a safe space for trial and error. A student (S1) and a teacher (T1) shared their views:

> "I like it when teachers give examples related to daily life, such as calculating travel time or making graphs from small survey results." (S1)
>
> "We try to create an atmosphere where students are not afraid of making mistakes when calculating. If they make an error, I ask them to explain their thinking process first before correcting it, so they feel valued." (T1)

These responses corroborate observational evidence that contextual learning and discussion-based activities contribute positively to student engagement. This integration effectively bridges the gap between abstract mathematical concepts and practical daily applications.

Theme 2: Experiences and Planning of Numeracy Integration Across Subjects

Students confirmed that numeracy was not limited to mathematics lessons, highlighting its application in science and social studies. However, teachers noted that this integration requires deliberate planning to be effective. A student (S3) and a teacher (T2) explained:

> "Our science teacher asked us to calculate experimental results like the speed of falling objects. It helped us understand the formula better." (S3)
>
> "Integrating numeracy into science lesson plans takes more time because I have to ensure the experimental data is mathematically sound. However, it makes the formulas students usually just memorize much more logical." (T2)

These accounts reinforce observational findings that numeracy integration is occurring, albeit with varying consistency between schools. This approach helps students perceive numeracy as a practical foundational skill rather than an isolated academic exercise.

Theme 3: Perceived Effectiveness of Instructional Strategies and Tools

Interviewed students perceived teachers' instructional strategies as helpful, particularly with the use of real-life examples and technology. Teachers justified these choices as a way to reduce student anxiety and increase focus on data interpretation. A student (S2) and a teacher (T3) noted:

> "The teacher used a calculator and a simple app to help us calculate experimental data." (S2)

> "I deliberately use simple graphing apps so students don't spend too much time drawing manually. My focus is on how they read and interpret the data trends." (T3)

These statements align with observational data showing the use of concrete media and technology to support numeracy learning. By utilizing these tools, teachers provide a more modern and accessible approach to developing numerical literacy [36].

Theme 4: Assessment and Student Confidence

Interviews revealed mixed feelings about numeracy assessments; while project-based tasks were enjoyed, complex problems often hindered confidence. Teachers acknowledged the difficulty in providing deep feedback during these assessments. A student (S4) and a teacher (T4) stated:

> "Making graphs from our own data was fun, but sometimes I feel unsure when the questions are different from examples." (S4)

> "Project tasks like calculating vehicle speed make them enthusiastic, but the challenge is giving individual feedback. Sometimes time runs out just grading the final result without discussing the process deeply." (T4)

This supports observational findings that despite varied assessment forms, students' difficulties with advanced concepts and low confidence persist. These challenges highlight the need for more interactive and formative feedback mechanisms in the assessment process [37].

3.2 Discussion

The findings of this study show that the strengthening of numeracy in the Driving School program in West Kalimantan has gone beyond just mechanical calculations and shifted towards the development of contextual numeracy literacy. This shift can be explained through the mathematical literacy framework developed by the OECD which emphasizes the ability of individuals to formulate, use, and interpret mathematics in a variety of life contexts [16]. Thus, the learning practices observed at SMPN 10 Pontianak and SMPN 3 Sungai Kakap reflect the transformation of numeracy as a functional competence, not just a procedural skill.

From the perspective of numeracy as a social practice, the use of the context of everyday life allows students to build a more meaningful understanding of mathematical concepts. This is in line with the role of numeracy literacy in understanding the modern world contextually [15]. In addition, within a constructivist framework, real-life experiential learning encourages students to actively construct knowledge. These findings are consistent with previous research which showed that realistic mathematical approaches improve students' numeracy skills [17]. Similar results were reported, who found that context-based learning was able to improve numeracy skills and reduce math anxiety [20].

However, this study reveals a significant difference in the consistency of numeracy integration between subjects. The more systematic integration at SMPN 10 Pontianak compared to the still spontaneous approach at SMPN 3 Sungai Kakap shows that the implementation of numeracy is greatly

influenced by the capacity of teachers. This is in line with the findings of Trisnawati et al. who emphasized that teachers' understanding of the Independent Curriculum still varies [2]. These findings are consistent with previous research by Dassa et al. which showed that the integration of cross-disciplinary numeracy requires careful planning [38]. In contrast to previous research, this study found that the integration of numeracy has not been fully internalized in formal learning planning.

Furthermore, the use of digital technology in learning shows that technology not only functions as a computational aid, but also as a pedagogical strategy to improve cognitive efficiency. This supports the view that in the data-driven era, analytical capabilities are more important than just manual calculations [14]. These findings are consistent with previous research by Pratiwi et al. which emphasized the importance of digital learning media innovation [5]. Similar results were reported by Dewi et al. which showed that learning technology is able to boost students' literacy and numeracy [36]. However, in contrast to previous research, this study found that the use of technology is not fully optimal because it has not been deeply integrated in pedagogical strategies.

In the aspect of assessment, the results of the study show that the practice carried out still tends to focus on the final result and has not fully developed the mathematical reasoning process of students. This is not entirely in line with the OECD's mathematical literacy framework [16] which emphasizes the importance of reasoning skills. The low confidence of students in solving non-routine problems also indicates that reasoning skills have not been developed optimally. These findings are consistent with previous research which stated that students' numeracy skills are low in unstructured problem-solving [19]. Similar results were reported who found that mathematical reasoning ability is related to students' self-confidence [37].

Analytically, the practices found in this study occur as part of the transformation of the educational paradigm towards student-centered learning as carried out in the Independent Curriculum [39]. This shift requires increasing teacher capacity, technology integration, and strengthening the assessment system. Therefore, the implications of this study are the need for continuous teacher training, cross-disciplinary collaboration, and the application of reasoning-based assessments.

Thus, this study not only corroborates previous findings, but also expands on previous research by showing that the success of strengthening numeracy depends on the integration of contextual approaches, teacher capacity, the use of technology, and assessment systems that support students' thinking processes.

4. Conclusion

This study shows that the strengthening of numeracy in the Sekolah Penggerak program is more effective when numeracy is treated as a cross-disciplinary practice rather than as a stand-alone mathematical activity. The findings indicate that effective implementation does not rely solely on students' final numerical accuracy, but on how numeracy is integrated into different subjects, such as science and social studies. When teachers focus on students' thinking processes and the use of numeracy in authentic contexts, for example, interpreting experimental data or population graphs, students are more likely to develop functional mathematical understanding. In this sense, numeracy operates as a shared tool across subjects and supports students' ability to engage with everyday problems [38].

To sustain these practices, several practical steps need to be taken by educational stakeholders. First, school leaders should provide structured opportunities for collaboration between mathematics teachers and teachers of other subjects so that numeracy-related activities are intentionally planned. Second, teachers should use assessment approaches that allow students to demonstrate their problem-solving processes, such as project-based tasks and ongoing feedback, rather than focusing only on final answers. Third, additional support is needed for students who experience

difficulties with basic numeracy or more complex concepts, through targeted mentoring and appropriate instructional resources. These measures help ensure that numeracy development is planned and systematic, rather than incidental.

Although the program was implemented satisfactorily, this study has several limitations. The research was conducted in only two schools in West Kalimantan, which limits the extent to which the findings can be generalized to other regions or educational contexts. In addition, the data mainly capture short-term changes in classroom interaction and student engagement, while the long-term development of students' numeracy skills was not examined. Further research using longitudinal designs and larger samples is therefore required to investigate the sustained impact of cross-disciplinary numeracy practice.

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